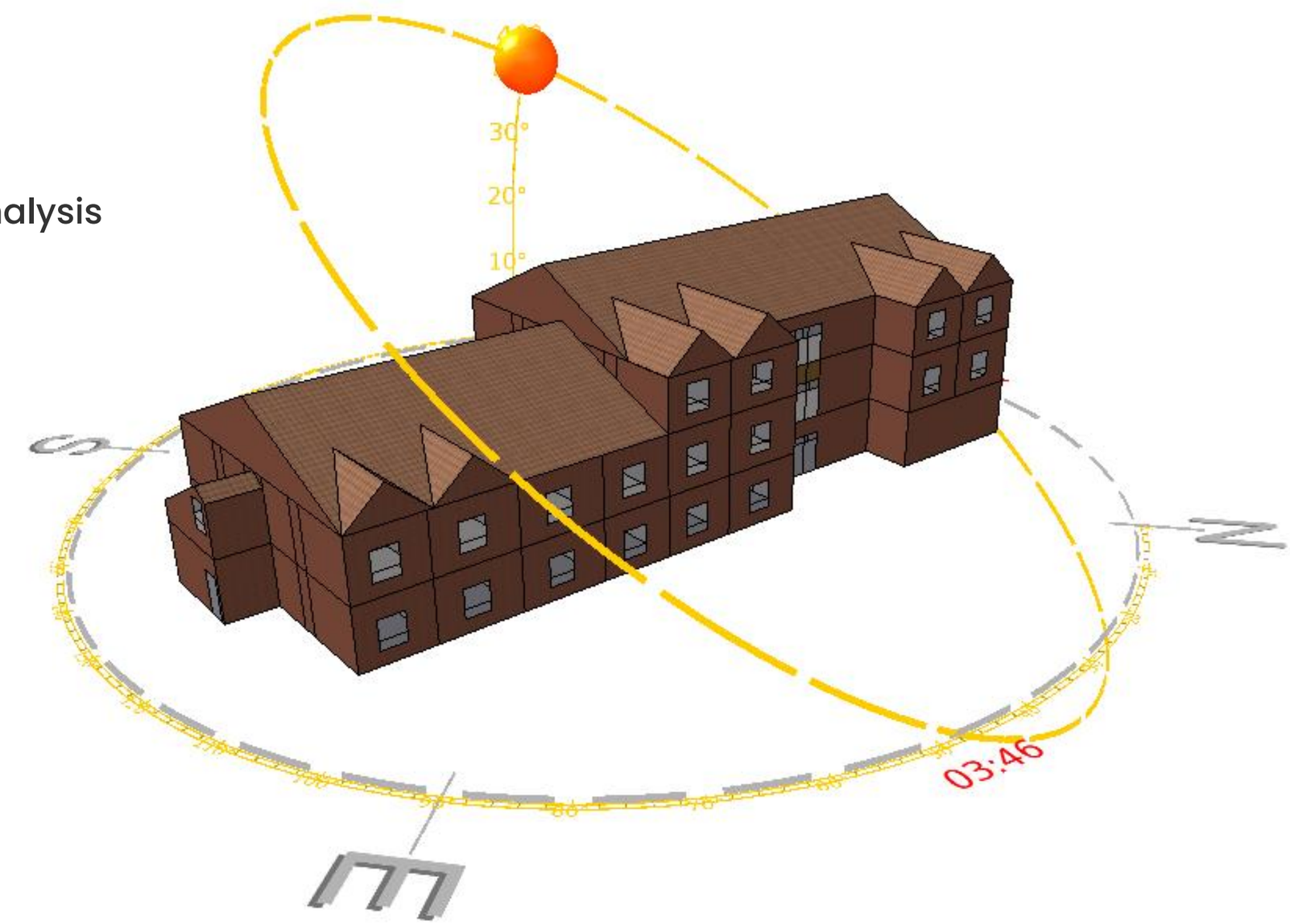
22 Proposed Apartments Scheme,
Woodfield Avenue,
Flint,
Wales

CIBSE TM59 Overheating Analysis

In accordance with Part O (Wales)

33919

First Issue



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Revision Record			
Rev	**Date**	**By**	**Summary of Changes**
-	01.06.26	BDF	-

1 Executive Summary

This report presents an analytical study of the overheating outcomes for the proposed 22no. apartments scheme at the Woodfield Road site in Flint, and assesses the units for risks of overheating. The modelling exercise uses design information and relevant industry standards. The results are based on the dynamic modelling outputs from the IES VE software.

The overheating assessment has been carried out with the guidance set out in CIBSE TM59: Design Methodology for the Assessment of Overheating in Homes in accordance with Approved Document Part O. The methodology aims to produce a test that encourages good design that is comfortable within sensible limits while prioritising passive measures to achieving compliance against the overheating assessment criteria.

All of the dwellings have been assessed against the DSY1 weather file to determine the likelihood of overheating to occur, with the modelling assessing each individual dwelling according to the proposed site-plan layout to stress-test the proposed overheating strategy.

The proposed natural ventilation strategy includes openable windows as per the architectural drawings/elevations. Opening schedules are detailed within this report, 100mm window openings on upper floor windows (as falling from height safeguarding measures being demonstrated with sill heights below the 1100mm threshold as specified in Approved Document O) unless specifically specified.

It has been confirmed that there are no acoustical limitations that prevent the use of opening windows as an overheating mitigation strategy during overnight hours, however all windows on the ground floor are assumed to be closed overnight for security / accessibility reasons outlined in AD O.

A glazing g value of 0.63 (BS EN 410) has been considered to prevent excessive solar gains.

The mechanical ventilation strategy for the site includes MVHR (system 4), in line with Approved Document F minimum requirements.

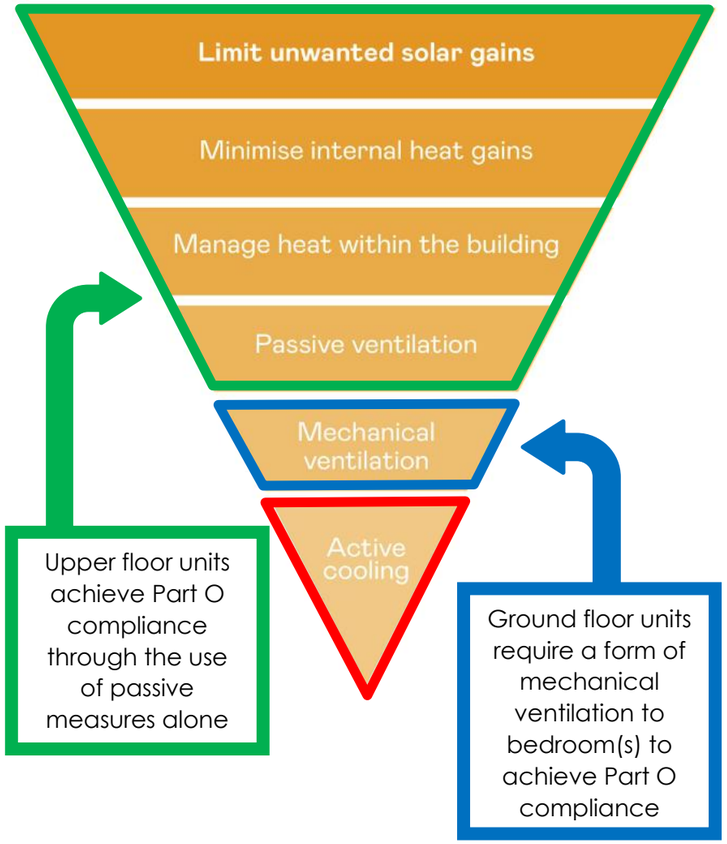


Figure 1: Site plan of the proposed development

Initially, the scheme was assessed utilising just passive measures alone (such as window & door openings as per the architectural drawings, targeting of low glazing g values, shading from roofs, glazed canopies etc) with minimum AD F flow rates from the MVHR system, where it was found that Part O compliance is not achieved through passive measures alone – see Appendix A for the detailed results of this assessment.

Following the hierarchy, mechanical ventilation in the form of boosted MVHR units was proposed, modelled to the units detailed in this assessment, where it was found that Part O compliance is now achieved throughout the scheme – see Appendix B for results.

The results show that the Cooling Hierarchy has been followed and can be concluded that with the current design of the proposed dwelling, Part O compliance can be achieved through the use of passive measures and mechanical ventilation, thus avoiding the necessity for oversized mechanical ventilation units or actively cool the dwelling.

Assessment findings

The assessment found all assessed dwellings are able to meet the TM59 overheating criteria and therefore achieve Part O compliance with the building design described in this report. However, a number of key measures that are required are listed below:

- Natural ventilation via window openings as per the architectural drawings
- Window openings to be opened as per window restrictions as outlined in this report
- Keeping the external patio doors fully open throughout the day (where applicable) to stimulate air movement throughout the entire dwelling
- Internal doors to be left open when possible to promote air movement in and out of rooms within the dwelling
- Glazing solar performance (g value) of 0.63 (BS EN 410) to all glass
- Mechanical ventilation via MVHR to all apartments, boosted overheating flow rates to units as per the schedule outlined on page 17.

Simulation	Cooling Hierarchy	Overheating Strategy Summary	Mechanical Ventilation Strategy	TM59/Part O Compliance?	Results	Comments
Simulation 1	**Passive Measures Only** - Limit unwanted solar gains - Minimise internal heat gains - Manage heat within building - Passive ventilation via window openings - Mechanical ventilation via MVHR (Part F minimum flow rates and true summer bypass mode as detailed in report)	Passive Measures Only	System 4 MVHR at Approved Document F minimum Flow Rates	✗	Appendix A	Bedrooms fail – additional measures required to these bedrooms (i.e. boosted flow rates beyond AD F minimum)
Simulation 2	**Passive & Mechanical Ventilation** - All the above passive measures - Mechanical ventilation via boosted MVHR flow rates as detailed in assessment	Passive Measures & Mechanical Ventilation	System 4 MVHR at Approved Document F minimum Flow Rates + Boosted overheating flow rates to units (see page 17 for details)	☑	Appendix B	Boosted MVHR flow rates (beyond Approved Document F minimum) modelled to apartments, see page 17 for schedule.
Simulation 3	**Passive, Mechanical Ventilation & Active Cooling** - All the above passive measures - Mechanical ventilation via MVHR (with boosted overheating flow rates and true summer bypass mode as detailed in report) - Hybrid cooling unit used to temper MVHR	Not required as demonstrated that active cooling can be avoided for Part O Compliance				

2 INTRODUCTION

This report reviews the overheating risk assessment carried out for the proposed 22no. apartments scheme at the Woodfield Road site in Flint, using dynamic simulation modelling following the guidance detailed in CIBSE TM59 Design methodology for the assessment of overheating risk in homes (2017).

An analytical study is presented within this report of the potential overheating risks of the residential spaces. The scope of this study is to report upon the likely overheating risk and to assess the periods of the year that the building has the potential to overheat using current CIBSE weather file data, and to present a working solution to any spaces within the assessed dwellings.

This report assesses the overheating risk of all fourteen dwelling unit types. The intention is that this study helps inform and verify the design proposals, thereby providing the basis for mitigating overheating risk and producing a building(s) that provides comfortable environmental conditions for occupants.

It is important to note that with any modelling exercise there are assumptions and approximations that have to be made. As far as possible, details of all assumptions and approximations are supplied within the report. These were predominantly informed by information provided by the design team and should be reviewed carefully.

All results are based on the output from computer modelling software and should be taken as an indication of the likely final situation, but these conditions cannot be guaranteed.

Moreover, this Overheating Assessment across the development supports the Planning Application and demonstrate that the proposed development complies with the relevant current guidance CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes (2017) and the requirements of the Dynamic Simulation of the building regulation in England setting standards for overheating in new residential buildings: Overheating: Approved Part O.

Figure 2: Site plan

2.1 Model Images

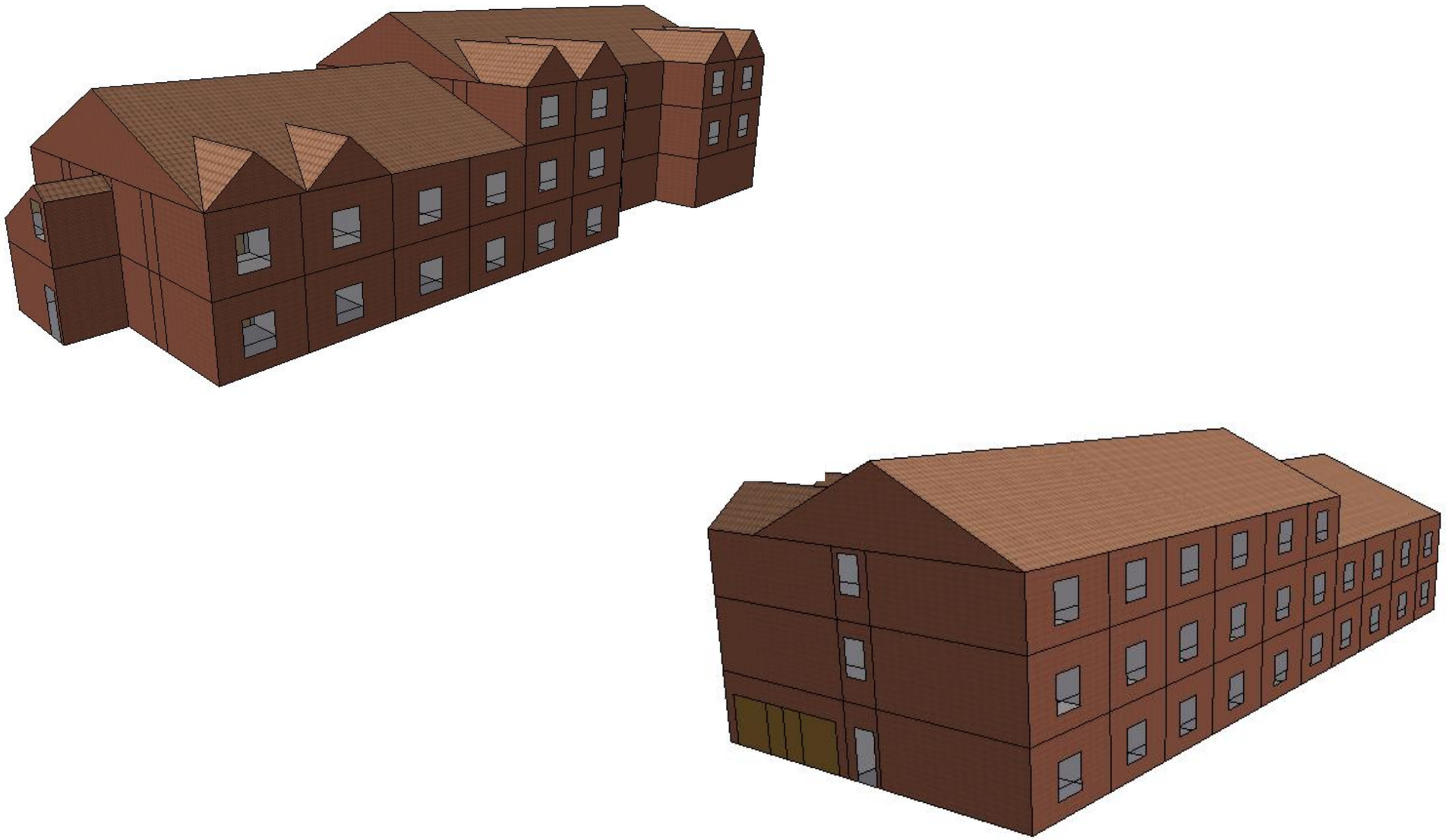


Figure 3: IES model Images of the proposed dwelling

2.2 Vulnerable to Intrusion / Easily Accessible Windows

Part O stipulates in section 3.6 *Security* that openings which may be vulnerable to intrusion by a casual or opportunistic burglar includes the following:

a) Ground Floor Bedrooms

b) Easily accessible bedrooms

With 'Easily Accessible' being defined as one of either of the following definitions:

- A window or doorway, any part of which is within 2m vertically of an accessible level surface, such as the ground or basement level, or an access boundary
- A window within 2m vertically of a flat or sloping roof (with a pitch of less than 30 degrees) that is within 3.5m of ground level.

Any windows which can be attributed with any of the above two criteria therefore are required to be closed overnight to ensure compliance with Part O stipulations is ahered to, which has been taken into account during the modelling processs, and extended to non-bedroom windows (such as bathrooms and landings which are often used as additional window openings to can aid the removal of excess heat in dwellings) which may act as access points into the dwelling for opportunistic burgulars etc.

Analysis has found that across the site, all ground floor windows have been modelled as closed overnight.

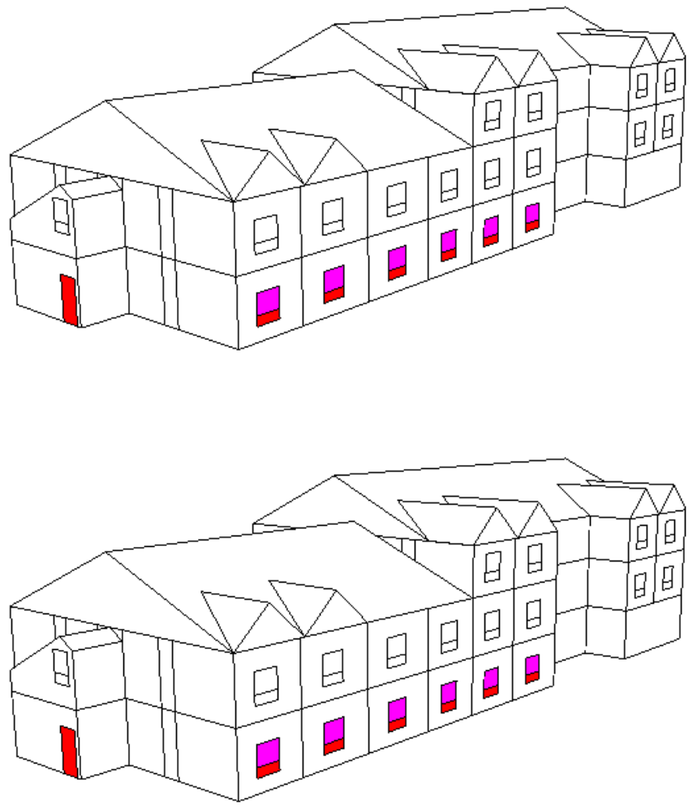


Figure 4: Window Opening Schedule Depiction

1.15 The following opening regime for windows and doors applies and should be modelled along with any other guidance set out in Section 3.3 of CIBSE TM59 (2017).

a. For a room occupied during the day (8:00 to 23:00 hours), windows, patio and balcony doors should be set to open and/or close using these parameters.
   - Start opening when the internal dry bulb temperature exceeds 22°C
   - Open to a maximum angle of 60°* when the internal dry bulb temperature reaches 26°C.
   - Start closing when the internal dry bulb temperature drops below 26°C
   - Be fully closed when the internal dry bulb temperature drops 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°*, and windows that **are** easily accessible should be set to the maximum opening angle achievable after being made secure (see paragraphs 2.6-2.7). 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.

2.3 NOISE / ACOUSTICAL IMPACT ASSESSMENT

Part O stipulates in section *3.2 Noise* In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:

a) 40dB $L_{Aeq,T,}$ averaged over 8 hours (between 11pm and 7am).

b) 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

On the proposed development, an acoustical assessment has found that none of the proposed plots to the site triggered the requirement to close the windows during sleeping hours, pertaining to only the bedrooms areas.

2.4 PROTECTION FROM FALLING (APPROVED DOCUMENT K)

- **3.8)** Openings which are intended to be open for long periods to reduce overheating risk might pose a higher risk of falls from height. Only the proportion of openings which can be opened with a very low risk of occupants falling from height should be considered to form part of the overheating mitigation strategy.

- **3.9)** Openings that can be opened wider than 100mm may form part of the overheating mitigation strategy where they meet all of the following conditions:
  a) Window handles on windows that open outwards are not more than 650mm from the inside face of the wall when the window is at its maximum openable angle.
  b) Guarding meets the minimum standards in Table 3.1
  c) Guarding does not allow children to easily climb it. For example, horizontal bars should generally be avoided.
  For more information, please refer to *Approved Document K*.

Analysis has found that there are a select number of upper floor windows across the development are restricted to 100mm openings as the sill heights are below the minimum threshold of 1100mm above FFL, as per the exampled below.

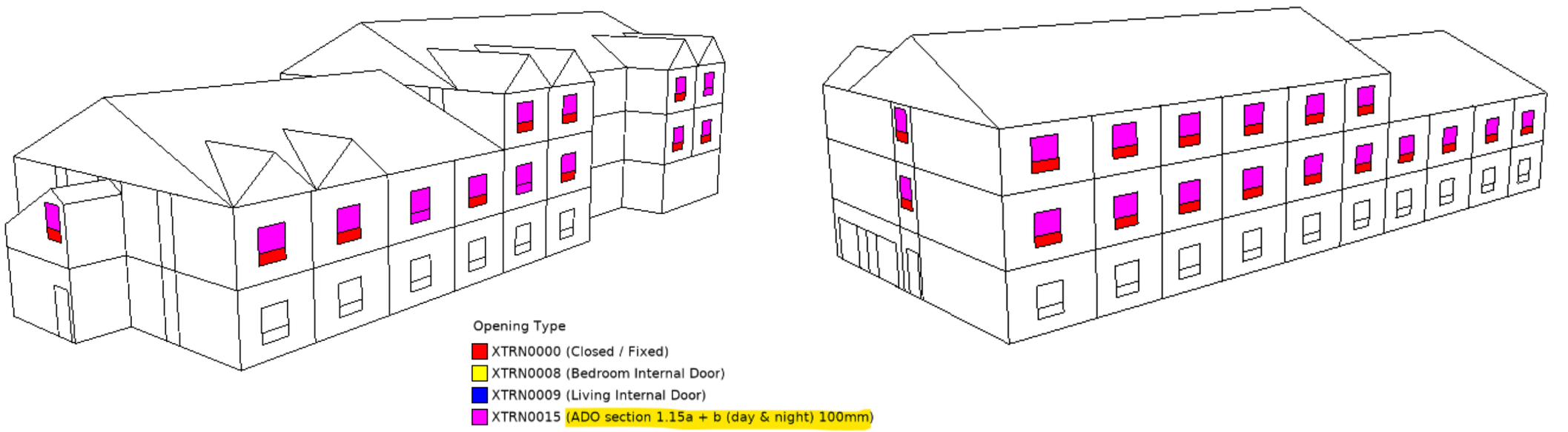


Figure 5: Window opening restrictions

3 Overheating Assessment Criteria

TM59 sets different overheating compliance criteria for homes that are predominantly naturally ventilated and for homes that are predominantly mechanically ventilated.

For homes that are predominantly naturally ventilated, the method with two criteria should be used to assess overheating. The first overheating criteria, which applies to both living rooms/kitchens and bedrooms, is an adaptive criterion. The second overheating criterion is a fixed temperature criteria which applies only to bedrooms. Both criteria must be met for all spaces within a home to demonstrate compliance.

For mechanically ventilated homes, the fixed temperature method with a single criterion should be used to assess overheating. This single criterion must be met for all spaces (living rooms/kitchens and bedrooms) within a mechanically ventilated home to demonstrate compliance.

The TM59 criteria for naturally and mechanically ventilated homes are summarised in the following table. The dwellings in this assessment are assessed against 'predominantly naturally ventilated' criteria.

All criteria must be met for all spaces within a home to demonstrate full compliance.

Table 3: Overheating Assessment Categorisation

Assessment Type	Assessment Criteria	Applicable Rooms	Occupied Hours	Naturally Ventilated Homes (open windows)	Mechanically Ventilated Homes (closed windows)
Predominantly Natural Ventilation	Criterion 1	Living rooms, kitchens and bedrooms	Living / Kitchen / Dining rooms – 9am to 10pm (13 hours/day) Bedrooms – 24-hour occupancy	The number of hours during which external and internal temperature difference 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.	Not Applicable
	Criterion 2	Bedrooms only	Bedrooms – 24-hour occupancy	The operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. 33 or more hours above 26˚C will be a fail	Not Applicable
Predominantly Mechanical Ventilation	Criterion 3	Living rooms, kitchens and bedrooms	Living / Kitchen / Dining rooms – 9am to 10pm (13 hours/day) Bedrooms – 24-hour occupancy	Not applicable	The operative temperature in occupied all occupied rooms should not exceed 26˚C for more than 3% of the annual occupied annual hours. 143 or more hours above 26˚C for living rooms and kitchens will be a fail. 263 or more hours above 26 ˚C for bedrooms will be a fail

4 Design Criteria

The following general criteria have been used throughout the simulation: -

4.1 Air permeability

An air infiltration rate of 0.10ACH has been applied to the dwellings.

4.2 External Envelope

The following U-values have been used: -

Table 4: Building envelope U-values

Element	Modelled U Value (W/m²K)
External Wall	As per SAP calculations -
Roof (Flat / Sloping)	
Ground Floor	
Glazed Windows	
Patio / Bi-Fold Glazed Doors	
Doors	
Roof Windows	
Internal Floors	

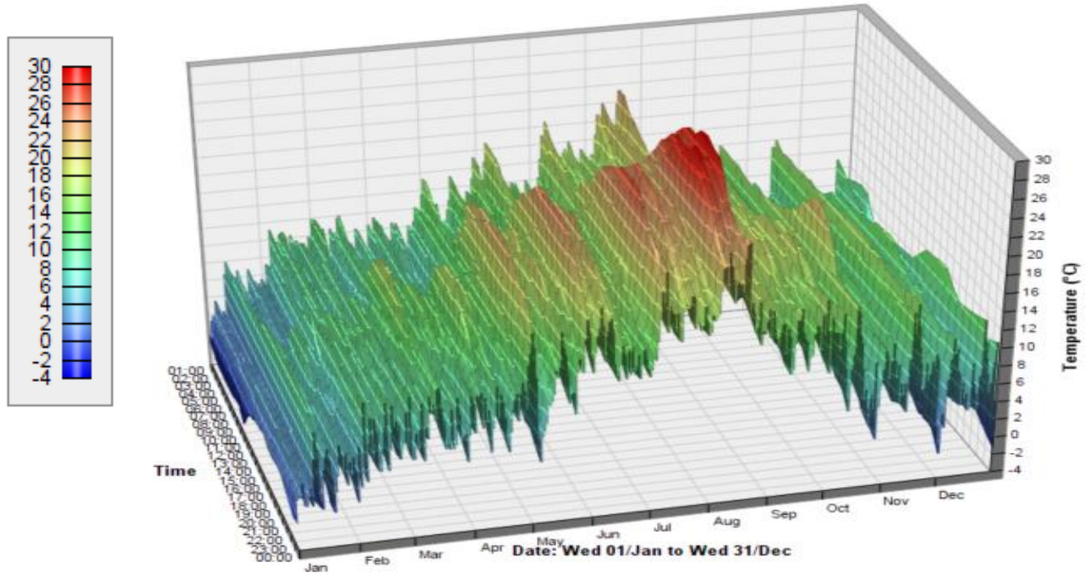


Figure 6: Annual dry-bulb temperature graph of modelled weather file

4.3 Glazing Specification

The glazing is based on a G-value of 0.63 (BS EN 410) for windows and glazed doors.

4.4 Internal window blinds

Internal blinds have been not included in the calculations

4.5 Weather

Weather file used in the calculation: - **Manchester _DSY1_2020High50_.epw** The peak summer temperature is 30°C.

4.6 Site & Orientation

The dwelling has been modelled as per figure 7.

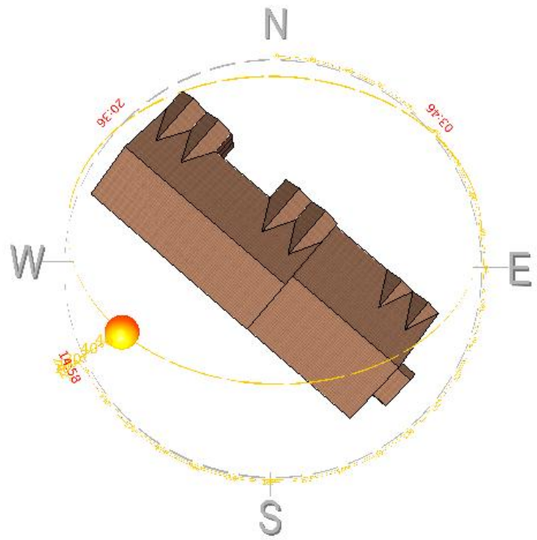


Figure 7: Site orientation

5 REFERENCE DATA

Architectural Drawings

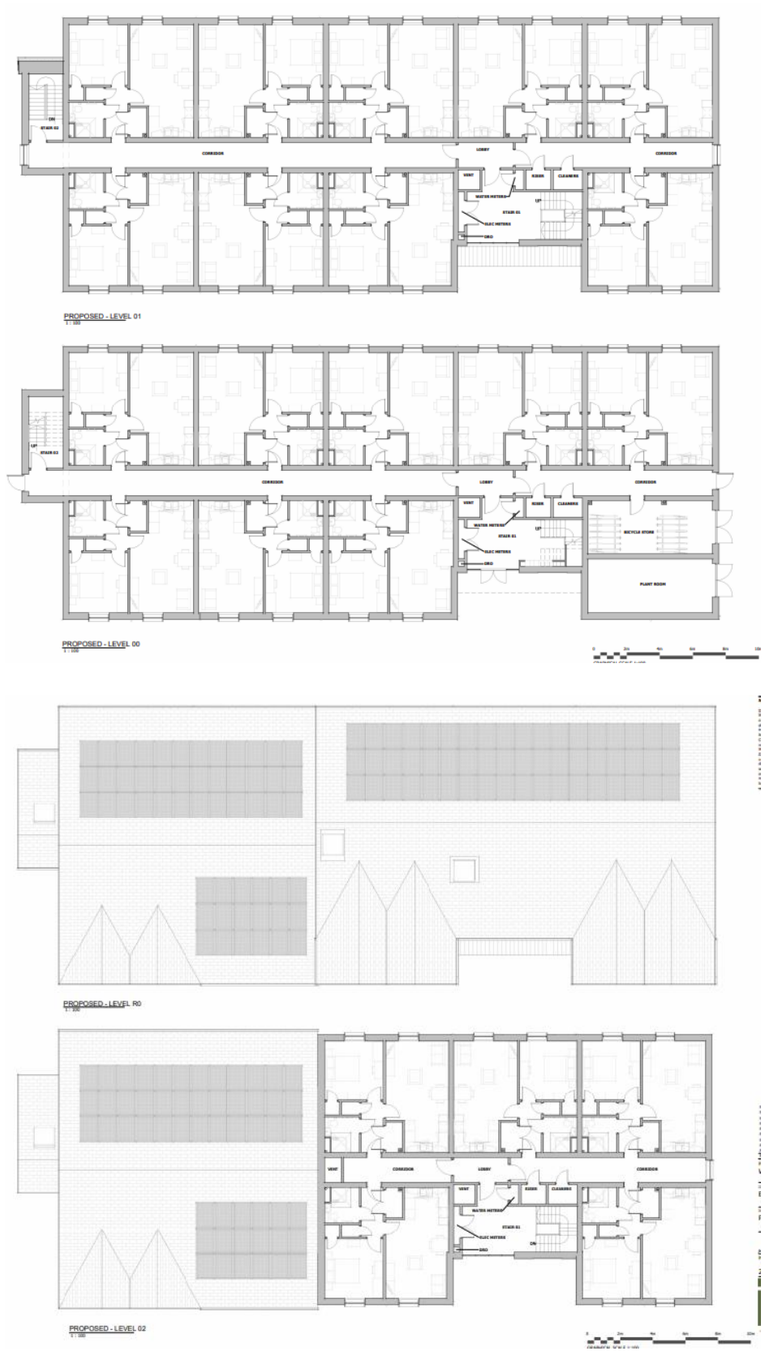


Figure 8: Reference drawings

6 Internal Gains

The internal gains used throughout the simulations are detailed below. No differences between weekdays and weekends are considered. Bedrooms are set with a 24 hour occupancy profile which means that one person is always considered in each bedroom during the daytime and two people in each double bedroom at night. Kitchen/living rooms are unoccupied during sleeping hours and occupied during the rest of the day. Occupied periods are totalled as 3672 hours per year for bedrooms (24/7 May to September) and 1989 hours for living areas (13 hours per day May to September).

See Appendix I for a detailed CIBSE TM59 internal gain schedule.

6.1 Occupancy

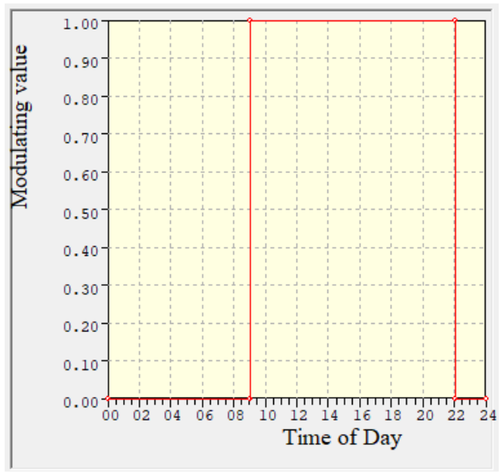
Based on CIBSE Guide A (2015a), a maximum sensible heat gain of 75W/person is assumed in the living spaces. An allowance for 30% reduced gain during sleeping is based on Addendum g to ANSI/ASHRAE Standard 55-2010.

Activity	Sensible heat gain per person (W)
Standard	75
Sleeping	52.5

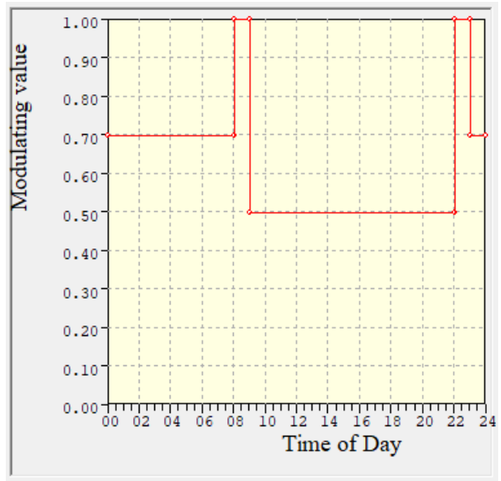
Occupant Gains

Unit/room type	Occupancy
1 bed living/kitchen	1 person from 9am to 10pm room is unoccupied for the rest of the day
2 bed living/kitchen	2 people from 9am to 10pm room is unoccupied for the rest of the day
3 bed living/kitchen	3 people from 9am to 10pm room is unoccupied for the rest of the day
Double bedroom	2 people at 70% gain from 11pm to 8am 2 people at full gain from 8am to 9am and from 10pm to 11pm 1 person at full gain from 9am to 10pm
Single bedroom	1 person at 70% gain from 11pm to 8am 1 person at full gain from 8am to 11pm

Occupancy



Typical living/kitchen occupancy profile



Typical double bedroom occupancy profile

6.2 LIGHTING

Lighting energy is assumed to be proportional to floor area. A default value of 2W/m² is applied to all occupied areas from 6pm to 11 pm.

Zone Type	Gain (W/m²)
living/kitchen/dining areas, bedrooms	2
	0

Lighting gains

6.3 EQUIPMENT

Equipment gains per room type are listed in the table below.

Unit/room type	Load
1 bed living/kitchen	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and 10pm to 12pm Base load of 85W for the rest of the day
2 bed living/kitchen	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and 10pm to 12pm Base load of 85W for the rest of the day
3 bed living/kitchen	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and 10pm to 12pm Base load of 85W for the rest of the day
Double bedroom	Peak load of 80W from 8am to 11pm Base load of 10W during sleeping hours
Single bedroom	Peak load of 80W from 8am to 11pm Base load of 10W during sleeping hours
Communal corridors	Assumed to be zero

Equipment gains

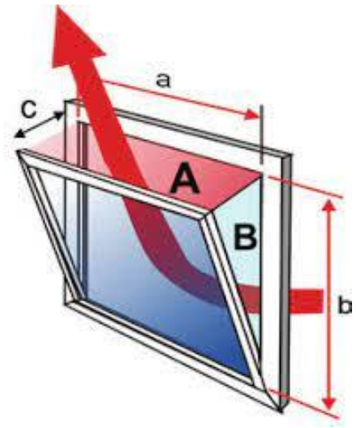
Typical living/kitchen equipment profile

Typical double bedroom equipment profile

7 Cooling Hierarchy – Passive Measures Only

7.1 Natural ventilation

The windows have been modelled using an opening profile that simulates the occupants within the rooms opening the windows when the internal temperature reaches 22°C, as stipulated by AD Part O. The same procedure operates in reverse as the air temperature cools.



The free area is a way of measuring what the equivalent completely open area is for a glazing assembly. Sufficient free area to the opening windows in a dwelling is vital to the overheating mitigation strategy and can be calculated using the combined areas of A+B (in m^2).

Opening angle is the degree of opening of area **B**. Windows have been modelled to be either top or side hung as shown on the architectural drawings.

Dimension **c** refers to the opening length that windows reach when opened. As referenced in AD Part O section 3.9, if the maximum opening angle (**B**) exceeds 100mm of dimension length **c** then the following three criteria must be met:

a) *Window handles on windows that open outwards are not more than 650mm from the inside face of the wall when the window is at its maximum openable angle.*
b) *Guarding meets the minimum standards in Table 3.1*
c) *Guarding does not allow children to easily climb it. For example, horizontal bars should generally be avoided.*

See section 7 of this report for more information.

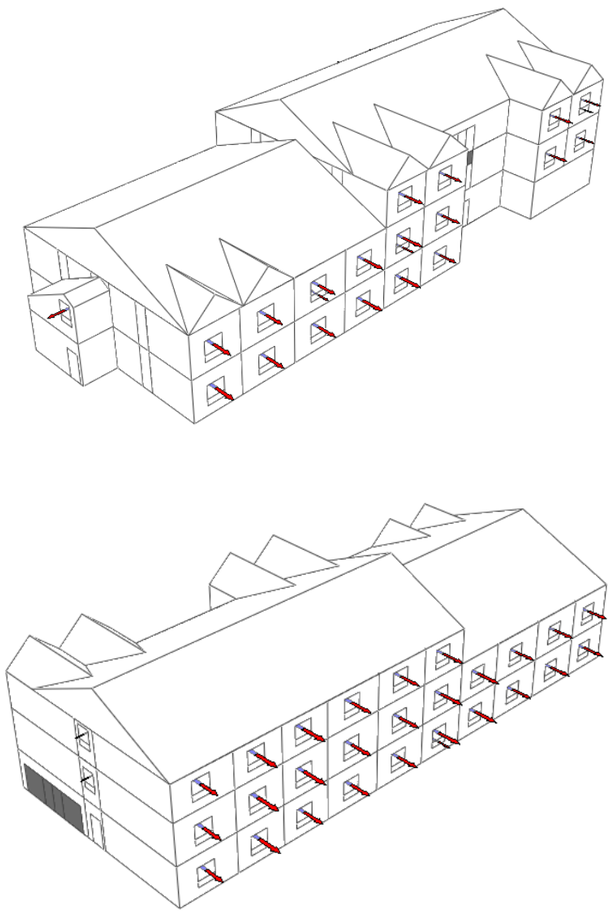


Figure 9: Natural ventilation airflow depiction

7.2 Internal Doors

It is recommended for dwelling occupants to keep internal doors open at all times where possible so to allow air movement between rooms. Openable windows in non-habitable spaces such as landing/halls and bathrooms have been modelled and can contribute to the overall natural ventilation strategy for the dwelling.

Approved Document Part O stipulates bedroom doors must be modelled to be closed during sleeping hours, however there are no constraints during the day and are therefore modelled as open. All non-bedroom doors are considered open on a 24/7 basis.

7.3 Window Opening Schedule

Opening Schedule Description:

2.5 CIBSE's TM59 method requires the modeller to make choices. The dynamic thermal modelling method in this section applies limits to these choices, which are detailed in paragraph 2.6. These limits should be applied when following the guidance in CIBSE's TM59.

2.6 All of the following limits on CIBSE's TM59, section 3.3, apply.

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

i. Start to open when the internal temperature exceeds 22°C.

ii. Be fully open 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. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply.

i. The opening is on the first floor or above and not easily accessible.

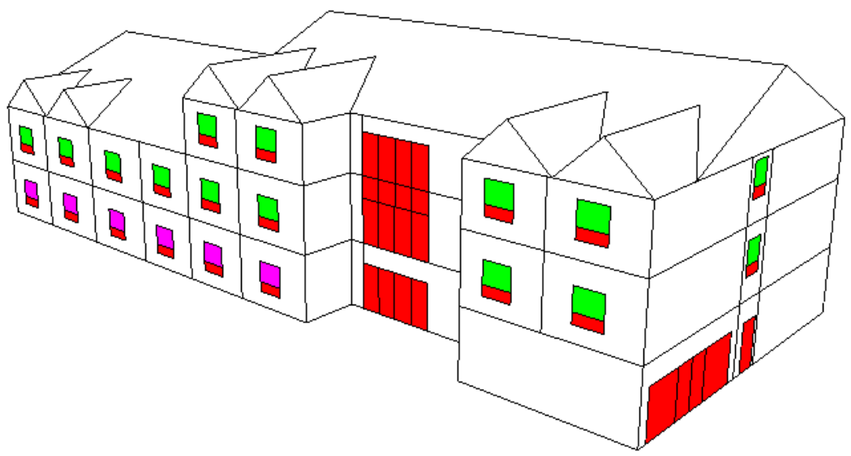
ii. The internal temperature exceeds 23°C at 11pm.

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

i. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely, following the guidance in paragraph 3.7 below.

ii. At night, windows, patio doors and balcony doors should be modelled as closed.

d. An entrance door should be included, which should be shut all the time.



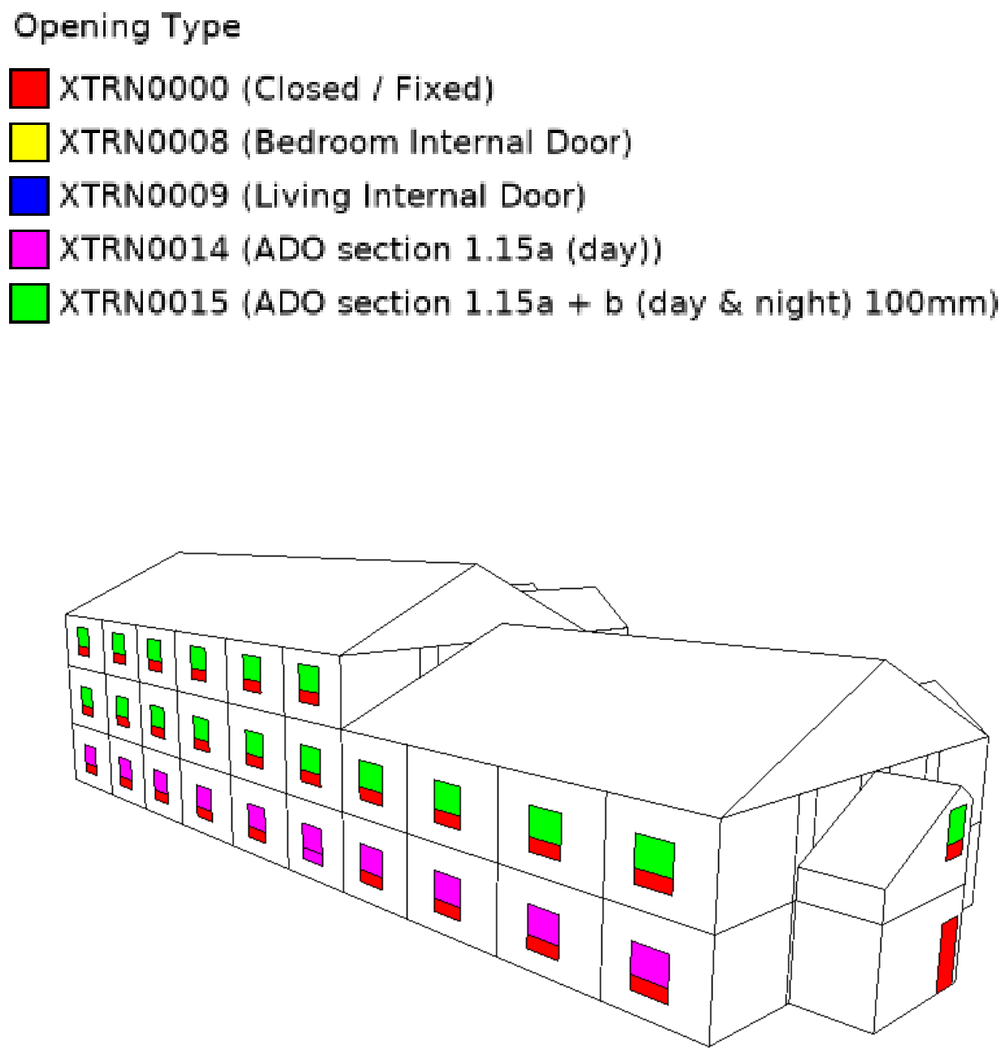


Figure 10: Window opening schedule key

7.4 MECHANICAL VENTILATION – MVHR (SYSTEM 4)

Mechanical ventilation in the form of MVHR is proposed for all units, known as system 4.

This is a low energy, continuous mechanical ventilation system designed to replace conventional extract ventilation systems (such as intermittent systems) by drawing moisture laden air out of the kitchen and wet rooms (bathrooms and utility) while supplying fresh air to habitable rooms such as Bedrooms and Living spaces.

An additional benefit is an air pathway is also formed drawing warm air out of habitable spaces and evacuated from the dwelling, with the makeup air being provided by mechanically supplied air from the unit in addition to any windows in habitable spaces (when opened).

The minimum whole house ventilation rates can be seen in table 1.3 – these have been taken from *Approved Document F.*

For more information, please refer to Approved Document F, Volume 1: Dwellings.

The units have been modelled to operate at Approved Document F minimum rates and in a true summer bypass mode, whereby during warmer months of the year the units deliver air at external conditions into the units.

Table 1.3 Minimum whole dwelling ventilation rates by no. of bedrooms

Number of bedrooms[1][2]	Minimum ventilation rate by no. of bedrooms (l/s)
1	19
2	25
3	31
4	37
5	43

NOTES:
1. If the dwelling only has one habitable room, a minimum ventilation rate of 13l/s should be used.
2. For each additional bedroom add 6l/s to the values in Table 1.3

▲ *Total Combined rate of continuous ventilation in the dwelling needs to meet the above minimum rates.*

System 4 – Continuous Mechanical Supply and Extract with Heat Recovery

Approved Document F1 Means of Ventilation

- Supplies and extracts air continuously at a low rate and incorporates a boost facility to extract pollutants and supply fresh outdoor air at a higher rate as required
- Control/ boost by manual switches or automatically via sensors – humidity/ CO_2/ motion/ other sensors
- Sited in a cupboard or insulated loft and ducted via rigid duct to the outside air
- Replacement air is dealt with by balanced supply/extract

Room	Intermittent Extract Rate (min)
Kitchen	13 L/sec
Utility	8 L/sec
Bathroom	8 L/sec
Sanitary	6 L/sec

Domestic Building Services Compliance Guide 2013 edition

Referred to in the 2013 edition of Approved Document L1A and the amended version of L1B, Conservation of Fuel and Power.
Mechanical ventilation systems should be designed to minimise electric fan power. The specific fan power (SFP) should not be worse than:

SFP < 1.5 W/L/Sec

FOR CONTINUOUS SUPPLY EXTRACT WITH HEAT RECOVERY VENTILATION SYSTEMS

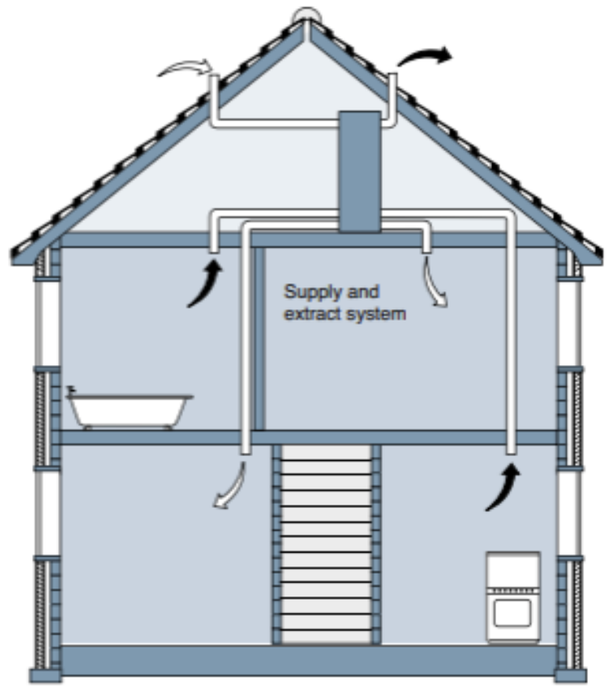


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Figure 11: MVHR unit depiction &Approved Document F Minimum Flow rates

7.5 SHADING

Shading devices such as from roof structures and balconies have been modelled as this would provide shading to the dwelling, limiting any unwanted solar gains.

Additionally, local buildings may provide useful shading, as shown below.

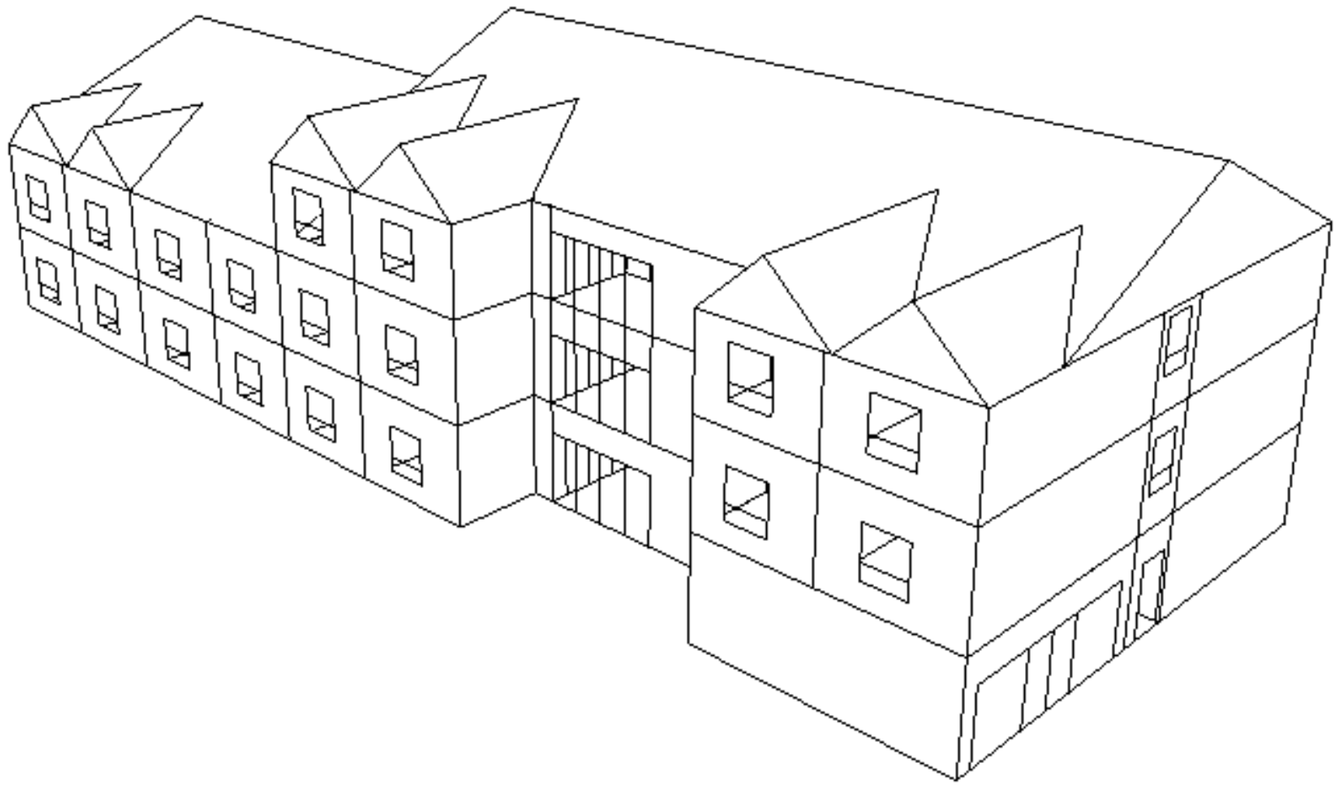


Figure 12: Shading proposed across the scheme

8 Cooling Hierarchy – Mechanical Ventilation

Additional mechanical ventilation measures, in the form of enhanced/boosted overheating flow rates are proposed to the units, as they have been identified at being at risk of overheating.

An additional form of ventilation was found to be required to ground floor units as they require the total closure of windows during overnight hours to ensure Part O compliance can be met. This is due to the requirement to close bedroom windows and doors during sleeping hours, as per Approved Document O stipulations on security.

Bedroom opening closures in particular during overnight hours leads to a build-up of warm air which becomes trapped within the dwelling, leading to warm overnight temperatures and a heightened risk of occupant. Note, this is only applicable to bedrooms, with the windows to non-bedroom spaces not subject to such measures and can be assumed open during the night (provided they do not trigger other requirements such as security etc).

Modelling has found that the mechanical ventilation system proposed must be capable of the below flow rates to ensure Part O compliance is met. In the modelling process, the enhanced/boosted flow rates of the MVHR unit was assumed to become active (i.e. begin to operate at speeds beyond Approved Document F minimum) when internal temperatures exceed 24°C.

During the warmest periods of the year, the cooler night-time temperatures provides bedrooms an opportunity to expel the built-up warm air accumulated throughout the day – which this system takes advantage of in the absence of natural ventilation from the mandatory closing of external windows as stipulated by Part O.

8.1 Mechanical ventilation – Accommodation Schedule

Plot / Unit	Unit Location/Level	Appendix A		Appendix B		Comments
		Approved Document F minimum flow rate, (based on 0.3l/s/m²) floor area) (l/s)	Compliant solution for Approved Document O Compliance?	Required Total Apartment Overheating Flow Rate (l/s)	Compliant solution for Approved Document O Compliance?	
001	Ground	19	No	**40 l/s**	**Yes**	Windows were found to trigger the ADO security stipulation, requiring full closure of windows during overnight hours
002	Ground	19	No	**40 l/s**	**Yes**	
003	Ground	19	No	**40 l/s**	**Yes**	
004	Ground	19	No	**70 l/s**	**Yes**	
005	Ground	19	No	**70 l/s**	**Yes**	
006	Ground	19	No	**70 l/s**	**Yes**	

Plot / Unit	Unit Location/Level	Appendix A		Appendix B		Comments
		Approved Document F minimum flow rate, (based on 0.3l/s/m^2) floor area) (l/s)	Compliant solution for Approved Document O Compliance?	Required Total Apartment Overheating Flow Rate (l/s)	Compliant solution for Approved Document O Compliance?	
007	Ground	19	No	**70 l/s**	**Yes**	
008	Ground	19	No	**70 l/s**	**Yes**	
101	First	19	No	**40 l/s**	**Yes**	Windows were found to trigger the ADO falling from height stipulation, requiring 100mm restrictors to be placed on openings
102	First	19	No	**40 l/s**	**Yes**	
103	First	19	No	**40 l/s**	**Yes**	
104	First	19	No	**40 l/s**	**Yes**	
105	First	19	No	**40 l/s**	**Yes**	
106	First	19	No	**40 l/s**	**Yes**	
107	First	19	No	**40 l/s**	**Yes**	
108	First	19	No	**40 l/s**	**Yes**	
109	First	19	No	**40 l/s**	**Yes**	
201	First	19	No	**40 l/s**	**Yes**	
202	First	19	No	**40 l/s**	**Yes**	
203	First	19	No	**40 l/s**	**Yes**	
204	First	19	No	**40 l/s**	**Yes**	
205	First	19	No	**40 l/s**	**Yes**	

9 COOLING HIERARCHY – ACTIVE COOLING

Not required for Part O compliance.

10 Cooling Hierarchy – Summary of Measures

The Cooling Hierarchy as stated in the London Plan has been followed, as summarised in the table below;

#	Cooling Hierarchy measure	Implementation of measure	Measure effect	Measure Adopted in
1	Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure	Solar control glazing to limit solar gains and modelling of garden/patio privacy screens satisfy the above.	Reduction in solar gains entering the dwellings	Run 1 (Appendix A)
2	Minimise internal heat generation through energy efficient design	This can be achieved by measures such as fully insulated pipework.	N/A	Run 1 (Appendix A)
3	Manage the heat within the building through exposed internal thermal mass and high ceilings	At the jurisdiction of the site architect	N/A	Run 1 (Appendix A)
4	Provide passive ventilation	Passive ventilation via as described opening windows and patio doors (as permitted by ADO and ADK) and MVHR at Part F minimum flow rates	Strategy non-compliant with ground floor units.	Run 1 (Appendix A)
5	Provide mechanical ventilation	Mechanical ventilation via MVHR boosted rates to ground floor unit bedrooms, in combination with natural ventilation via opening windows	All assessed rooms satisfy TM59 criteria and are Part O compliant	Run 2 (Appendix B)
6	Provide active cooling systems	Cooling via MVHR hybrid cooling units or traditional Air Conditioning Units	Not required	N/A

11 ENSURING THE OVERHEATING STRATEGY IS USABLE

Approved Document O lists a number of measures to ensure the overheating mitigation strategy can be feasibly implemented in reality, as well as complying with overlapping building codes. The full literature can be found in *Section 3: Ensuring the overheating mitigation strategy is usable* of Approved Document O. A summary of these standards has been compiled below:

11.1 NOISE

- **3.2)** In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

- **3.3)** Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits: A) 40dB LAeq,T, averaged over 8 hours (between 11pm and 7am). & b) 55dB LAFmax, more than 10 times a night (between 11pm and 7am).

Site applicability: See page 6 of this report.

11.2 POLLUTION

- **3.5)** Buildings located near to significant local pollution sources should be designed to minimise the intake of external air pollutants. Guidance is given in Section 2 of Approved Document F, Volume 1: Dwellings.

Site applicability: Not applicable to the site.

11.3 SECURITY

- **3.6)** When determining the free area available for ventilation during sleeping hours, only the proportion of openings that can be opened securely should be considered to provide useful ventilation. This particularly applies in the following locations, where openings may be vulnerable to intrusion by a casual or opportunistic burglar.
  a) Ground floor bedrooms
  b) Easily accessible bedrooms

Site applicability: See page 5 of this report.

11.4 Protection from Falling

- **3.8)** Openings which are intended to be open for long periods to reduce overheating risk might pose a higher risk of falls from height. Only the proportion of openings which can be opened with a very low risk of occupants falling from height should be considered to form part of the overheating mitigation strategy.

- **3.9)** Openings that can be opened wider than 100mm may form part of the overheating mitigation strategy where they meet all of the following conditions:

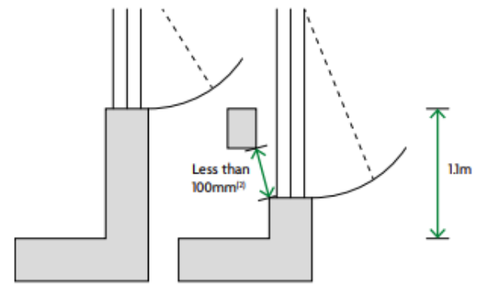
  d) Window handles on windows that open outwards are not more than 650mm from the inside face of the wall when the window is at its maximum openable angle.
  e) Guarding meets the minimum standards in Table 3.1
  f) Guarding does not allow children to easily climb it. For example, horizontal bars should generally be avoided.

  For more information, please refer to *Approved Document K*.

Site applicability: See page 7 of this report.

Table 3.1 Guarding heights

Change in floor level between inside and outside	Guarding height[1]
Less than 600mm	See Approved Document K
More than 600mm	1.1m



NOTES:

1. This approved document has increased levels of protection from falling compared to Approved Document K. Where applicable, the higher standard applies.
2. Guarding should be sized to prevent the passage of a 100mm sphere.

Figure 13: Guarding heights (from Approved Document K)

12 RESULTS SUMMARY

Results Summary

Simulation	Cooling Hierarchy	Overheating Strategy Summary	Mechanical Ventilation Strategy	TM59/Part O Compliance?	Results	Comments
Simulation 1	**Passive Measures Only** - Limit unwanted solar gains - Minimise internal heat gains - Manage heat within building - Passive ventilation via window openings - Mechanical ventilation via MVHR (Part F minimum flow rates and true summer bypass mode as detailed in report)	Passive Measures Only	System 4 MVHR at Approved Document F minimum Flow Rates	✗	Appendix A	Bedrooms fail – additional measures required to these bedrooms (i.e. boosted flow rates beyond AD F minimum)
Simulation 2	**Passive & Mechanical Ventilation** - All the above passive measures - Mechanical ventilation via boosted MVHR flow rates as detailed in assessment	Passive Measures & Mechanical Ventilation	System 4 MVHR at Approved Document F minimum Flow Rates + Boosted overheating flow rates to units (see page 17 for details	☑	Appendix B	Boosted MVHR flow rates (beyond Approved Document F minimum) modelled to apartments, see page 17 for schedule.
Simulation 3	**Passive, Mechanical Ventilation & Active Cooling** - All the above passive measures - Mechanical ventilation via MVHR (with boosted overheating flow rates and true summer bypass mode as detailed in report) - Hybrid cooling unit used to temper MVHR supply air to dwelling or traditional cooling coils to condition the dwelling via AC	Not required as demonstrated that active cooling can be avoided for Part O Compliance				

13 Assessment Summary

The assessment has shown that the assessed residential dwelling presents a low to medium chance of overheating – with the detailed dynamic thermal modelling has shown where the risk is likely to occur.

Following the cooling hierarchy (as adopted in the GLA London Plan), the modelling has found that the use of passive measures with mechanical ventilation to be the best solution to ensuring the proposed units maintains a comfortable internal environment for occupants during the summer months, and to minimise the risk of overheating.

Natural ventilation via openable windows forms the primary overheating mitigation strategy for the site, with it being demonstrated that there are no limits to the use of opening windows (day and/or night) for overheating purposes from the noise impact assessment findings. All ground floor openings are to close overnight in line with security measures outlined in AD O, whereas upper floor windows are placed on 100mm restricted openings as the falling from height safeguarding measure.

A solar controlled window glazing g value of 0.63 (BS EN 410) has been considered to prevent excessive solar gains during summer months.

Passive solutions such as solar shading devices, reduced glazing g values, opening windows/doors and MVHR at part F minimum flow rates were found to be a sufficient solution for upper floor units only, with the modelling finding that internal temperatures are kept to a comfortable level and Part O compliance is achieved.

However, all units were found to require additional mechanical ventilation in the form of boosted MVHR flow rates supply to ensure Part O compliance was achieved – as detailed on page 17.

A summary of the overheating mitigation strategy is listed below:

- Natural ventilation via window openings as per the architectural drawings
- Window openings to be opened as per window restrictions as outlined in this report
- Keeping the external patio doors fully open throughout the day (where applicable) to stimulate air movement throughout the entire dwelling
- Internal doors to be left open when possible to promote air movement in and out of rooms within the dwelling
- Glazing solar performance (g value) of 0.63 (BS EN 410) to all glass
- Mechanical ventilation via MVHR to all apartments, boosted overheating flow rates to units as per the schedule outlined on page 17.

With the above measures implemented, the modelling found all spaces in the assessed dwellings to pass the overheating criteria and comply with Part O building regulations.

Though the regulations do not permit the use of blinds and curtains in the calculations, if the sun shines directly into a living space, the occupant should consider closing the curtains or blinds to limit solar gains and try and keep rooms as cool as possible.

Mitigating overheating will rely on the end user operation and understanding of overheating. Heat comes into the house in two ways: solar radiation from the sun, and hot air. We need to limit both to prevent overheating, which may require closing both the windows and curtains on the warmest days.

If it's cooler inside than outside, it is advised that occupants should keep their windows closed, to prevent bringing warm air in. If it reaches a point where the temperature inside the house is equal to that outside, then you should open the windows, keeping the curtains closed.

14 Modelling Disclaimer

The calculations produced by Complete Sustainability have been carried out with the information provided by others to determine whether the thermal model of the proposed building can achieve compliance, at design stage, with the stated criteria within this report.

It should be noted that the data generated by this work is obtained using computer simulations. These simulations are the best means of predicting the performance of the building at this stage. Full certainty can only be achieved by measuring the performance of the building and associated systems after a period of use.

The actual operative temperatures within the building once occupied may vary from the calculated values within this report. These differences will occur due to a number of variable parameters between the modelled building and the actual building. Such differences will include the hours, levels of occupancy, equipment, how the windows are used etc.

Whilst the simulations have been undertaken in good faith using reasonable skill and care, Complete Sustainability can take no responsibility for differences between the computer simulations and the actual performance of the completed development due to the inherent complexity and variability of the physics in a building and its environment.

On the Approved Document O detailed report appendices, although Complete Sustainability Solutions Ltd. is listed in the Approved Document O detailed report appendices under designer details, including organisation and address, we hold no responsibility for the design of the building, houses, or dwellings referenced. The term "designer" in this context refers solely to our role as a consultant interpreting drawings and details provided by the architect, client, or contractor. Our responsibility is limited to constructing and simulating the Part O overheating model within the IES software based on this information.

15 APPENDIX C - DETAILED OCCUPANCY SCHEDULES – CIBSE TM 59 HEAT GAIN PROFILE

Number of People	Description /Occupancy	Period																						
		00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
		Hour ending																							
		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
1	Single Bedroom	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double Bedroom	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.7
2	Studio	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
1	1-bedroom /living/Kitchen	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
1	1 - bedroom /living	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
1	1 - bedroom Kitchen	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
2	2-bedroom /living/Kitchen	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	2 - bedroom /living	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
2	2 - bedroom Kitchen	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
3	3 - bedroom/living/Kitchen	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3	3 - bedroom /living	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
3	3 - bedroom Kitchen	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0

16 Appendix D – Compliance Checklist (Approved Document O – Appendix B – Part 1)

1A Designer details	
Designer's name	Ben Dibb-Fuller
Company	Complete Sustainability Solutions Ltd
Address	1 Balloon St, Manchester
Postcode	M4 4BE
Telephone Number	0161 706 0298
Email Adress	office@completesustainability.co.uk
1B Site/Building details	
Dwelling address/es	Woodfield Avenue
Postcode	-
Scheme name	Woodfield Avenue, Flint
Building type – see table 1.1	Dwelling-houses single aspect
No of aspects (single/ dual/ multiple)	Single aspect
Storey (ground floor or story number)	All buildings are singular storey dwellings
Ventilation strategy (natural / mechanical)	Mechanical (MVHR)
Is the dwelling close to sources of noise and/or pollution?	No noise impact assessment provided at this time; it has been assumed there are no noise and/or pollution issues.
Are there security issues (e.g. accessible windows/ openings)?	ADO security restriction to ground floor openings, ADO falling from height to upper floor windows (100mm restrictors modelled)

17 APPENDIX E – COMPLIANCE CHECKLIST (APPROVED DOCUMENT O – APPENDIX B – PART 3)

3. Overheating mitigation strategy – The Dynamic Thermal Modelling Method		
Dynamic software name and version	IES Virtual Environment 2025 (Version 2024.1.0.0)	
Weather file location used for the modelling	Manchester_DSY1_2020High50_.epw	
Sample size for modelling and reasons for excluding specific dwellings from the modelling	All assessed in their correct orientations	
Occupancy type (Confirmation that Type I occupancy has been used as per section 4.4 of CIBSE TM59 (2017))	Yes, Type II occupancy has been used as per section 4.4 of CIBSE TM59 (2017)	
Confirmation that modelling is in line with guidance in CIBSE TM59 (2017) including assumptions on equipment gains etc.	Yes, modelling is in line with guidance in CIBSE TM59 (2017) including assumptions on equipment gains etc.	
Confirmation that window and door opening regime is as per paragraph 1.14	Yes, the window and door opening regime is as per paragraph 1.14	
Glazed area (%) of floor area	-	
Glazing g-value	Windows (0.63) (BS EN 410)	
External shading devices used (description)	See report	
Free area (%) of floor area	-	
Air permeability (m3/h.m2 at 50 Pa)	1-2	
Mechanical ventilation flow rates, where applicable	MVHR with flow rates as detailed in report	
Mechanical ventilation operation profile, where applicable	MVHR continuous trickle rates (ADF Minimum), then boost mode activates one the internal temperatures exceed 22°C	
What issues of external noise and pollution, safety and security have been taken into account and what limitations this has on the mitigation strategy (e.g. window opening etc).	ADO security restriction to ground floor openings, assumed closed overnight ADO Falling from Heights (100mm restrictors on upper floor windows)	
Has the project passed the assessment described in CIBSE's TM59, taking into account the limits detailed in paragraphs 1.12 to 1.15? (YES/NO)	**YES**	~~NO~~