John Street, Cardiff

Overheating Report

Grainger Residential Limited

JSCX-ACM-XX-XX-RP-ZZ-040004

June 2025

Quality information

Prepared by	Checked by	Verified by	Approved by
FZ Principal Building Physics Engineer	LH Principal Sustainability Consultant	BS Regional Director	AF Project Director

Revision History

Revision	Revision date	Details	Authorized	Position
P01	14/05/2025	Draft Issue for approval	AF	Project Director
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Prepared for:

Grainger Residential Limited

Prepared by:

AECOM Limited

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1. Introduction

1.1. Background

This Overheating Report has been prepared by AECOM on behalf of Grainger Residential Limited (“the Applicant”) to support a full planning application relating to the detailed design of the intended residential-led, mixed-use development of John Street (hereafter the ‘Proposed Development’) located in Cardiff within the administrative authority of the Cardiff County Council (CCC) (the ‘Site’).

1.2. The Site

The existing site is located in the centre of Cardiff, bounded by John Street to the South, Bute Street to the West and two railway lines to the North and East.

Figure 1. Site Location (Credit: Chapman Taylor)

1.3. The Proposed Development

The John Street development is a Build to Rent (BtR) residential and mixed-use scheme located in the heart of Cardiff. The project comprises two tower blocks, rising to 28 and 18 storeys respectively, connected by a six-storey link building. The development will feature a substantial ground floor commercial unit, which will be leased by the landlord, alongside a variety of resident amenity spaces. These include a reception area, gym, co-working facilities, lounge, and bookable private function rooms located on the upper levels. Externally, the scheme will offer a publicly accessible landscaped area at the front of the site, a private garden at ground level, and a rooftop garden situated above the link building, exclusively for residents. In addition to the main structure, the developer has secured a long-term lease for five arches within the adjacent railway viaduct. Of these, two arches will be sublet as commercial units, while the remaining three will serve as resident amenities, providing additional communal space and secure cycle storage.

2. Design methodology

2.1. Software

AECOM uses the IES Virtual Environment (IESVE) software to undertake dynamic thermal modelling. In this instance, version 2024.1.0.0 has been used. This uses the SunCast module to model sun paths and account for solar shading. The Macroflo bulk airflow module within IES allows the user to set the openable area and window/opening type. The software calculates the natural ventilation based on standard wind pressure coefficients and using wind data from the selected weather file.

2.2. Part O

The Welsh 2022 Approved Document Part O gives guidance on how to comply with overheating of the Building Regulations. New requirement O1 (Overheating mitigation) can be demonstrated by using one of the following methods:

1. Simplified method gives elemental guidance on glazing area and g-value depending on location, overheating risk and whether the dwelling has cross-ventilation. The simplified method is not appropriate for buildings with more than one residential unit with a communal heating or hot water system, or with high noise levels at night.
2. Dynamic thermal modelling method is for dwellings that don’t meet the simplified method requirements. Multi-residential blocks with a communal heating or hot water system, or areas with high noise levels at night must use this method. It provides a standardised approach to predicting overheating risk for residential buildings using dynamic thermal modelling as an alternative to the simplified method.

The proposed development does not meet the requirements for the simplified method therefore, the dynamic thermal modelling method is implemented. To demonstrate compliance using the dynamic thermal modelling method, all of the following guidance should be followed.

A. CIBSE’s TM59 methodology for predicting overheating risk.

B. The limits on the use of CIBSE’s TM59 methodology:
   a. Compliance should be assessed using Type I occupancy.
   b. Windows opening in a ramp function in the daytime and maximum opening angle of 60°.
   c. Set parameters for night-time openings.
   d. Secured openings on ground floor units and easily accessible rooms.

C. The acceptable strategies for reducing overheating risk:
   a. Limiting solar gains through fixed external shading device (shutters, external blinds, overhangs and awnings) and appropriate glazing design considering size, orientation, g-value and depth of window reveal.
   b. Removing excess heat through opening windows, ventilation louvres in external walls, mechanical ventilation systems or mechanical cooling systems.

The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 cannot be met using openings.

2.2.1. Part O Constraints

Part O also places limits on opening windows due to overnight noise levels, pollution and security risk.

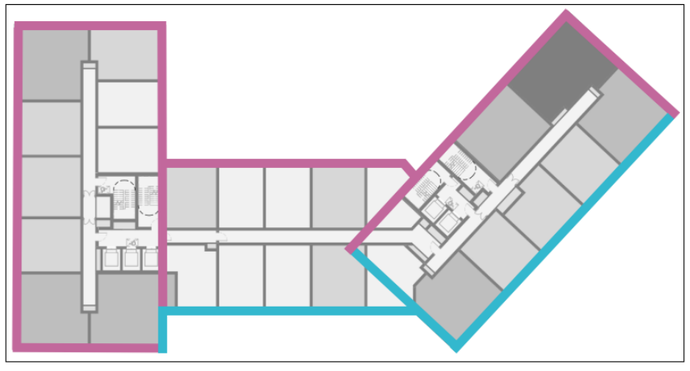
Windows will be openable in order to enable natural ventilation to occur at less sensitive time of the day, when there is lower noise, when people are not present in the room or not engaged in noise sensitive activities. Windows may need to be closed to maintain acceptable indoor acoustic conditions (when people are sleeping or using the rooms for office work). Noise levels in bedrooms should be kept to a minimum during the sleeping hours of 23:00 – 07:00.

Buildings located near to significant local pollution sources should be designed to minimise the intake of external air pollutants.

In dwellings that are vulnerable to intrusions as ground floor bedrooms, openings should be made secure through design by using fixed or lockable shutters, grilles or railings.

Hydrock, now Stantec, the project acoustician, has advised that there are limitations to opening windows for mitigating overheating.

The acoustician report states that 2 glazing types have been assumed for the development. The figure below shows where the window types are applied.



Glazing Type	Example Glazing Configuration	Minimum Sound Reduction Index dB 'R' (BS EN ISO 10140-2:2010) @ Octave Band Centre Frequency (Hz)							$R_w + C_{tr}$
		63	125	250	500	1k	2k	4k	
Type 1	10mm/12as/8.8mm (laminate)	28	30	30	38	45	49	54	**38**
Type 2	4mm/6as/10mm	27	30	26	29	37	42	46	**33**

Façades with Glazing Type 1 have external noise levels of up to 62dB LAeq,8hr and 82dB LAmax,F. This indicates that bedroom façades with Glazing Type 1 are at a 'High Risk'. Overheating mitigation via openable windows is deemed unlikely to be sufficient.

Façades with Glazing Type 2 have external noise levels up to 54dB LAeq,8hr and 74dB LAmax,F. This indicates that bedroom facades with Glazing Type 2 are at a 'Medium Risk' of adverse effect in periods of overheating at night.

This shows that the majority of the development cannot be relied upon to open bedroom windows overnight, with most other areas showing that only a bedroom window on a 100mm restrictor can be used to mitigate overheating overnight. For the above reasons, iterations using restricted windows and fully closed windows have been run for bedrooms overnight.

2.3. CIBSE TM59

The thermal comfort criteria for assessments within the apartments that are predominantly naturally ventilated are defined in CIBSE TM59. Compliance is based on passing both of the following two criteria:

a) For living rooms, kitchens, and bedrooms the number of hours during which the difference between the operative temperature and the dynamic threshold comfort temperature exceeds 1°K or more during the period May to September inclusive shall not be more than 3% of occupied hours.

b) For bedrooms only, to guarantee comfort during the sleeping hours, the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours. 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail.

The criteria for apartments predominantly mechanically ventilated and with restricted window openings should follow the CIBSE fixed temperature test, i.e., all occupied rooms should not exceed an operative temperature of 26˚C for more than 3% of the annual occupied annual hours.

All units have been assessed as Category II buildings where there is a normal level of expectation of comfort.

2.4. Weather data

The Cardiff dataset has been chosen as it is most appropriate for the location of the Proposed Development. Each scenario was simulated using the Cardiff DSY1 weather data for the 2020's high emissions, 50th percentile scenario, as required in TM59 and TM52.

3. Cooling hierarchy

All major development proposals should reduce the potential overheating and the reliance on air conditioning systems. Part O prioritises passive measures to reduce overheating, minimising the need for active cooling. The study has followed the hierarchy of cooling, as set out below:

1. **Reduce the amount of heat entering a building in summer through orientation, shading, fenestration, insulation:**
   - The orientation of the building results in shading to areas of the development.
   - Glazing areas have been optimised whilst balancing daylighting, energy, and overheating requirements.
   - A window balanced g-value has been selected to reduce unwanted summer solar gains.
   - Well insulated walls and roof will be used to reduce conduction gains through the building fabric.
2. **Minimise internal heat generation through energy efficient design:**
   - All the heat distribution infrastructure will be insulated to minimise unwanted heat gains.
   - Low energy lights have been included in all rooms.
3. **Manage the heat within the building through exposed internal thermal mass and high ceilings:**
   - Limited internal exposed mass due to required level of finishes.
   - Maximised ceiling height where reasonable.
4. **Passive ventilation:**
   - The glazing has been designed to maximise natural ventilation through inward opening side hung windows and ventilation panels, while maintaining security through shading perforated panel.
5. **Mechanical ventilation:**
   - MVHR units for ventilation are provided in all dwellings.
6. **Active cooling systems:**
   - No cooling system is adopted in the occupied spaces, however the development has been futureproofed by allowing space for a tempered cooling module to be added to the MVHR if required in the future. .

4. Model Geometry

4.1. Sample unit selection

A sample of 20 residential units were selected. This covered the different occupancies, orientations, acoustic restrictions and locations. Overall, this gave a reasonable representation of the worst performing units on the site. The selection concentrated on top floor units. Table 1 below details the sample of residential units selected and a markup of the floor plans showing the sample units is included in Appendix A.

The drawings used for the modelling were issued by Chapman Taylor Architects on 9th May (GA Plans, Elevations and Sections).

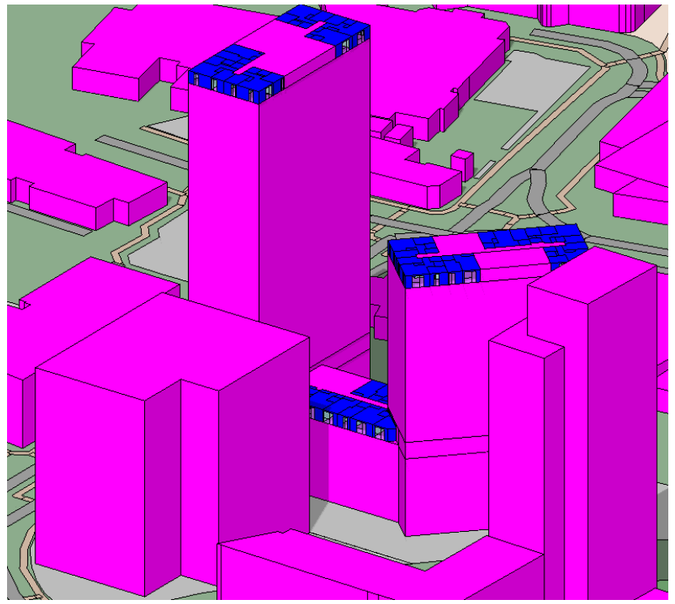
Table 1 Sample unit selection properties

Level	Bedroom number / Occupancy	Type	Aspect
5	Studio(a)	Top	Single
5	Studio(b)	Top	Single
5	Studio(c)	Top	Single
5	Studio(d)	Top	Single
5	Studio(e)	Top	Single
5	Studio(f)	Top	Single
5	1B2P(a)	Top	Single
5	1B2P(b)	Top	Single
17	1B2P	Top	Single
17	2B4P(a)	Top	Single
17	2B4P(b)	Top	Double
17	2B4P(c)	Top	Double
17	2B4P(d)	Top	Double
17	3B6P	Top	Double
27	1B2P(a)	Top	Single
27	1B2P(b)	Top	Double
27	2B4P(a)	Top	Double
27	2B4P(b)	Top	Double
27	2B4P(c)	Top	Double
27	Studio	Top	Single

4.2. 3D Model

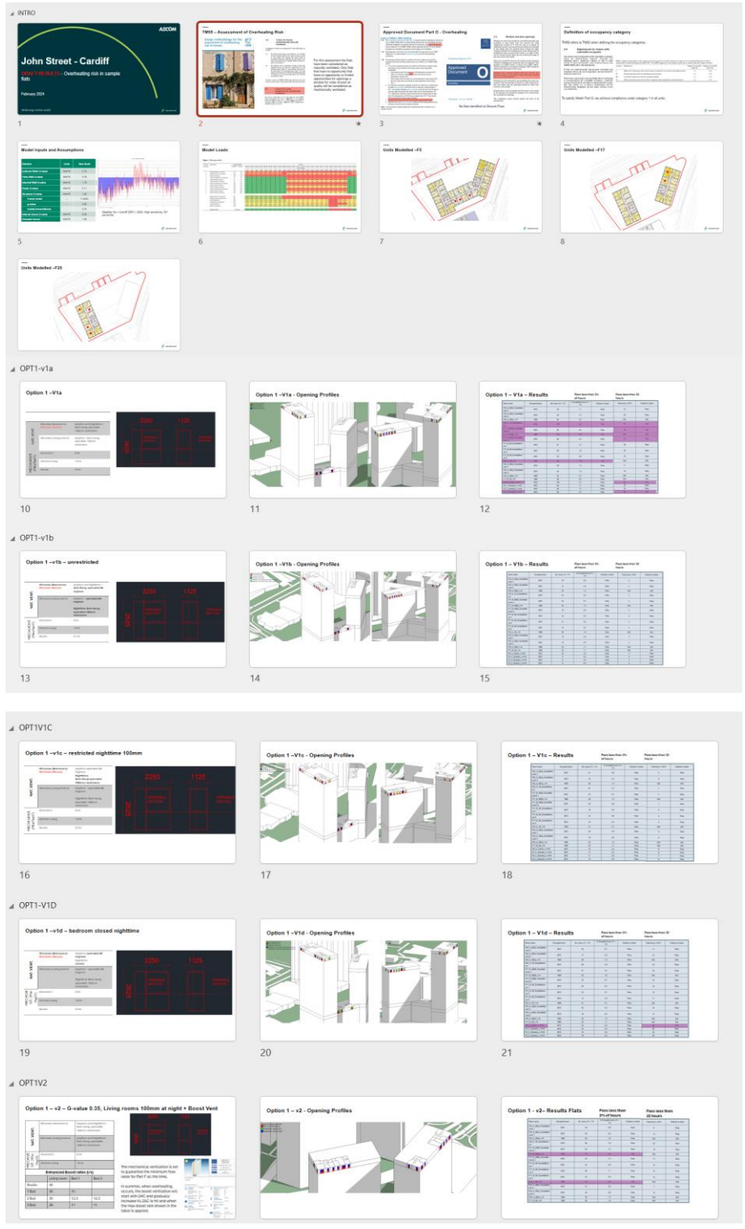
A three-dimensional thermal model of the building was created based on drawings provided by Chapman Taylor Architects. The building fabric, activity profiles and HVAC servicing strategy were entered into each zone of the thermal model based on the inputs described in this report. See Appendix B for the list of drawings and model inputs.

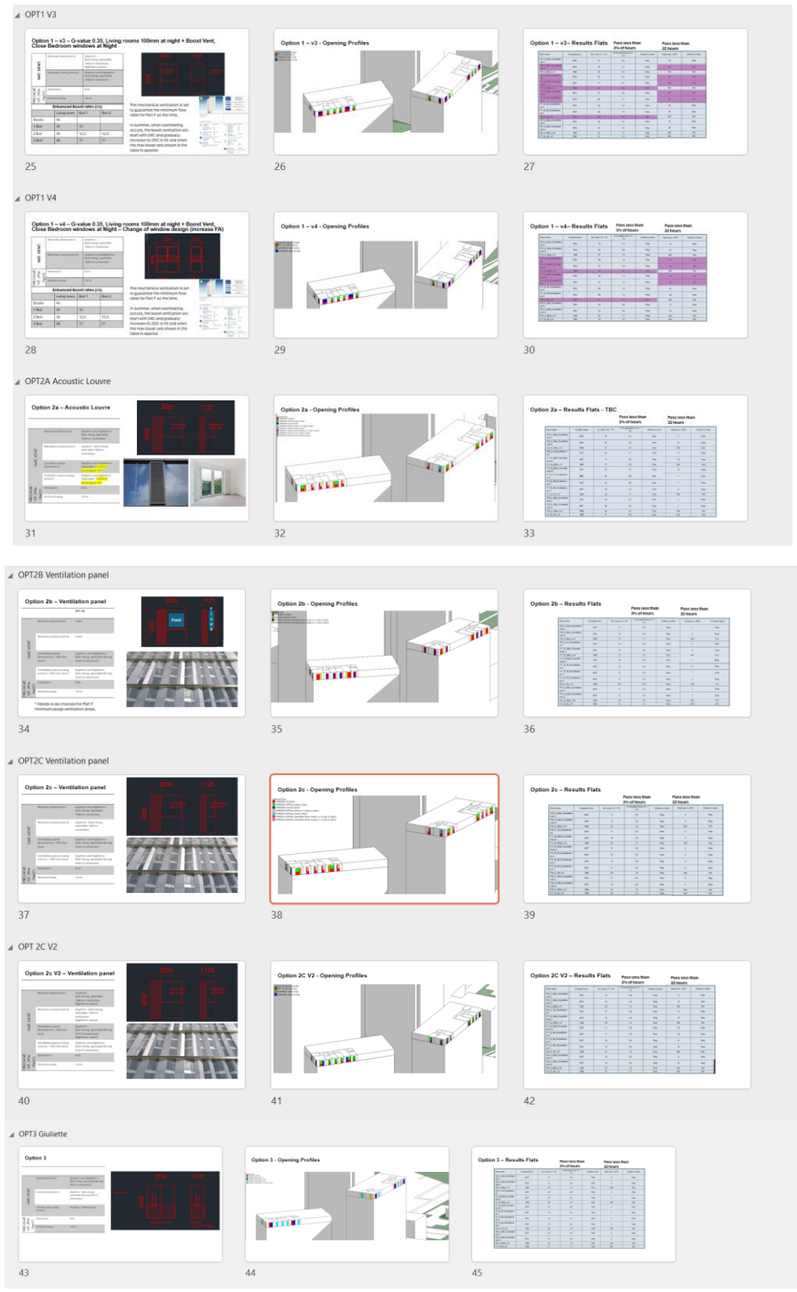
Figure 2 View of the model



5. Early Stage Optioneering

Detailed dynamic simulation modelling took place during the early-stage design development to identify the potential risks of overheating and the most suitable solutions to mitigate this risk as much as possible. This overheating modelling took place on a small sample of likely worst-case units. The screenshot below shows part of the early-stage design process.





Following this process, many passive design options were considered and implemented. This included:

- Minimising the glazing areas whilst balancing daylighting, energy, and overheating requirements.
- Lowering g-value to reduce the unwanted solar gains.
- Well insulated walls and roof will be used to reduce conduction gains through the building fabric.
- Provision of a natural ventilation panel to guarantee natural ventilation and security.

6. Model Input Data

6.1. Building Fabric

The tables below list the fabric parameters used for the modelling. The full list of model inputs is available in Appendix B.

Table 2. Area weighted average U-values for thermal envelope

Building Element	U-value (W/m²K)
Roof	0.10
External wall	0.15
Internal wall within apartments	1.79
Internal wall to communal corridors	0.18
Internal ceiling/floor	1.08
Main entrance Doors	1.00

Table 3. Glazing building fabric

Building Element	Overall U-value (W/m^2K)	g-value (EN ISO 410)	Visible light transmittance	Frame ratio
Glazing – windows	1.20	0.40	0.70	0.17/0.21

6.2. Infiltration Rate

An infiltration rate of 0.25ach was applied in the model. This is equivalent to an air permeability of $2.5m^3/(h.m^2)$, which is lower than the standard set in Approved Document L (2022), of $8.0m^3/(h.m^2)$.

6.3. Natural ventilation

The model was run using the MacroFlo bulk airflow module within IESVE which allows the user to set the openable area and window type for the windows. The software then calculates the natural ventilation based on standard wind pressure coefficients and using wind data from the weather data.

The opening profiles of all external openable windows were based on the limitations set by Welsh Approved Document O on CIBSE TM59 window and door openings and as summarised below.

a. For a room occupied during the day (8am to 11pm), windows, patio and balcony doors should be set to open and/or close using these parameters.:
    I. Start to open when the internal temperature exceeds 22°C
    II. Open to a maximum angle of 60 degrees when the internal temperature exceeds 26°C
    III. Start to close when the internal temperature falls below 26°C
    IV. Be fully closed when the internal temperature falls below 22°C
b. For bedrooms occupied at nighttime (23:00 hrs to 08:00 hrs), windows that are not easily accessible should be set to a maximum opening angle of 60 degrees, and windows that are easily accessible should be set to the maximum opening angle achievable after being made secure. Additionally, bedroom windows should be set as being open at night only if the temperature at 23:00 hours is greater than 23°C. They should then be assumed to remain open overnight.
c. Windows and doors should be set as closed in unoccupied rooms.
d. External doors and easily accessible windows without appropriate security measures should be set as closed at all times.

Table 4. Details of openable areas

Opening Category	Openable area (%)	Ventilation panel free area (%)
Window 1400x1380mm	9.85% (restricted to 100mm)	N/A
Large ventilation panel 860x2500mm	78.5% (60 degrees)	70%
Small ventilation panel 445x2500mm	73.9% (60 degrees)	70%

In the thermal models evaluated, living room and studio openings are always available, while bedroom openings will be increasingly restricted to evaluate possible closures at night due to adverse acoustic conditions.

6.4. Mechanical Ventilation

The Part F mechanical ventilation rate of 6 l/s was assumed to be supplied ‘on continuously’ to bedrooms, 13 l/s to kitchen / living rooms and 19 l/s to studio flat. Enhanced ventilation rates have been allowed when the room temperature hits 25C The mechanical ventilation rates of the MVHR units under enhanced ventilation were assumed to be:

Enhanced mode (l/s)	Living	Bed. 1	Bed. 2	Bed 3
Studio:	62			
1 Bed:	32	40		
2 Bed:	44	28	28	
3 Bed:	48	24	24	24

6.5. Corridor Overheating

Consideration was also given to the overheating of communal corridors due to internal heat gains. TM59 provides a methodology of assessment for this risk, stating that operative temperature in the corridors should not exceed 28°C for more than 3% of total annual hours.

The CIBSE TM59 corridor methodology states 2 W/m² of lighting gain is to be used within the communal corridors.

7. Results

The following **three** iterations were carried out, showing how the development has progressed regarding passive design solutions, and how it is likely to perform during certain site constraints.

Iteration 1 – Passive Design – Incorporating all passive design solutions with unrestricted windows overnight. Mechanical ventilation set with min Part F rates.

Iteration 2 – Acoustic Constraints – Incorporating all passive design solutions with bedroom ventilation panels closed overnight. Mechanical ventilation set with min Part F rates.

Iteration 3 – Acoustic Constraints – Incorporating all passive design solutions with bedroom ventilation panels closed overnight. Mechanical ventilation set with enhanced rates.

7.1. Iteration 1 – Passive Design

The selected sample units were assessed against the CIBSE TM59 naturally ventilated criteria a and b and using the DSY1 2020s weather data. The results for each option are shown in the table below.

Table 5. Results summary for Iteration 1 2020s (DSY1)

Floor	Occupancy	Iteration 1 - Bedroom windows fully opened during day and night – Min Part F rates
Floor	Occupancy	Pass
5	1B2P(a)	Pass
5	1B2P(d)	Pass
5	Studio(a)	Pass
5	Studio(b)	Pass
5	Studio(c)	Pass
5	Studio(d)	Pass
5	Studio(e)	Pass
5	Studio(f)	Pass
17	1B2P	Pass
17	2B4P(a)	Pass
17	2B4P(b)	Pass
17	2B4P(c)	Pass
17	2B4P(d)	Pass
17	3B6P	Pass
27	1B2P(a)	Pass
27	1B2P(b)	Pass
27	2B4P(a)	Pass
27	2B4P(b)	Pass
27	2B4P(c)	Pass
27	Studio	Pass
	Units passing	20 out of 20 units

The results above show that all units pass when the windows are unrestricted. Full results for each room can be found in Appendix C.

7.2. Iteration 2 and 3 – Acoustic Constraints

The selected sample units were assessed against the against the CIBSE TM59 naturally ventilated criteria a and b and using the DSY1 2020s weather data. The results are shown in the table below.

Table 6: Results summary for Iteration 2 and 3 2020s (DSY1)

Floor	Occupancy	Iteration 2 - Bedroom windows fully opened during day – Closed at night - Min Part F rates	Iteration 3 - Bedroom windows fully opened during day – Closed at night –– Enhanced rates
Floor	Occupancy	Pass	Pass
5	1B2P(a)	Pass	Pass
5	1B2P(d)	Pass	Pass
5	Studio(a)	Pass	Pass
5	Studio(b)	Pass	Pass
5	Studio(c)	Pass	Pass
5	Studio(d)	Pass	Pass
5	Studio(e)	Pass	Pass
5	Studio(f)	Pass	Pass
17	1B2P	Pass	Pass
17	2B4P(a)	Pass	Pass
17	2B4P(b)	Pass	Pass
17	2B4P(c)	Pass	Pass
17	2B4P(d)	Pass	Pass
17	3B6P	Pass	Pass
27	1B2P(a)	Pass	Pass
27	1B2P(b)	Pass	Pass
27	2B4P(a)	Pass	Pass
27	2B4P(b)	Pass	Pass
27	2B4P(c)	Pass	Pass
27	Studio	Pass	Pass
	Units passing	20 out of 20 units	20 out of 20 units

7.3. Communal corridors

The overheating risk was assessed within four test corridors for each iteration completed. There is no significant overheating risk within the corridors for any iteration.

Table 7. Overheating risk in communal corridors

Corridor name	Iteration 1 - Bedroom windows fully opened during day and night – Min Part F rates	Iteration 2 - Bedroom windows fully opened during day and night – Min Part F rates	Iteration 3 - Bedroom windows closed during night – Enhanced rates
06_Corridor 1	No	No	No
08_Corridor 2	No	No	No
10_Corridor 3	No	No	No
10_Corridor 4	No	No	No

8. Conclusion

Dynamic thermal modelling of the sample apartments was undertaken to assess the Proposed Development against TM59 and Part O.

As demonstrated in the iterative modelling process, the cooling hierarchy has been followed, and the following mitigation measures have been incorporated:

1. The amount of heat entering a building in summer has been mitigated through lower glazing ratios (whilst maintaining reasonable daylight levels) and lower g-values that provide a balance between unwanted summer solar gains and wanted winter gains.
3. Passive ventilation has been balanced with occupant safety through glazing that has been designed to maximise natural ventilation through inward opening side hung windows and ventilation panels, while maintaining security.
4. Mechanical ventilation is proposed to each apartment and suitable ventilation rates proposed.
5. Due to onsite acoustic constraints and Part O requiring bedrooms windows to be closed overnight, occupied spaces can benefit from enhanced mechanical ventilation rates.
6. No cooling system is adopted in the occupied spaces, however the development has been futureproofed by allowing space for a tempered cooling module to be added to the MVHR if required in the future.

The following **three** iterations were carried out, showing how the development has progressed regarding passive design solutions, and how it is likely to perform during certain site constraints.

Iteration 1 – Passive Design – Incorporating all passive design solutions with unrestricted windows overnight. Mechanical ventilation set with min Part F rates.

Iteration 2 – Acoustic Constraints – Incorporating all passive design solutions with bedroom closed windows overnight. Mechanical ventilation set with min Part F rates.

Iteration 3 – Acoustic Constraints – Incorporating all passive design solutions with bedroom closed windows overnight. Mechanical ventilation set with enhanced rates.

All iterations show a pass under the Part O overheating criteria. The occupants will have the flexibility to select their preference of using passive ventilation via openable windows day and night with acceptance of external noise levels or closed windows in combination with MVHR providing ventilation until the room temperature reaches 25˚C when enhanced ventilation rates would be automatically available.

Sample corridors surrounding the sample rooms were also assessed for overheating in line with TM59. From the results, overheating is not a risk in these spaces with the aid of mechanical ventilation to these spaces.

Appendix A Sample unit selection

Figure 3 Fifth floor sample unit selection

Figure 4 Seventeenth and twenty seventh floor sample unit selection

Appendix B Model inputs

B.1 Location

Site location: Cardiff

Latitude: 51.48 ºN

Longitude: 3.17 ºW

Building orientation as shown below.

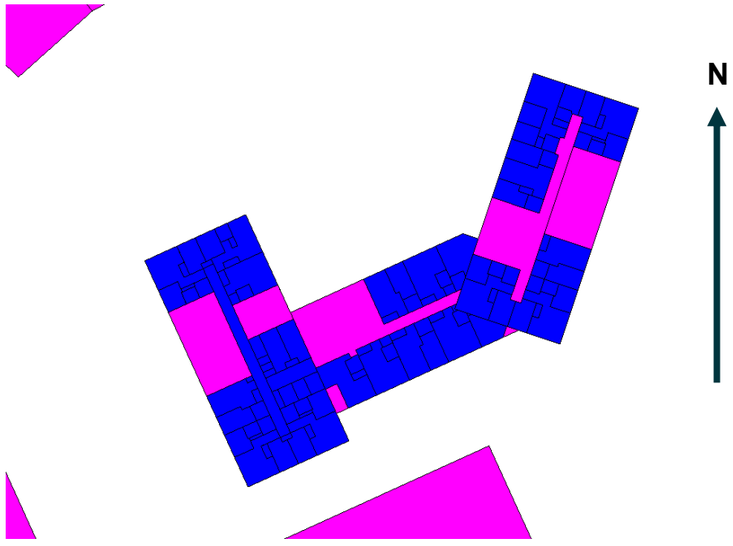


Figure 5. Building orientation

B.2 Building form

The model geometry was built using the drawings issued by Chapman Taylor Architects that are listed in the table below.

Table 8. Drawings used to create IES model geometry

Drawing number	Drawing title	Date
B494JSC-CTA-XX-00-DR-A-07100	Ground Floor Plan	09/05/2025
B494JSC-CTA-XX-01-DR-A-07101	First Floor Plan	09/05/2025
B494JSC-CTA-XX-02-DR-A-07102	Second to Fifth Floor Plan	09/05/2025
B494JSC-CTA-XX-06-DR-A-07106	Sixth Floor Plan	09/05/2025
B494JSC-CTA-XX-07-DR-A-07107	Seventh to Seventeenth Floor Plan	09/05/2025
B494JSC-CTA-XX-18-DR-A-07118	Eighteenth to Twenty Sixth Floor Plan	09/05/2025
B494JSC-CTA-XX-27-DR-A-07127	Twenty Seventh Floor Plan	09/05/2025
B494JSC-CTA-XX-RP-DR-A-07130	Roof Plan	09/05/2025
B494JSC_John Street_ENVELOPE_2024	Revit model	09/05/2025
B494JSC_John Street_CENTRAL_2024	Revit model	09/05/2025

B.3 Space heating and cooling

The following table details the heating set points applied to the rooms based on activity.

No space cooling was assumed in any apartments in Option 1, 2 and 3.

Table 9. Heating set points and profiles applied to the model

Room Activity	Heating Set Point [Note 1]	Profile
Bedroom	18°C	On continuously
Living room / Kitchen	19.5C [Note 2]	On continuously
Storeroom	None	Off continuously
Bathroom	18°C	On continuously
Communal corridors	None	Off continuously

Note 1: Based on the CIBSE Guide A winter operative temperatures.
Note 2: Average of a minimum winter operative temperatures for living room and kitchen.

B.4 Internal gains

The internal occupancy, lighting and equipment gains and profiles were applied to rooms based on activity following the methodology in CIBSE TM59.

The heat loss of 78W per heat interface unit (HUI) was assumed in all store / utility rooms with HIU.

There is no heat losses from pipework since there are no hot service pipes in the communal corridors.

Appendix C Detailed CIBSE TM59 Results for DSY1 2020s

Room name	Iteration 1 - Ventilation Panel - Side hung, 60˚ inwards openable in bedrooms and living / kitchen (day&night) -Window – Side hung, 100mm restrictors, living rooms - Min Part F ventilation rates			Iteration 2 - Ventilation panels: Side hung, 60˚ inwards openable in living / kitchen (day&night) - Ventilation panels: Side hung, 60˚ inwards openable ventilation panels in bedrooms (day), closed at night. -Window – Side hung, 100mm restrictors, living rooms - Min Part F ventilation rates			Iteration 3 - Ventilation panels: Side hung, 60˚ inwards openable in living / kitchen (day&night) - Ventilation panels: Side hung, 60˚ inwards openable ventilation panels in bedrooms (day), closed at night. -Window – Side hung, 100mm restrictors, living rooms - Enhanced ventilation rates		
	Crit (a) result (%)	Crit (b) result (hrs)	Overall result	Crit (a) result (%)	Crit (b) result (hrs)	Overall result	Crit (a) result (%)	Crit (b) result (hrs)	Overall result
F5_C_1B2P(a)_DoubleBedroom	0.2	3	Pass	0.2	8	Pass	0.2	5	Pass
F5_C_1B2P(a)_L+K	0.4	N/A	Pass	0.4	N/A	Pass	0.4	N/A	Pass
F5_C_1B2P(b)_DoubleBedroom	0.2	3	Pass	0.3	9	Pass	0.3	5	Pass
F5_C_1B2P(b)_L+K	0.4	N/A	Pass	0.5	N/A	Pass	0.5	N/A	Pass
F5_C_Studio(a)_L+K+B	0.2	2	Pass	0.2	2	Pass	0.2	2	Pass
F5_C_Studio(b)_L+K+B	0.2	2	Pass	0.2	2	Pass	0.2	2	Pass
F5_C_Studio(c)_L+K+B	0.2	2	Pass	0.2	3	Pass	0.2	2	Pass
F5_C_Studio(d)_L+K+B	0.1	3	Pass	0.1	3	Pass	0.1	2	Pass
F5_C_Studio(e)_L+K+B	0.4	2	Pass	0.4	2	Pass	0.4	2	Pass
F5_C_Studio(f)_L+K+B	0.3	3	Pass	0.3	3	Pass	0.3	2	Pass
F17_B_1B2P_DoubleBedroom	0.2	3	Pass	0.4	12	Pass	0.4	5	Pass
F17_B_1B2P_L+K	0.6	N/A	Pass	0.6	N/A	Pass	0.6	N/A	Pass
F17_B_2B4P(a)_DoubleBedroom1	0.7	4	Pass	1	30	Pass	1	11	Pass
F17_B_2B4P(a)_DoubleBedroom2	0.7	4	Pass	0.8	20	Pass	0.8	8	Pass
F17_B_2B4P(a)_L+K	1.1	N/A	Pass	1.3	N/A	Pass	1.3	N/A	Pass
F17_B_2B4P(b)_Doublebedroom1	0.4	4	Pass	0.6	18	Pass	0.6	8	Pass
F17_B_2B4P(b)_DoubleBedroom2	0.4	3	Pass	0.5	9	Pass	0.5	6	Pass
F17_B_2B4P(b)_L+K	0.7	N/A	Pass	0.8	N/A	Pass	0.8	N/A	Pass
F17_B_2B4P(c)_DoubleBedroom1	0.3	3	Pass	0.4	14	Pass	0.4	7	Pass
F17_B_2B4P(c)_DoubleBedroom2	0.3	3	Pass	0.4	12	Pass	0.4	6	Pass
F17_B_2B4P(c)_L+K	0.5	N/A	Pass	0.6	N/A	Pass	0.6	N/A	Pass
F17_B_2B4P(d)_DoubleBedroom1	0.5	4	Pass	0.5	12	Pass	0.5	7	Pass
F17_B_2B4P(d)_DoubleBedroom2	0.3	2	Pass	0.4	10	Pass	0.4	5	Pass
F17_B_2B4P(d)_L+K	0.6	N/A	Pass	0.7	N/A	Pass	0.7	N/A	Pass
F17_B_3B6P_DoubleBedroom1	0.8	4	Pass	1	25	Pass	1	8	Pass
F17_B_3B6P_DoubleBedroom2	0.8	4	Pass	0.8	15	Pass	0.8	7	Pass
F17_B_3B6P_DoubleBedroom3	0.4	3	Pass	0.5	14	Pass	0.5	7	Pass
F17_B_3B6P_L+K	1.2	N/A	Pass	1.2	N/A	Pass	1.2	N/A	Pass
F27_A_1B2P(a)_DoubleBedroom	1	4	Pass	1.2	25	Pass	1.2	7	Pass
F27_A_1B2P(a)_L+K	1.7	N/A	Pass	1.9	N/A	Pass	1.9	N/A	Pass
F27_A_1B2P(b)_DoubleBedroom1	0.3	2	Pass	0.3	9	Pass	0.3	5	Pass
F27_A_1B2P(b)_L+K	0.5	N/A	Pass	0.5	N/A	Pass	0.5	N/A	Pass
F27_A_2B4P(a)_DoubleBedroom1	0.8	4	Pass	0.9	16	Pass	0.9	7	Pass
F27_A_2B4P(a)_DoubleBedroom2	0.5	4	Pass	0.7	18	Pass	0.7	7	Pass
F27_A_2B4P(a)_L+K	1.2	N/A	Pass	1.4	N/A	Pass	1.4	N/A	Pass
F27_A_2B4P(b)_DoubleBedroom1	0.8	3	Pass	0.9	12	Pass	0.9	7	Pass
F27_A_2B4P(b)_DoubleBedroom2	0.5	3	Pass	0.7	14	Pass	0.7	7	Pass
F27_A_2B4P(b)_L+K	1.2	N/A	Pass	1.3	N/A	Pass	1.3	N/A	Pass
F27_A_2B4P(c)_DoubleBedroom1	0.4	3	Pass	0.4	11	Pass	0.4	5	Pass
F27_A_2B4P(c)_DoubleBedroom2	0.4	4	Pass	0.4	12	Pass	0.4	7	Pass
F27_A_2B4P(c)_L+K	0.7	N/A	Pass	0.7	N/A	Pass	0.7	N/A	Pass
F27_A_Studio_L+K+B	0.2	3	Pass	0.2	3	Pass	0.2	2	Pass

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