Overheating Assessment

Allport House, Cowley Business Park, Uxbridge

Prepared by Ivan Ball

Bluesky Unlimited
39 Marsh Baldon
Oxfordshire
OX44 9LP

www.blueskyunlimited.co.uk

18th January 2021

Executive Summary

This Statement has been prepared in response to a planning condition imposed on the consent for ten new apartments created from a two-storey roof extension to the existing building at Allport House.

The condition says;

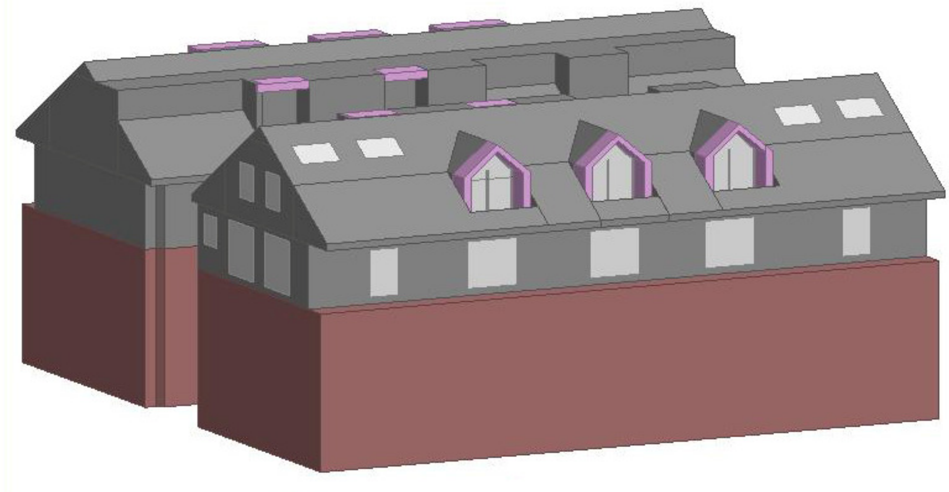
Prior to above ground works, further detailed design of the development shall be submitted and approved by the Local Planning Authority to identify the design features incorporated to prevent overheating of the units, this shall include the overnight temperature. The details approved shall be implemented in full and retained for the lifetime of the development.

A detailed Overheating Assessment has been prepared and concludes that all rooms pass the requirements of the CIBSE TM59 methodology on the basis that;

- Internal blinds are provided to windows on the South, East and West elevations;
- The ‘g’ value of the glazing used will be less than 0.40.

The requirements of the planning condition are met.

Contents



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 ***Allport House Apartments*** 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 corridor spaces highlighted overheating to the circulation areas of apartment 29.

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 third floor gable windows openable, internal blinds and Low G Glazing. 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**
Current Proposals	**Almost all zones fail TM59**		
Internal Blinds to South, East and West windows	**Improved Results but most still failing**		
Low G-Glazing (G-value <0.40)	**All Zones pass TM59**		

2.0 Introduction

This report had been produced to assess the design stage proposals for ***Allport House 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 apartments are part of a proposed second and third floor extension to and existing building at Cowley Business Park, Cowley, Uxbridge. The Extension consists of 10 duplex apartments, 5 units on the Northern wing and 5 units on the Southern wing

("Map data ©2021 Google")

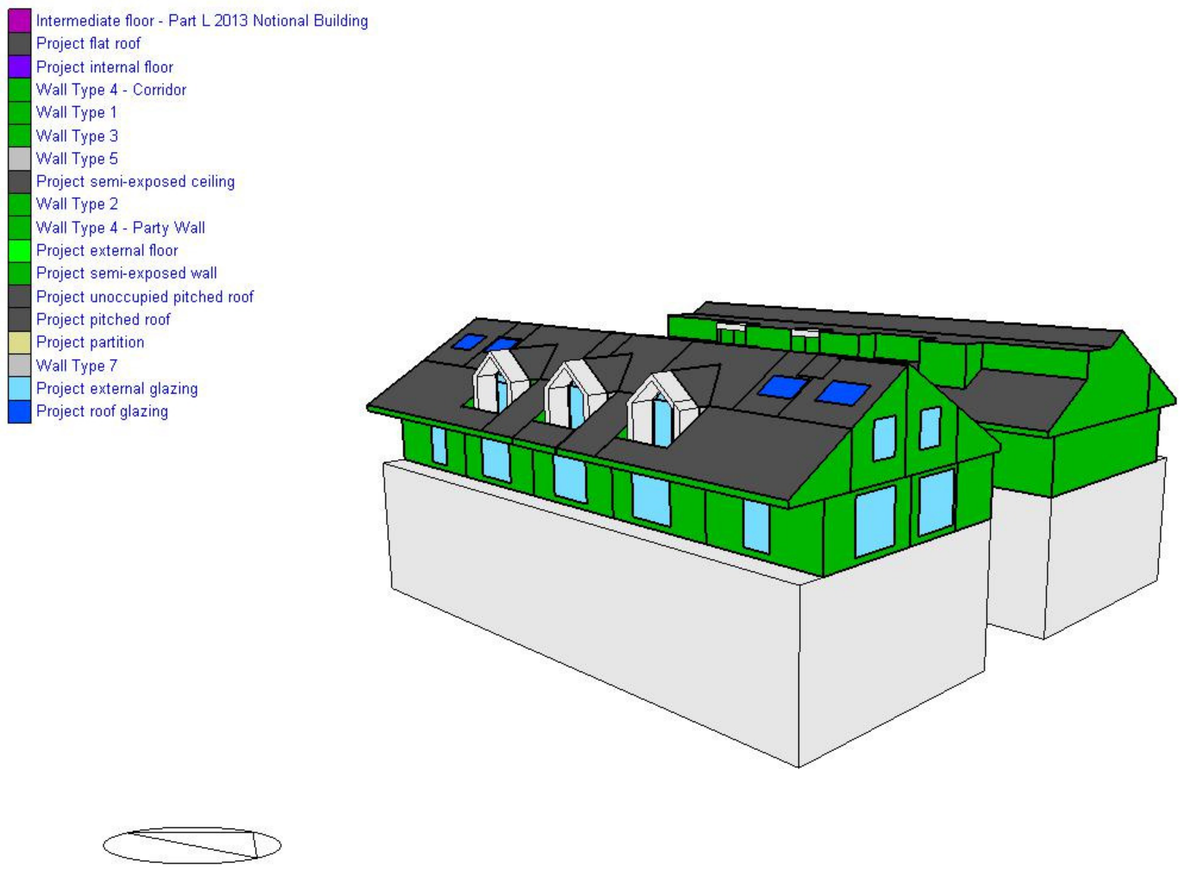
3.0 Overheating Criteria

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

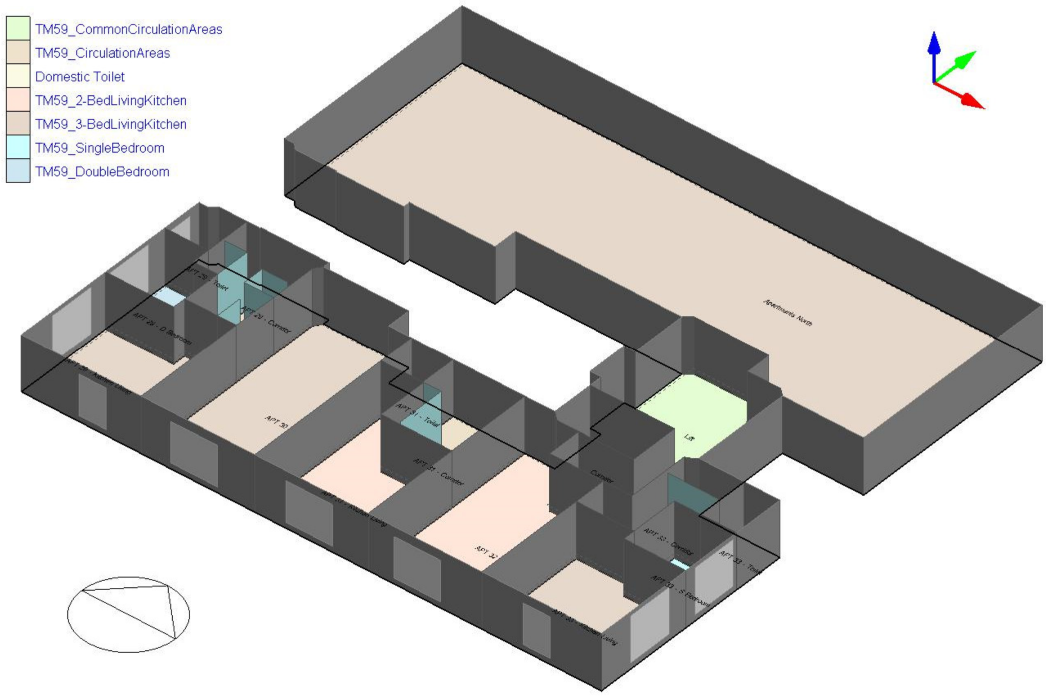
A three-dimensional thermal model was produced based on information provided by the client/architect or otherwise stated in this report. Where specific information is provided building fabric, occupancy densities, profiles, small power gains were based on the TM59 profiles and NCM assumptions. Specific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

5.2 Sample Units

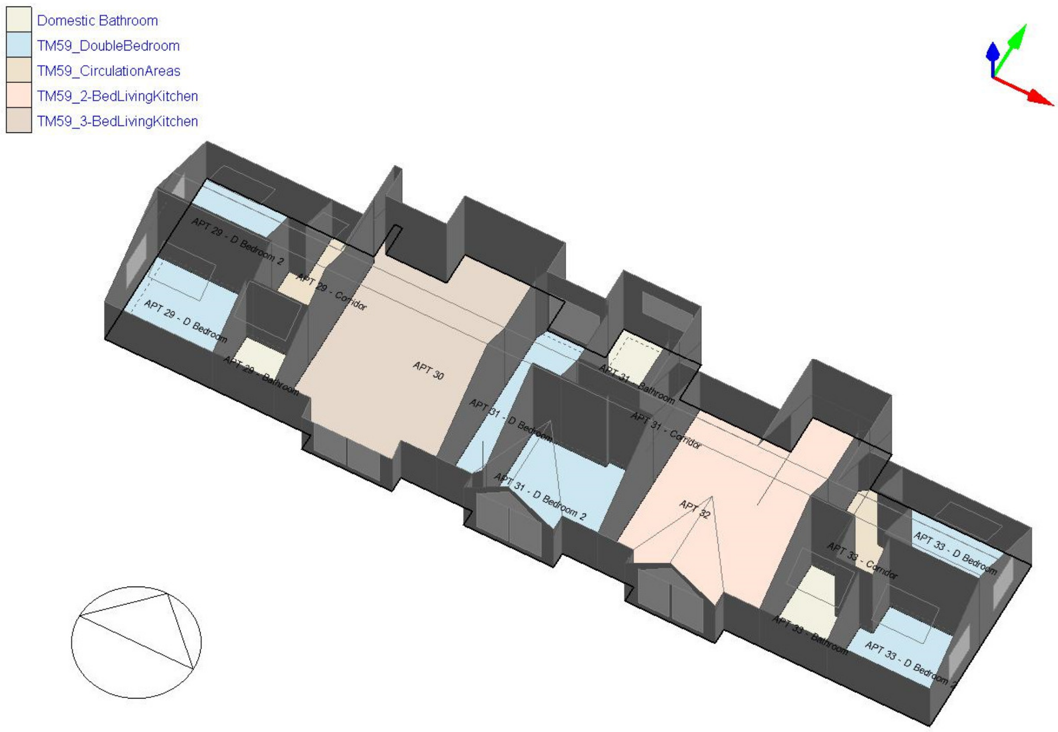
A sample of high-risk apartments has been selected for simulation. Sample apartments have been selected based on the following criteria:

- Apartment 29 – 3 Bedroom, End unit, South and West facing windows.
- Apartment 31– 2 Bedroom, Mid Unit, South Facing Windows.
- Apartment 33 – 3 Bedroom, End unit, South and East facing windows.

5.3 Sample Units – Second Floor Plan Apartments 30, 32 and 33



5.4 Sample Units – Third Floor Plan Apartments 30, 32 and 33



QUEENSBERRY DESIGN Ltd.

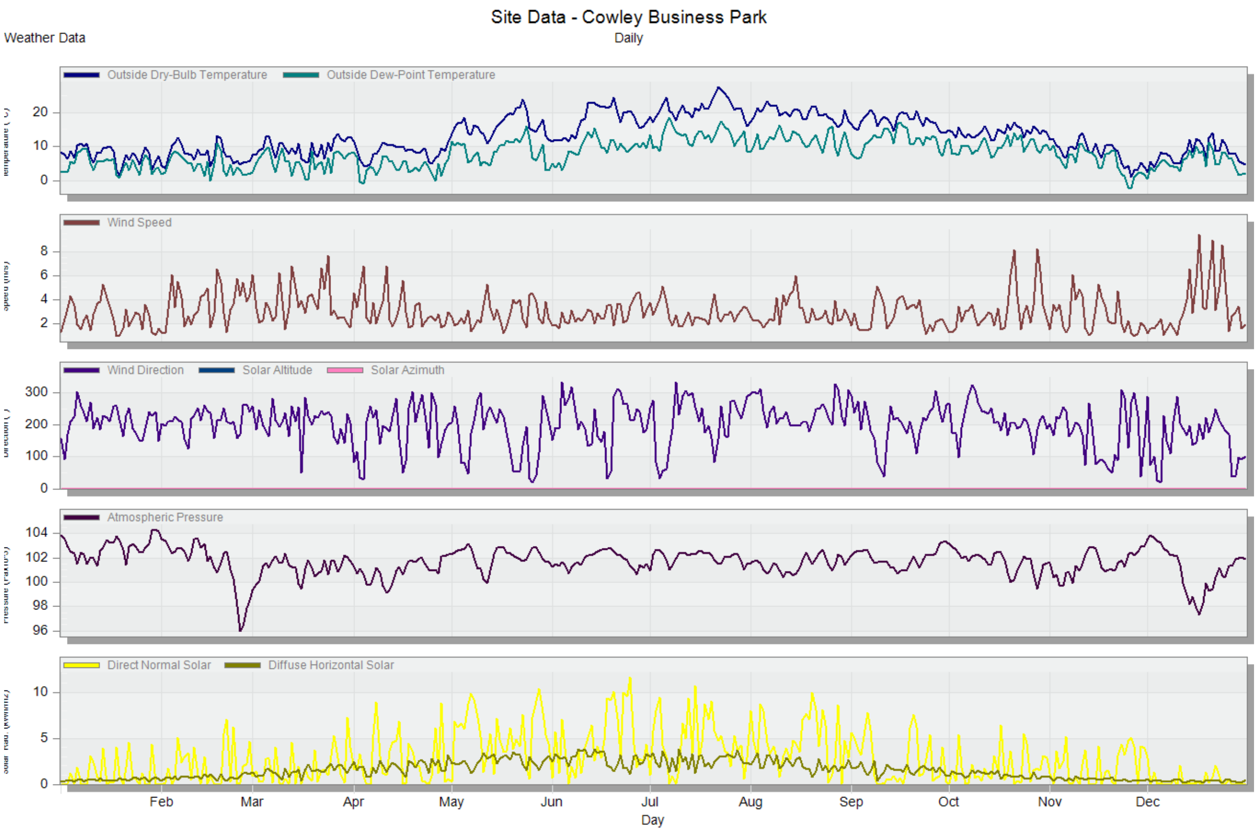
6.0 Summary of Model Inputs

6.1 Location Data

Building type: Residential
Building Location: Cowley Business Park, Cowley, Uxbridge UB8
Orientation: Building Entrance Faces East
Latitude: 51.31° North
Longitude: 0.29° West

6.2 Weather Data Report

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



6.3 Building Fabric

Fabric U-vales are based on preliminary information provided.

Table 2 – Building Fabric		
Wall Type 1 (External)	2x15 mm Gyproc Wallboard, Vapour Control layer, 90mm Isover APR 1200 in Cavity, 92mm metal stud, 12mm cementitious board, Tyvek breather membrane, 20mm Airspace, 200mm EPS insulation and 5m Render.	
Wall Type 2 (External)	1X12.5mm Gyproc wallboard, Vapour control layer, 15mm Gyproc Fireline, 70mm Metsec with 70mm Rockwool insulation, 12mm Hardie Wind Breaker sheathing board, Tyvrek breather membrane, 25mm cavity, 12mm RCM -Y wall, 110mm PermaRock Mineral Fiberinsulation and PermaRockRender system.	
Wall Type 3 (Internal)	12.5 mm Gyproc Wallboard plasterboard to each side of stud, 70mm metal stud/metsec with 50mm Isover APR 1200 in cavity	
Wall Type 4 (Corridor)	2 x 12.5mm Soundbloc plasterboard to each side of stud, 16mm Gypframe RB1 resilient bars @ 600 c/c to one side, 70mm metal stud/metsec with 50mm Isover APR 1200 in cavity.	
Wall Type 4 (Party Wall)	2 x 15mm British Gypsum plasterboard both sides the stud, Approx 150 cavity, Braced Twin Frame 50 C stud 2x 50mm Isover APR 1200 in between studs.	
Wall Type 5 (Lift Shaft)	10mm plaster, 100mm blockwork medium density, 10mm gap for dot and dab and 15 mm Fire board to each side.	
Wall Type 6 (Wall in Roof)	62.5mm K18 insulated plasterboard, 125 mm timber stud with full fill Insulation and Tyvek breather membrane.	
Wall Type 7	62.5mm K18 insulated plasterboard, 125 mm timber stud with full fill Insulation, Tyvek breather membrane, 18mm Ply wood, Timber battens to create cavity, exterior cement Board and Render.	
Intermediate Floor	Rockwool insulation infill between the steel structures.	
Pitched Roof	62.5mm K18 insulated plasterboard, 200mm mineral wool insulation in between rafters, 18mm WBP plywood decking, roof tiles laid on battens and underlay.	
Dormer Roof	62.5mm K18 insulated plasterboard, 200mm mineral wool insulation in between rafters, 18mm WBP plywood decking, roof tiles laid on battens and underlay.	
Table 3 – Glazing Specification		
Windows	G-Value 0.72 (light transmission based on 0.7)	**0.14 W/m2K**

6.4.1 Building Services:

- ***Heating and hot waters:*** Electric panel heating to apartments and hot water via air sourced heat pump (Dimplex Edel or Vaillant aroSTOR). The Communal corridors also 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/m$_2$. From 6pm to 11pm, 2 W/m$_2$ should be assumed as the default for an efficient new-build home."*
    - *"For communal corridors, 2 W/m$_2$, 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-1m-2 @ 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. To complete the assessment all full hight balcony doors are based on fully openable, openable windows are assessed based on a free aperture of 50% and for rooflights 80%. 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 TM59:217. 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 4 – 2020's Simulation Results for Sample Apartments (CIBSE TM59:2017)			
Zone	**Criteria A (%)**	**Criteria B (hr)**	**Pass / Fail**
Apartment 29 Second Floor – Double Bedroom	76.14	1228.5	Fail
Apartment 29 Second Floor – Livingroom / Kitchen	8.73	N/A	Fail
Apartment 29 Third Floor – Double Bedroom	18.16	207.83	Fail
Apartment 29 Third Floor – Double Bedroom	8.76	110.33	Fail
Apartment 31 Second Floor – Livingroom / Kitchen	0.95	N/A	Pass
Apartment 31 Third Floor – Double Bedroom	0.47	28.5	Pass
Apartment 31 Third Floor – Double Bedroom	0.53	33.83	Fail
Apartment 33 Second Floor – Livingroom / Kitchen	5.46	N/A	Fail
Apartment 33 Second Floor – Double Bedroom	3.95	24.17	Fail
Apartment 33 Third Floor – Double Bedroom	4.11	42.5	Fail
Apartment 33 Third Floor – Double Bedroom	15.23	134.5	Fail

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). All except apartment 29 pass.

Table 5 – 2020's Simulation Results for Corridors (CIBSE TM59:2017)		
Zone	**Exceedance 28° (%)**	**Pass / Fail**
Apartment 29 Second Floor – Circulation	15.82	Fail
Apartment 31 Second Floor – Circulation	0.83	Pass
Apartment 33 Second Floor – Circulation	1.34	Pass
Second Floor Communal – Circulation	1.75	Pass
Apartment 29 Third Floor – Circulation	5.25	Fail
Apartment 31 Third Floor – Circulation	0.71	Pass
Apartment 33 Third Floor – Circulation	2.50	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 third floor gable windows openable, internal blinds and Low G Glazing. The developer should also consider building wide measures such as external shading to futureproof the building.

Given the high failure in the end gable third floor bedrooms (apartments 29 & 33) it is strongly advised that these windows are deigned to be openable. All further simulation results are based on these windows being opened to form a 50% free aperture.

8.2 Blinds

To reduce the projected solar gains the developer should consider internal blinds to South West and East facing non-openable windows. As the majority of these openings are full hight sliding door balcony doors it is advised that blinds be installed to the fixed pain side of double doors.

Blinds Specification	- Low reflective fixed angle slats, manually operated (Summertime occupancy schedule)

Table 6 – Internal Blinds (third floor gable windows openable)

Results for Sample Apartments previously failing (CIBSE TM59:2017)

Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Apartment 29 Second Floor – Double Bedroom	7.04	44.17	Fail
Apartment 29 Second Floor – Livingroom / Kitchen	5.61	N/A	Fail
Apartment 29 Third Floor – Double Bedroom	6.42	31.67	Fail
Apartment 29 Third Floor – Double Bedroom	3.52	26.83	Fail
Apartment 31 Second Floor – Livingroom / Kitchen	0.9	N/A	Pass
Apartment 31 Third Floor – Double Bedroom	0.47	28.5	Pass
Apartment 31 Third Floor – Double Bedroom	0.53	34.5	Fail
Apartment 33 Second Floor – Livingroom / Kitchen	3.72	N/A	Fail
Apartment 33 Second Floor – Double Bedroom	3.49	28	Fail
Apartment 33 Third Floor – Double Bedroom	2.87	23	Pass
Apartment 33 Third Floor – Double Bedroom	6.1	27.17	Fail

As shown in the table above internal blinds do reduce the level of failure, however the majority of zones are still failing to meet the CIBSE TM59:2017 overheating criteria.

Corridors Additional Results 2020's

Based on the inclusion of internal blinds corridors have been re-tested under the advisory TM59 overheating criteria. (internal temperatures advised not to exceed 28°C for more than 3% of annual hours). All corridor zones pass.

Table 5 – 2020's Simulation Results for Corridors (CIBSE TM59:2017)		
Zone	**Exceedance 28° (%)**	**Pass / Fail**
Apartment 29 Second Floor – Circulation	1.6	Pass
Apartment 31 Second Floor – Circulation	0.83	Pass
Apartment 33 Second Floor – Circulation	1.24	Pass
Second Floor Communal – Circulation	1.75	Pass
Apartment 29 Third Floor – Circulation	2.38	Pass
Apartment 31 Third Floor – Circulation	0.72	Pass
Apartment 33 Third Floor – Circulation	1.79	Pass

8.3 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 <0.40

Table 7 – Low G-value glazing (third floor gable windows openable) Results for Sample Apartments previously failing (CIBSE TM59:2017)			
Zone	**Criteria A (%)**	**Criteria B (hr)**	**Pass / Fail**
Apartment 29 Second Floor – Double Bedroom	2.97	30	Pass
Apartment 29 Second Floor – Livingroom / Kitchen	2.77	N/A	Pass
Apartment 29 Third Floor – Double Bedroom	2.42	24.17	Pass
Apartment 29 Third Floor – Double Bedroom	1.38	20	Pass
Apartment 31 Second Floor – Livingroom / Kitchen	0.62	N/A	Pass
Apartment 31 Third Floor – Double Bedroom	0.28	26.17	Pass
Apartment 31 Third Floor – Double Bedroom	0.29	29.33	Pass
Apartment 33 Second Floor – Livingroom / Kitchen	1.9	N/A	Pass
Apartment 33 Second Floor – Double Bedroom	1.55	18.83	Pass
Apartment 33 Third Floor – Double Bedroom	0.91	19.17	Pass
Apartment 33 Third Floor – Double Bedroom	2.46	22.5	Pass

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

9. Conclusions

A detailed dynamic thermal model of the proposed ***Allport House Apartments*** 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 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

Baseline result show significant failures to all apartments based on the overheating criteria as defined by CIBSE TM59:2017. A sample of corridor areas highlighted failures in the circulation spaces withing apartment 29. Based on third floor gable windows openable, and internal blinds, all circulation zones pass the CIBSE TM59 criteria.

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 third floor gable windows openable, internal blinds and Low G Glazing. These simulation results 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.

Table 8 - Additional calculations to meet TM59 for 2020's, high emissions, 90%			
Additional Measures	**Criteria A (%)**	**Criteria B (hr)**	**Pass / Fail**
Current Proposals	**Almost all zones fail TM59**		
Internal Blinds to South, East and West windows	**Improved Results but most still failing**		
Low G-Glazing (G-value <0.40)	**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 Vent Axia 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. Vent-Axia 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 Vent-Axia 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 $0.3 l/s/m^2$:

- Kitchen areas: an extract rate of no less than $216m^3/h$ 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 $108m^3/h$ 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 $54m^3/h$ 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 Vent-Axia'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	30minimum	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 $0.3 l/s/m^2$. This is based on the whole dwelling volume, with provision to increase the inlet volume, as required, in moisture generation areas.

T: 0844 856 0590

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

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