

Havant & South Downs College Places for People Developments Limited

Residential Part O Overheating Analysis
CIBSE TM59:2017

AES Sustainability Consultants Ltd

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This report has been commissioned by Places for People Developments Limited to assess the potential risk of overheating to 85 plots at Havant & South Downs College, Waterloooville. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

Contents

1.	Executive Summary.....	4
2.	Scope and Limitations.....	6
4.	Introduction to Overheating in Modern Dwellings	9
5.	Methodology and Key Assumptions.....	10
6.	Results – Summertime Overheating Modelling	13
7.	Conclusion	16
	References.....	17
	Appendix A – TM59 Risk factors	18
	Appendix B – Dwelling designs.....	19
	Appendix C – Modelling schedules.....	25
	Appendix D – Assumptions for Natural Ventilation	28

List of figures & tables

Figure 1. Proposed Site Layout	4
Table 1: Thermal modelling results (CIBSE Southampton DSY 1 - 2020, high emissions, 50% scenario) 5	
Figure 2. Plots analysed.....	5
Figure 3. 3D Model (IES VE)	5
Figure 4. Service design in apartments, cumulative effects of individual heat gains	9
Table 2: Part F minimum standards for new dwellings	10
Figure 5: Temperature profile CIBSE Southampton DSY 01 2020, high emissions, 50% percentile scenario [Screenshot – IESVE 2024]	10
Table 3: Baseline Building Fabric.....	11
Table 4: Lighting Gains.....	11
Table 5: Ventilation & Shading Strategy	11
Table 6: Equipment gains.....	12
Table 7. Results – DSY1 2020s, high emissions, 50% percentile scenario (Base Case).....	13
Table 8. Results – DSY1 2020s, high emissions, 50% percentile scenario (Mitigation Measures).....	15
Figure 6: Security issues for window above canopy and GF floor bedrooms in apartments	16

1. Executive Summary

Purpose and scope of the statement

- 1.1. AES Sustainability Consultants Ltd has undertaken calculations to identify whether certain House types and Apartments within Havant & South Downs College, Waterlooville will be at significant risk of overheating. The 10 samples have been selected as their orientation, potential acoustic issues and glazing areas represent a worst-case scenario for the proposed development.
- 1.2. This report uses room profiles assessed against CIBSE benchmarks outlined in CIBSE TM52:2013 and TM59:2017 for the analysis of the risk of overheating by using CIBSE weather files.
- 1.3. CIBSE TM59 provides a methodology to assess the risk of overheating in homes and has been used to carry out this analysis.
- 1.4. Compliance is based on passing BOTH of the following 2 criteria:
 - 1) TM52 Criterion 1 must pass (Operative temperature cannot exceed the upper comfort limit for more than 3% of the occupied summer hours).
 - 2) TM59 Bedrooms only - An additional requirement must be checked for the bedrooms to guarantee comfort during the sleeping hours. The resultant temperature in the bedroom from 10pm to 7am cannot exceed 26°C for more than 1% of annual hours (1% of hours between 22:00-07:00 for bedrooms is 32 hours).
- 1.5. Adjustments to the requirements of CIBSE TM59:2017 have been made to accommodate the proposals of the new Approved Document O (ADO) which came into force past June 2022.
- 1.6. The modelling has been conducted using design weather data taken from the file CIBSE Southampton DSY 1 - 2020s, high emissions, 50% scenario. The weather file has been chosen as the most appropriate following guidance from TM59:2017 and the CL2.1 SBEM Weather location lookup.

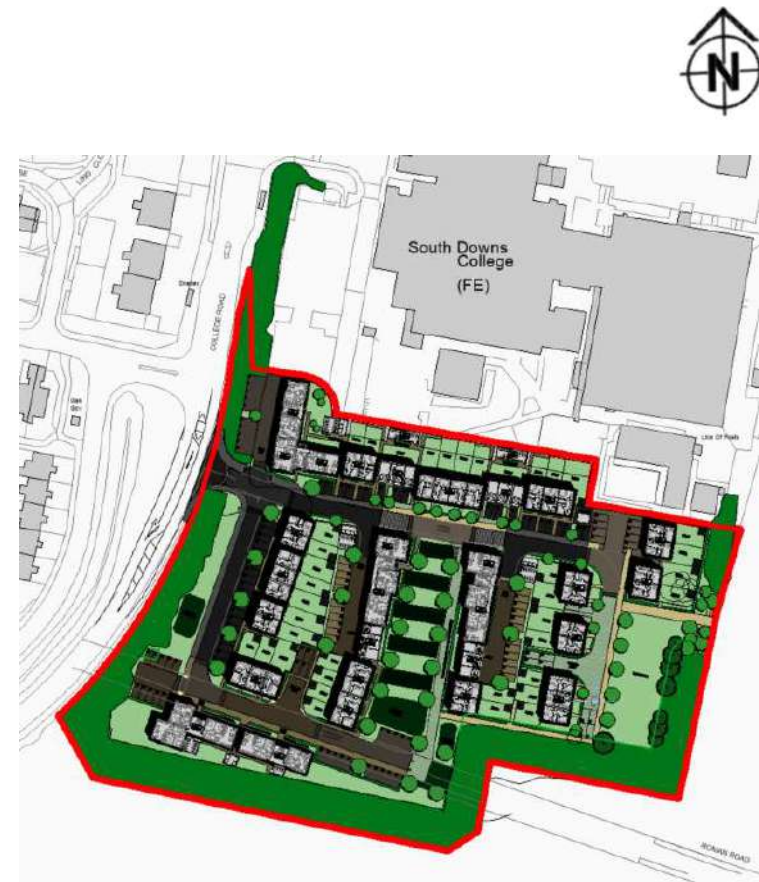


Figure 1. Proposed Site Layout

CIBSE Southampton DSY 1 - 2020s, high emissions, 50% scenario

- 1.7. Initial results indicate that there is a significant risk of overheating using the base case specification with a window U value of 1.2 / g-glazing of 0.5 and minimum Part F ventilation rates.

Table 1: Thermal modelling results (CIBSE Southampton DSY 1 - 2020, high emissions, 50% scenario)

	Results Blocks AB, CD and EF
Base case	Windows with a g glazing of 0.50, openable as specified in Appendix D. Standard ventilation rates are as follows: dMEV - 0.3 l/(s.m ²)
Mitigation Measure 1	Incorporation of additional ventilation rates as follows. GF 1 bedroom flats: D Bed1 - 10 l/s SF 1 bedroom flats: D Bed1 - 20 l/s GF 2 bedroom flats: D Bed1/ D Bed2 - 10 l/s SF 2 bedroom flats: D Bed1/ D Bed2 - 15 l/s Maxstone: D Bed3 - 10 l/s & S Bed4 - 5l/s Kelmarch: D Bed2/ D Bed3 - 5 l/s Dropmore: D Bed2 - 5l/s

- 1.8. The modelled Mitigation measures are shown to be effective for all rooms (Living/ Kitchen/ Bedrooms) on dwellings at all floor levels tested.
- 1.9. All windows have been assigned a relevant opening profile, where applicable as shown in the Appendix D. Internal doors are assumed to be left open throughout the non-sleeping hours.
- 1.10. Figure 2 indicates plots analysed highlighted in yellow
Plots affected by noise restrictions: 27, 78, 79 and apartments
Plots not affected by noise restrictions: 33, 46 and 60



Figure 2. Plots analysed

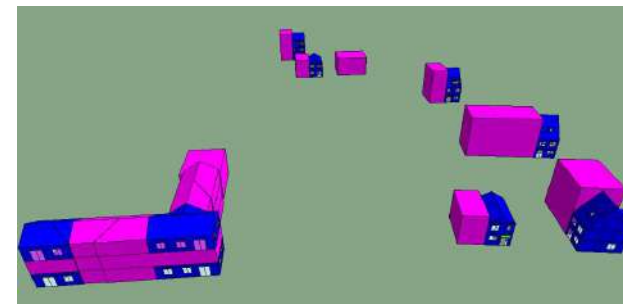


Figure 3. 3D Model (IES VE)

2. Scope and Limitations

- 2.1. Historically, Part L1A – Building Regulations 2013 Criterion 3 – Limiting the effects of solar gains during the summer which stated that reasonable provision should be made to limit solar gains was the only regulatory requirement. This could be achieved by an appropriate combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and high thermal capacity..
- 2.2. This is assessed within SAP in terms of regulatory compliance; however, this is not a particularly sensitive analysis. Assessing the risk in accordance with CIBSE guidance provides a more in-depth analysis.
- 2.3. Living areas and bedrooms are the rooms that should be considered most closely as it is envisaged that these will be the rooms occupied for significant periods of time. Bedroom temperatures are likely to be most critical as people find sleeping difficult in the heat. Rooms such as bathrooms, circulation spaces, store rooms and kitchens do not have overheating criteria or a suggested maximum temperature as it is envisaged that no one will occupy these rooms for a significant period of time.
- 2.4. The purpose of this report is to ascertain whether internal temperatures are likely to exceed the criterion recommended in CIBSE TM59:2017 – Design methodology for the assessment of overheating risk in homes.
- 2.5. This methodology provides a baseline for all domestic overheating risk assessments. and will:
 - 1) Allow different designs to be compared with a common approach based on reasonable assumptions.
 - 2) Support design decisions that improve comfort without cooling.
 - 3) Provide consistency across the industry as all consultants will be using the same methodology for overheating risk prediction.
- 2.6. This methodology will not:
 - 1) Guarantee that people will always be comfortable, however they act.
 - 2) Take into account unusual use.
- 2.7. Compliance is based on passing BOTH of the following 2 criteria:
 - a) TM52 Criterion 1 must pass (Operative temperature cannot exceed the upper comfort limit for more than 3% of the occupied summer hours)
 - b) TM59 Bedrooms only - An additional requirement must be checked for the bedrooms to guarantee comfort during the sleeping hours. The resultant temperature in the bedroom from 10pm to 7am cannot exceed 26°C for more than 1% of annual hours (1% of hours between 2200-0700 for bedrooms is 32 hours).
- 2.8. If a dwelling fails above criteria, measures should be investigated to reduce internal temperatures and therefore reduce the likelihood of overheating.
- 2.9. To ensure that the CIBSE standards are met it is necessary to use appropriate simulation software in the design process and introduce adequate measures to ensure it is maintained within the completed dwellings. In order to assess the overheating risk IES Virtual Environment has been used. IES Virtual Environment is a state-of-the-art dynamic modelling software tool for assessing building energy, carbon, lighting and thermal comfort.
- 2.10. IES version 2024.0.1.0 'Apache Sim' has been used to carry out dynamic simulation to analyze the thermal comfort likely to be experienced within the apartments. The full dynamic simulation in accordance with CIBSE TM59:2017 combines the effects of:
 - Annual Design Summer Year (DSY) weather data as produced by CIBSE;
 - Casual, lighting and people heat gains.
 - Thermal mass of the building.
 - Solar heat gain.
- 2.11. All results and strategies are directly affected by the inputs listed in this document. Any deviations from these will affect the results. It is important to note that with any modelling exercise there are assumptions and approximations that have to be made. Details of all assumptions made, and approximations used are supplied as part of the report.
- 2.12. The results give an indication of the predicted environmental conditions based on weather data and the anticipated operation strategy of the building.
- 2.13. The predicted simulated internal temperatures generated by the software may not match the actual internal air temperatures due to several reasons, for example, change in space function, use of equipment, natural wear and tear of building elements, global climate change and metrological changes, change in operation management of apertures etc.

3. New Approved Document O – Overheating

3.1. In December 2021, a new approved document related to overheating in dwellings was introduced by the government for use in England. Approved Document O (ADO) took effect on 15 June 2022 for use in England. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building was started before 15 June 2023.

3.2. Overheating will no longer be assessed under Part L 2021- Building Regulations 2013 Criterion 3 – Limiting the effects of solar gains during the summer and has become a stand-alone document. For the purposes of compliance with the ADO, two types of methodology have been introduced; the simplified method and the dynamic thermal modelling method.

3.3. For the purposes of this assessment, the dynamic simulation method has been used.

3.4. In order to demonstrate compliance using the dynamic thermal modelling method, all of the following guidance should be followed:

CIBSE's TM59 methodology for predicting overheating risk.

The limits on the use of CIBSE's TM59 methodology set out below.

The acceptable strategies for reducing overheating risk as indicated in this section.

3.5. 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 below. For compliance with ADO these limits should be applied when following the guidance in CIBSE's TM59.

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

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

Be fully open when the internal temperature exceeds 26°C.

Start to close when the internal temperature falls below 26°C.

Be fully closed when the internal temperature falls below 22°C.

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

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

The internal temperature exceeds 23°C at 11pm.

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

In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely.

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

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

3.10. The building should be constructed to meet the requirements of ADO using passive means as far as reasonably practicable. Any mechanical cooling (air-conditioning) is expected to be used only where the requirements of ADO cannot be met using openings.

3.11. Solar gains in summer should be limited by any of the following means:

Fixed shading devices, like shutters, external blinds, overhangs and awnings.

Glazing design, involving any of the following solutions: size, orientation, g-value and depth of the window reveal.

Building design – for example, the placement of balconies.

Shading provided by adjacent permanent buildings, structures or landscaping.

3.12. Although internal blinds and curtains provide some reduction in solar gains, they should not be taken into account when considering whether the requirements of ADO have been met. Foliage, such as tree cover, can provide some reduction in solar gains.

3.13. Excess heat should be removed from the residential building by any of the following means.

Opening windows (the effectiveness of this method is improved by cross-ventilation).

Ventilation louvres in external walls.

A mechanical ventilation system.

A mechanical cooling system

Protection from Falling

- 3.14. As part of the new approved document Part O, precautionary measures for the protection from falling have been introduced in the design of openings.
- 3.15. 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.
- 3.16. Openings that can be opened wider than 100mm may form part of the overheating mitigation strategy where they meet all of the following conditions.

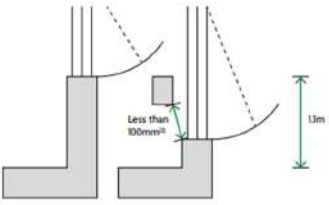
Window handles on windows that open outwards are not more than 650mm from the inside face of the wall when the window is at its maximum openable angle.

Guarding meets the minimum standards in Table 3.1.

Guarding does not allow children to easily climb it. For example, horizontal bars should generally be avoided.

• Table 4: Part O requirements for guarding heights

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.

- 3.17. To ensure safe operation it may be necessary to reduce the size of the outward opening windows and provide more windows to meet the required free area.
- 3.18. Guarding for large openings could include, but is not limited to, either of the following

Shutters with a child-proof lock.
Fixed guarding.

- 3.19. For the purposes of this assessment, consideration has been given into adjusting the height of the openings and windows in order to meet the proposed requirements listed in ADO.

Noise

- 3.20. 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).
- 3.21. Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:
- 40dB LAeq,T , averaged over 8 hours (between 11pm and 7am).
55dB LAFmax , more than 10 times a night (between 11pm and 7am).
- 3.22. Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants' Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

Pollution

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

Security

- 3.24. 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.

Ground floor bedrooms.
Easily accessible bedrooms.

- 3.25. Open windows or doors can be made secure by using any of the following.

Fixed or lockable louvred shutters.
Fixed or lockable window grilles or railings.

4. Introduction to Overheating in Modern Dwellings

- 4.1. The project team should consider the risk of overheating in their building designs very early in the design process as it has the potential to not only cause discomfort for building occupants, but also cause potentially harmful medical conditions such as dehydration or heat exhaustion.
- 4.2. People may feel hot, uncomfortable and show lower productivity when temperatures reach between 25-28°C. Indoor operative temperatures that stay at or over 28°C for long periods of the day will result in dissatisfaction for many occupants. This can be expressed as the occupant experiencing thermal discomfort and in some cases thermal stress. Thermal discomfort is where occupants feel uncomfortable as they are too hot (or cold). Thermal stress is where the thermal environment will cause potentially harmful medical conditions such as dehydration or heat exhaustion. Vulnerable people, such as the elderly are particularly susceptible to health problems due to overheating.
- 4.3. Homes in the UK have not historically been associated with overheating. This is most likely due to a combination of the heavyweight materials from which they were constructed, a low level of thermal insulation and high levels of uncontrolled ventilation through minor gaps in the fabric.
- 4.4. The use of heavyweight materials provides high thermal mass within the building envelope. This ensures that external daily temperature variations are not reproduced as quickly inside the building because the fabric will absorb heat during the day and release it slowly when temperatures drop at night. In this way, the impact of maximum heat levels reached during the day is delayed by the thermal mass of the building and can be counter-balanced by strategies that make use of the cool of the night.
- 4.5. Modern homes are usually constructed from lightweight materials, are highly insulated, have been built to high standards of air tightness and have double-glazed windows that have coatings specifically designed to trap the sun's heat. This results in more heat being retained within the homes which is not able to be absorbed by the lightweight fabric.
- 4.6. Rooms with large glazing areas to their South and West facades are likely to be those at highest risk of overheating. South facades receive the highest amount of direct sunlight when the sun is highest, whilst West facades experience unwanted solar gains from low-level sun in the evenings. Proposed mitigation measures need to take account of the difference in the position of the sun during the day as some measures will work on certain facades but not on others. For example, overhangs can block out the sun when it is high in the sky but will have little effect if installed on West facing elevations when the sun is low in the sky.

- 4.7. Overheating in apartments is a greater risk where apartments are designed with a single-aspect and where community heating pipework is routed through corridors and common spaces. In these situations, high internal temperatures are often caused by a combination of inadequate ventilation and excessive heat discharged by heating pipework.

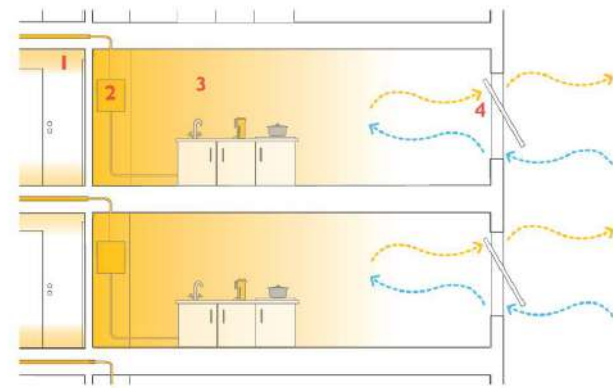


Figure 4. Service design in apartments, cumulative effects of individual heat gains

- 4.8. Mechanical services installed in apartments cause heat gains in the same way as in houses; however with limited scope for ventilation their impact becomes more significant. Consequently, a different strategy is required to ensure that unwanted heat is removed. In blocks where space and water heating is provided by a community heating system, the CIU is permanently charged with hot water all year round to meet the hot water demand. This unit, particularly if not well insulated, may effectively emit heat like a radiator in the dwelling. It is often positioned in an unventilated cupboard or kitchen so heat transfers directly to the living spaces.
- 4.9. In addition, the distribution pipework for the community heating system often runs through the corridors and common spaces. Since this pipework is constantly emitting heat, it can cause high temperatures in these spaces, especially when there is insufficient ventilation. Even well-insulated heating systems will emit heat, albeit at a slower rate. Unless there is a strategy to remove this heat it will be transferred from common areas into the adjacent apartments.

5. Methodology and Key Assumptions

Methodology

- 5.1. CIBSE has undertaken considerable consultation and research on the impact of climate change on the indoor environment and weather data. TM52:2013, TM59:2017, CIBSE Guide A 2015, AD Part L1A 2013, AD Part F 2013 and SAP 2012 provide data on maximum average temperatures, ventilation rates and overheating criteria for areas of dwellings as illustrated below. We have used this data as the basis for our analysis and the recommendations are presented in this report.
- 5.2. Building Regulations Part F 2021 states that for dwellings the whole dwelling ventilation rate for the supply of air to the habitable rooms should be no less than the rates detailed in the Table 2 below.

Table 2: Part F minimum standards for new dwellings

Number of bedrooms ⁽¹⁾⁽²⁾	Minimum ventilation rate by number 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.

- 5.3. Windows in Bedrooms of house types and blocks of apartments, on the orientations marked in the APPENDIX C: Glazing Markup Plan of the noise report have been modelled as closed during the night due to noise concerns outlined in the Noise Assessment report provided by Noise.co.uk noise and vibration consultancy, dated 17th April 2025. Report reference no 21840-1-R2.
- 5.4. The proposed ventilations system for the development is dMEV with the assumption that minimum rates stated in Part F will be achieved in all rooms (0.30 l/s per m²)

Weather Data

- 5.5. Our analysis has been carried out using average weather data appropriate to the location of the proposed development. The weather file that has been used is CIBSE Southampton:
- CIBSE Southampton DSY 1 - 2020s, high emissions, 50% percentile scenario
- 5.6. Figure 5 below shows a typical metrological year for CIBSE Southampton using DSY 1 2020 weather data. Dry bulb temperature exceeds 31.8°C in July and the maximum adaptive temperature is exceeded 38 hours. Over the course of a year.

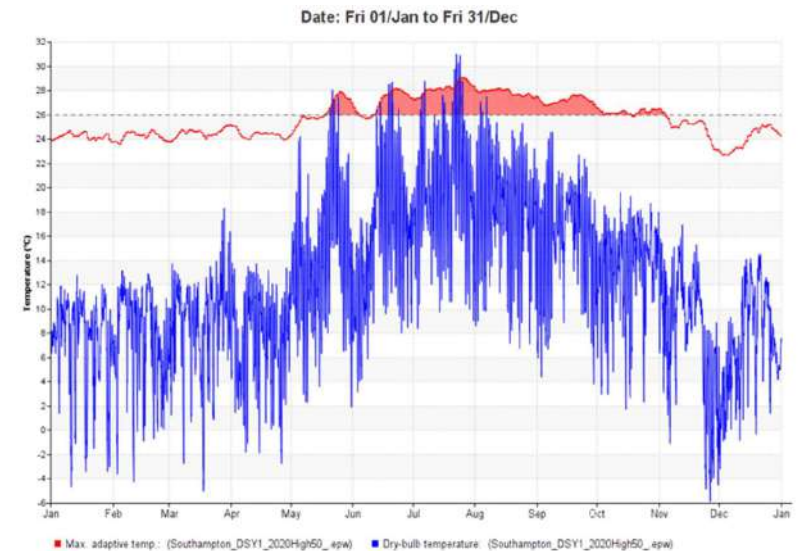


Figure 5: Temperature profile CIBSE Southampton DSY 01 2020, high emissions, 50% percentile scenario [Screenshot - IESVE 2024]

Development Design

- 5.7. The modelling has been based upon architectural plans: issue dated December 2024, revisions P5 (for all house types and blocks of apartments,) provided by HGP Architects. For a more detailed apartments' designs, please see Appendix B of this report.
- 5.8. The following design criteria have been used in the modelling software to perform the calculations and modelling to assess the risk of summertime overheating.

Building Fabric

- 5.9. The building elements were modelled according to the construction specification detailed in the table below.

Table 3: Baseline Building Fabric

Construction Elements	U-value in [W/m ² K]	Kappa in (kJ/m ² K)
Ground Floor	0.12	75
External Wall	0.18	60
Dormer Cheek	0.28	9
Main Roofs	0.09	9
Dormer Roof	0.2	9
Slope Roof	0.16	9
Int. Ceiling & Floor	N/A	9
Internal Partitions	N/A	9
Windows	1.2 (G-Glazing 0.50)	-
French Door	1.4 (G-Glazing 0.63)	-
Roof window	1.8 (G-Glazing 0.71)	-
Door	1.4	-
Party wall	0	45
Infiltration	-	0.25/0.3 ACH

*Kappa values stated for structural element only. DSM model accounts for low thermal mass including the plasterboard of the suspended ceiling.

Lighting Gains

- 5.10. The following table summarizes the assumed lighting gains used in the base model. Light energy is assumed to be proportional to the floor area. Only summer months are assessed from 6pm to 11 pm.

Table 4: Lighting Gains

Area	Lighting Gains in (W/m ²)	Notes
All rooms	2.0	TM59

Natural Ventilation

- 5.11. One of the most effective ways of addressing the risk of overheating in homes is to have a well thought out strategy for purge ventilation (supply of large amounts of fresh air in a short period of time).
- 5.12. This can be achieved by providing means for cross-ventilation, circulating large amounts of air through the home. Where mechanical ventilation is used, occupants should still be able to open windows adequately and in a secure manner, even if only for a short period of time.

Table 5: Ventilation & Shading Strategy

	Notes
Ventilation Strategy	Calculated natural ventilation (MacroFlo). Windows / doors are allowed to be open when internal temperatures are higher than ambient temperatures and internal dry-bulb temperature exceeds 22°C.
Shading Strategy	The blocks shade one another because of their close proximity within the development.

- 5.13. Natural ventilation via openable windows has been allowed during times when the room being assessed is occupied. For a more detailed schedule of ventilation assumptions, please see Appendix D of this report.

Mechanical Ventilation

- 5.14. Where natural ventilation can't sufficiently mitigate overheating due to noise or security issues, additional mechanical ventilation rate has been introduced to sufficiently ventilate the occupied areas within a dwelling.
- 5.15. A basic ventilation rate of 0.3 l/(s.m²) has been utilized in all rooms where mechanical ventilation is supplied (base case scenario).

Occupancy Gains

- 5.16. Maximum Sensible Gain assumptions are based on CIBSE Guide A 2015 at 75 W/person and Maximum Latent Gain of 55 W/person. See Appendix C for full occupancy profiles.

Equipment Gains

- 5.17. It is assumed that apartments with the same number of occupants and bedrooms are usually provided with the same appliances, therefore any gains resulting from them is assumed to be independent of floor area.
- 5.18. The following equipment gains have been assumed for the rooms being assessed. Equipment gains for the living room are based on CIBSE TM59. Variation profiles are shown in Appendix C.

Table 6: Equipment gains

Room	Equipment gains (W)	
Living/Kitchen	450	ICT (information and communications technologies), Audio-visual and Kitchen appliances and others
Bedroom	80	Laptop or TV

6. Results – Summertime Overheating Modelling

6.1. The following tables illustrate the results using the design specification, mechanical and natural ventilation. The results are compared with the recommendations from TM59:2017 as stated earlier in this report.

Items within the table:

- Items in **Red** DO NOT comply with the CIBSE recommendations.
- Items in **Green** DO comply with the CIBSE recommendations.

6.2. Natural ventilation via openable windows has been allowed once the internal air temperature exceeds a comfortable temperature, which is modelled as 22°C.

6.3. Compliance is based on passing BOTH of the following 2 criteria:

- 1) TM52 Criterion 1 must pass (Operative temperature cannot exceed the upper comfort limit for more than 3% of the occupied summer hours)
- 2) TM59 Bedrooms only - An additional requirement must be checked for the bedrooms to guarantee comfort during the sleeping hours. The resultant temperature in the bedroom from 10pm to 7am cannot exceed 26°C for more than 1% of annual hours. (1% of hours between 22:00-07:00 for bedrooms is 32).

Results – DSY 1 2020s, high emissions, 50% scenario (Base Case)

6.4. The table below shows the detailed results against CIBSE TM59:2017 criteria when using a glazing g-glazing of 0.50 and the ventilation rates specified in table 1.

Table 7. Results – DSY1 2020s, high emissions, 50% percentile scenario (Base Case)

House type	Room Name	Criteria a	Criteria b	Pass / Fail
P33 Daresbury	Living	2.8	N/A	Pass
	Kitchen	1.1	N/A	Pass
	D Bedroom 1	1.1	2	Pass
	D Bedroom 2	0.5	3	Pass
P46 Madaley	Living	1.6	N/A	Pass
	Kitchen/Dining	1.3	N/A	Pass
	D Bedroom 1	1.5	2	Pass
	D Bedroom 2	0.9	2	Pass
	D Bedroom 3	0.8	3	Pass
	S Bedroom 4	0.8	3	Pass
P60 Kelmarch	Living	1.5	N/A	Pass
	Kitchen/Dining	2.0	N/A	Pass
	D Bedroom 1	0.7	6	Pass
	D Bedroom 2	0.6	3	Pass
	D Bedroom 3	1.2	2	Pass
P27 Maxstone	Living	1.7	N/A	Pass
	Kitchen/Dining	1.3	N/A	Pass
	D Bedroom 1	1.1	2	Pass
	D Bedroom 2	0.9	2	Pass
	D Bedroom 3	0.8	47	Fail
	S Bedroom 4	1.0	37	Fail
P78 Kelmarch	Living	1.7	N/A	Pass
	Kitchen/Dining	1.3	N/A	Pass
	D Bedroom 1	1.0	32	Pass
	D Bedroom 2	1.0	39	Fail

House type	Room Name	Criteria a	Criteria b	Pass / Fail
	D Bedroom 3	0.8	39	Fail
P79 Dropmore	Living	1.6	N/A	Pass
	Kitchen	1.5	N/A	Pass
	D Bedroom 1	0.8	3	Pass
	D Bedroom 2	1.0	56	Fail
Apartments	Block A			
GF 2Bedroom Flat	Living/Kitchen/Dining	1.9	N/A	Pass
	D Bedroom 1	0.9	65	Fail
	D Bedroom 2	1.2	62	Fail
Upper Floor 2B Flat	Living/Kitchen/Dining	2.6	N/A	Pass
	D Bedroom 1	1.3	106	Fail
	D Bedroom 2	1.6	101	Fail
GF 1Bedroom Flat	Living/Kitchen/Dining	2.2	N/A	Pass
	D Bedroom 1	1.0	72	Fail
Upper Floor 1B Flat	Living/Kitchen/Dining	2.7	N/A	Pass
	D Bedroom 1	1.6	108	Fail

- 6.5. The results show there is a significant risk of overheating within the Kitchen Living and bedrooms when compared with CIBSE TM59. The maximum hours of exceedance are not above the 3% threshold.
- 6.6. The results show that the predicted hours over and above 26°C in GF bedrooms and bedrooms affected by noise between 10pm and 7am are more than 33 hours and therefore the design criterion b is not met.

Results - DSY 1 2020s, high emissions, 50% scenario (Mitigation Measures)

6.7. The table below shows the detailed results against CIBSE TM59:2017 criteria when incorporating auxiliary ventilation of 5 l/s to 20l/s in bedrooms.

Table 8. Results - DSY1 2020s, high emissions, 50% percentile scenario (Mitigation Measures)

House types	Room Name	Criteria a	Criteria b	Pass / Fail
P33 Daresbury	Living	2.8	N/A	Pass
	Kitchen	1.1	N/A	Pass
	D Bedroom 1	1.1	2	Pass
	D Bedroom 2	0.5	3	Pass
P46 Madaley	Living	1.6	N/A	Pass
	Kitchen/Dining	1.3	N/A	Pass
	D Bedroom 1	1.5	2	Pass
	D Bedroom 2	0.9	2	Pass
	D Bedroom 3	0.8	3	Pass
	S Bedroom 4	0.8	3	Pass
P60 Kelmarch	Living	1.5	N/A	Pass
	Kitchen/Dining	2.0	N/A	Pass
	D Bedroom 1	0.7	6	Pass
	D Bedroom 2	0.6	3	Pass
	D Bedroom 3	1.2	2	Pass
P27 Maxstone	Living	1.7	N/A	Pass
	Kitchen/Dining	1.3	N/A	Pass
	D Bedroom 1	1.1	2	Pass
	D Bedroom 2	0.9	2	Pass
	D Bedroom 3	0.8	23	Pass
	S Bedroom 4	1.0	22	Pass
P78 Kelmarch	Living	1.7	N/A	Pass
	Kitchen/Dining	1.3	N/A	Pass
	D Bedroom 1	1.0	31	Pass

House types	Room Name	Criteria a	Criteria b	Pass / Fail
	D Bedroom 2	1.0	32	Pass
	D Bedroom 3	0.8	31	Pass
P79 Dropmore	Living	1.6	N/A	Pass
	Kitchen	1.5	N/A	Pass
	D Bedroom 1	0.8	3	Pass
	D Bedroom 2	1.0	31	Pass
Apartments		Block A		
GF 2Bedroom Flat	Living/Kitchen/Dining	1.9	N/A	Pass
	D Bedroom 1	0.9	28	Pass
	D Bedroom 2	1.2	26	Pass
Upper Floor 2B Flat	Living/Kitchen/Dining	2.6	N/A	Pass
	D Bedroom 1	1.3	31	Pass
	D Bedroom 2	1.6	31	Pass
GF 1Bedroom Flat	Living/Kitchen/Dining	2.2	N/A	Pass
	D Bedroom 1	1.0	31	Pass
Upper Floor 1B Flat	Living/Kitchen/Dining	2.7	N/A	Pass
	D Bedroom 1	1.6	31	Pass

- 6.8. The results show there is no significant risk of overheating within the living/kitchen and bedrooms when compared with CIBSE TM59. The maximum hours of exceedance are not above the 3% threshold.
- 6.9. The results show that the predicted hours over and above 26°C in bedrooms between 10pm and 7am are less than 32 hours in total and therefore the second design criterion is met.

7. Conclusion

- 7.1. AES Sustainability Consultants Ltd has conducted an overheating assessment in accordance with CIBSE TM59:2017 to determine if house types and apartments within Havant & South Downs College are at significant risk of overheating.
- 7.2. The samples have been selected as their orientation, potential acoustic issues and glazing areas represent a worst case for the proposed development.
- 7.3. Adjustments have been made to the requirements of CIBSE TM59:2017 to align with the provisions of the new Approved Document O (ADO), ensuring that the development of all apartments is future proofed in light of the ADO's implementation.
- 7.4. The modelling has been conducted using design weather data taken from the file CIBSE Southampton DSY 1 - 2020s, high emissions, 50% scenario.
- 7.5. The base case results (DSY1) indicate that some of Bedrooms fail due to security and noise issues. Therefore, additional ventilation is used to mitigate overheating and the additional ventilation rates provided to mitigate are outlined below.
 - GF 1 bedroom flats: D Bed1 – 10 l/s
 - SF 1 bedroom flats: D Bed1 – 20 l/s
 - GF 2 bedroom flats: D Bed1/ D Bed2 – 10 l/s
 - SF 2 bedroom flats: D Bed1/ D Bed2 – 15 l/s
 - Maxstone: D Bed3 – 10 l/s & S Bed4 – 5l/s
 - Kelmarch: D Bed2/ D Bed3 – 5 l/s
 - Dropmore: D Bed2 – 5l/s



Figure 6: Security issues for window above canopy and GF floor bedrooms in apartments

References

CIBSE Guide A: Environmental Design. Chartered Institute of Building Services Engineers, London, 2015.

CIBSE TM36: Climate change and the indoor environment: Impacts and adaptation. (Principal authors Hacker J N, Holmes M J, Belcher S B, Davies G D). Chartered Institute of Building Services Engineers, London, 2005

CIBSE TM37: Design for improved solar shading control. (Principal author Paul Littlefair, BRE). Chartered Institute of Building Services Engineers, London, 2005

CIBSE TM52: The limits of thermal comfort: Avoiding overheating in European buildings. (Principal author Fergus Nicol, Oxford Brookes University). Chartered Institute of Building Services Engineers, London, 2013. ISBN 978-1-906846-34-4.

CIBSE TM59: Design methodology for the assessment of overheating risk in homes. (Contributing authors: Bonfigli, Chorafa, et.al.). Chartered Institute of Building Services Engineers, London, 2017. ISBN 978-1-912034-17-8.

The Building Regulations 2010: Conservation of Fuel and Power Part L1A. Conservation of fuel and power, Volume 1: Dwellings (2021 edition).

The Building Regulations 2010: Ventilation. Requirement F1: Means of Ventilation, Volume 1: Dwellings (2021 edition).

NHBC Foundation: Understanding overheating – where to start: An introduction for house builders and designers. NHBC Foundation by Richards Partington Architects. (July 2012), Milton Keynes. ISBN 978-1-84806-279-5

Energy Saving Trust (EST): Energy Efficiency Best Practice in Housing: Reducing overheating – a designer's guide. (March 2005),

Thermal simulation software: IES Virtual Environment – Version 2024

Weather file: CIBSE, in collaboration with UK Climate Impacts Programme (UKCIP). - <http://www.cibse.org/index.cfm?go=page.view&item=1300>

The Building Regulations 2010: Overheating Approved Document Part O (2021 edition).

Appendix A – TM59 Risk factors

Risk Factors

A simple list of risk factors is provided below to assist in determining developments that have low risk of overheating and therefore do not require dynamic thermal modelling.

It is recommended that the risk factors are used for the assessment of all units and properties are identified as being at risk when they have answered 'yes' against any one of the risk factors below.

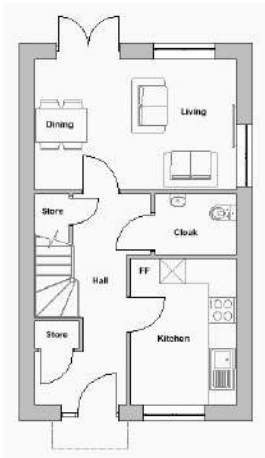
- ☒ Site location – South East England, Urban e.g. central London or in a high-density urban area (UHI effect)
- ☐ Occupancy – Vulnerable people (elderly, disabled, young children), occupants likely to be at home during the day (e.g. students)
- ☒ Dwelling type – top floor, single aspect
- ☒ Fabric type – lightweight, dark color facades, air tight constructions
- ☒ Orientation – South, south east/west
- ☒ Glazing – glazing ratio greater than 25%, roof lights
- ☒ Environmental factors that restrict the opening of windows – noise and air quality (e.g. near busy roads, railways, airports and flight paths, industrial activities, security (e.g. ground floor flats)

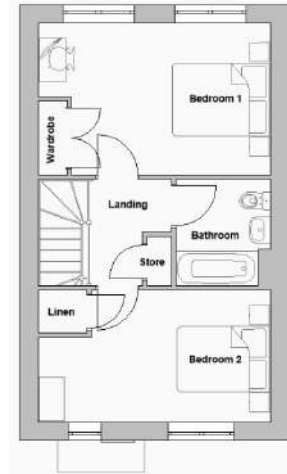
Appendix B – Dwelling designs

Development Design

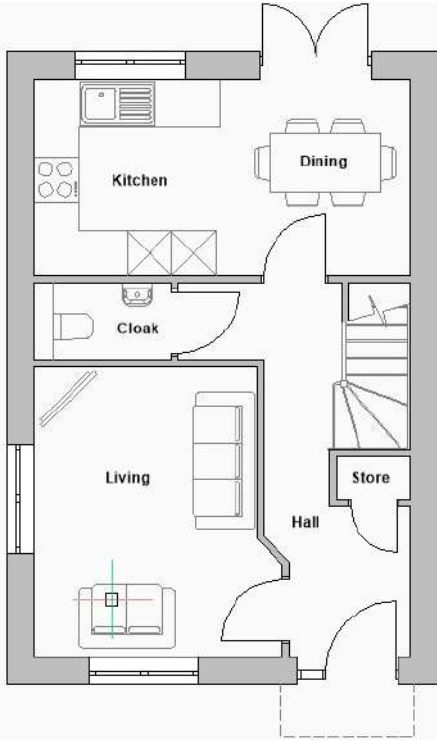
The modelling has been based upon the architectural plans: issue dated March 2024, revisions P5 (for all blocks) provided by HGP Architects. provided in May 2025 to AES.

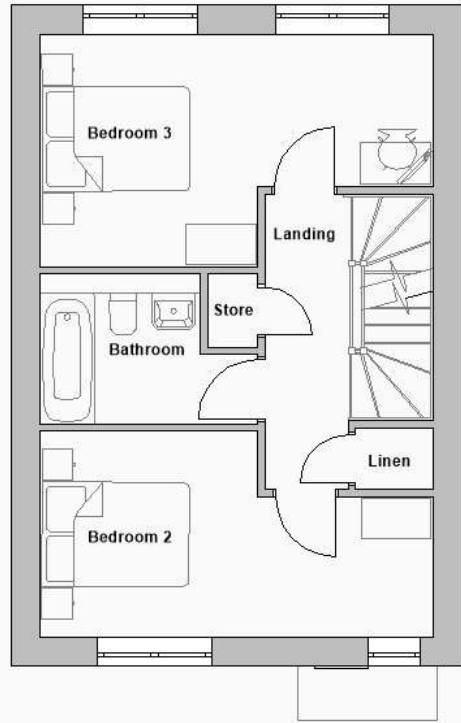
Housetype 23 2B4P – Dropmore/Daresbury

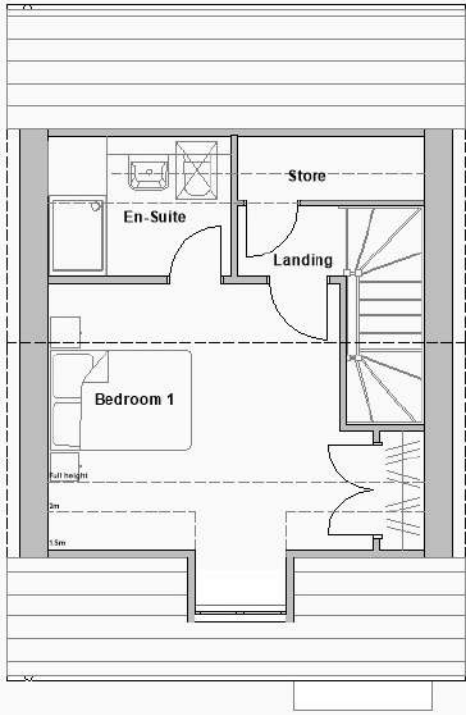
Floor Name:	Ground Floor
Plot Number:	13, 14, 21, 22, 23, 28, 29, 30, 31, 32, 33, 34, 79, 80, 84, 85
	

Floor Name:	First Floor
Plot Number:	13, 14, 21, 22, 23, 28, 29, 30, 31, 32, 33, 34, 79, 80, 84, 85
	

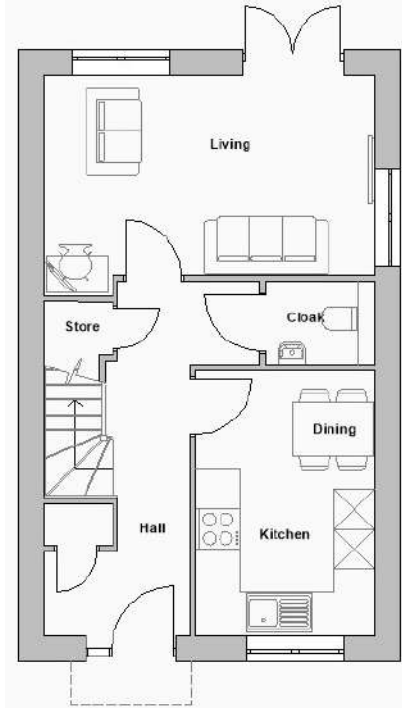
Housetype 37 3B6P – Kelmarch

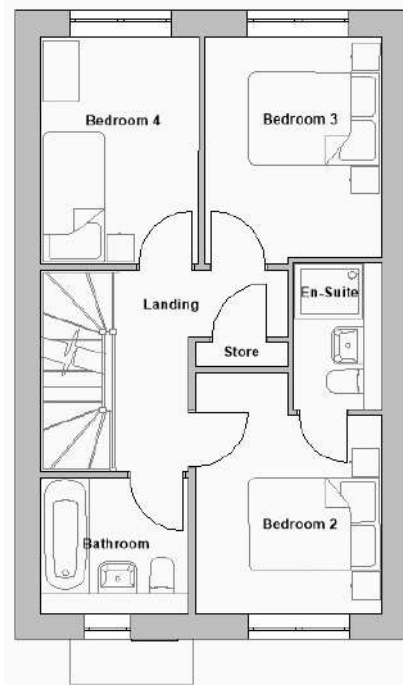
Floor Name:	Ground Floor
Plot Number:	16, 17, 18, 19, 57, 58, 59, 60, 76, 77, 78, 81, 82, 83
 The ground floor plan shows a rectangular layout. At the top is the Kitchen, which includes a sink, stove, and refrigerator. To its right is the Dining area with a table and chairs. Below the Kitchen is a Cloak. The Living area is at the bottom left, featuring a sofa and a coffee table. A central Hall provides access to the Living area, a Store, and a staircase. The right side of the plan is partially obscured by a grey wall.	

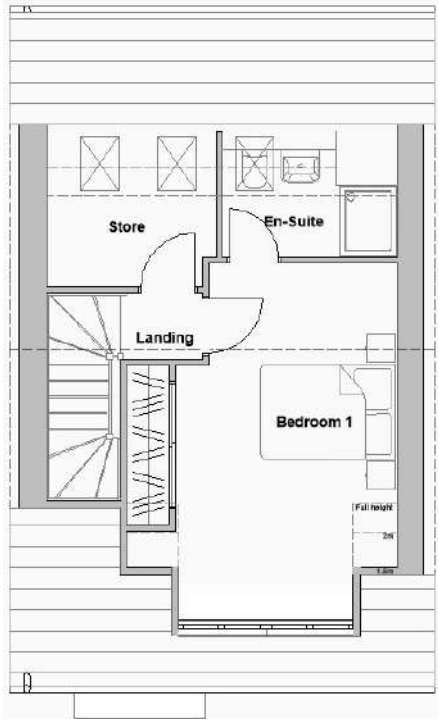
Floor Name:	First Floor
Plot Number:	16, 17, 18, 19, 57, 58, 59, 60, 76, 77, 78, 81, 82, 83
 The first floor plan shows a rectangular layout. At the top is Bedroom 3. Below it is the Bathroom, which includes a bathtub, toilet, and sink. To the right of the Bathroom is a Landing with a staircase. Below the Bathroom is Bedroom 2. A central Store and Linen closet are located between the bedrooms and the landing. The right side of the plan is partially obscured by a grey wall.	

Floor Name:	Second Floor
Plot Number:	16, 17, 18, 19, 57, 58, 59, 60, 76, 77, 78, 81, 82, 83
 The floor plan shows a rectangular room layout. On the left side, there is a large room labeled 'Bedroom 1' with a window. To its right is a smaller room labeled 'En-Suite' containing a toilet and a sink. Further right is a 'Landing' area with a staircase. At the top of the plan is a small room labeled 'Store'. The plan also shows various doors, windows, and built-in furniture like a bed and a desk.	

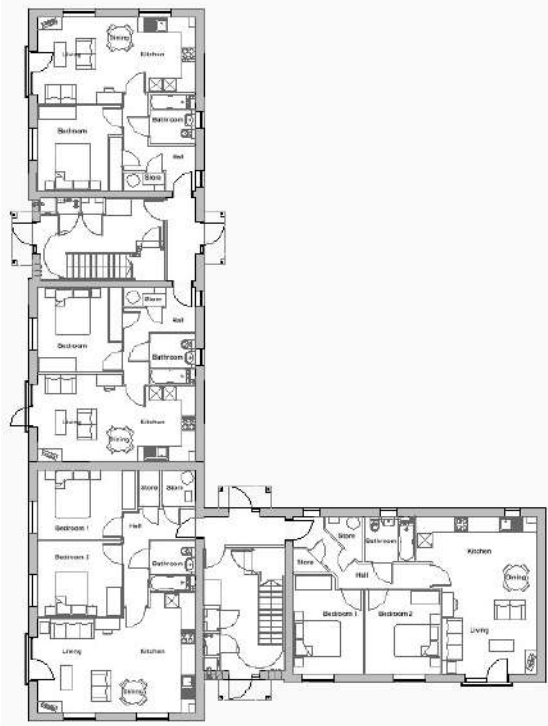
Housetype 42 4B7P - Maxstone/ Madaley

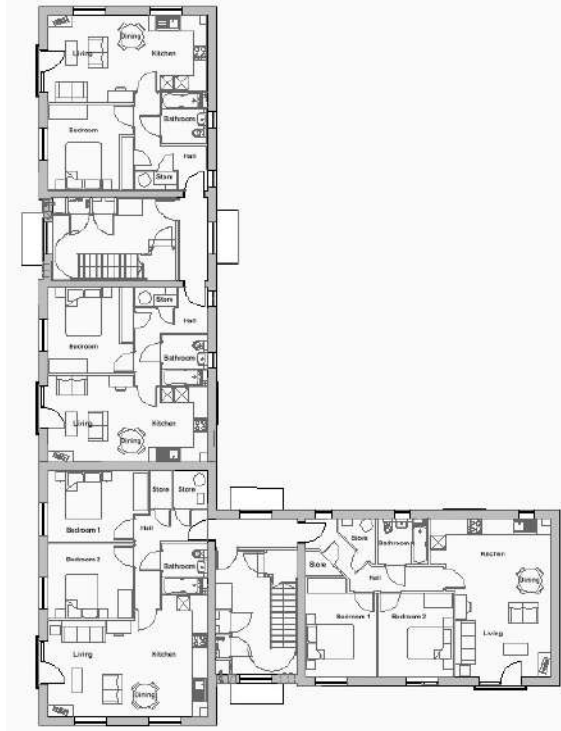
Floor Name:	Ground Floor
Plot Number:	24, 25, 26, 27, 45, 46
 The ground floor plan shows a rectangular layout. At the top is a large 'Living' room with a fireplace and a sofa. To the left of the living room is a 'Store' room. Below the living room is a 'Dining' area with a table and chairs. To the right of the dining area is a 'Kitchen' with a stove and sink. A 'Hall' is located at the bottom left, containing a staircase and a 'Cloak' room. A 'Store' room is also located between the living room and the hall.	

Floor Name:	First Floor
Plot Number:	24, 25, 26, 27, 45, 46
 The first floor plan shows a rectangular layout. At the top are 'Bedroom 4' and 'Bedroom 3'. Below them is a 'Landing' area with a staircase. To the right of the landing is an 'En-Suite' bathroom. Below the landing is a 'Store' room. At the bottom are 'Bedroom 2' and a 'Bathroom'.	

Floor Name:	Second Floor
Plot Number:	24, 25, 26, 27, 45, 46
 The floor plan shows a central landing area with a staircase. To the left of the landing is a 'Store' room. To the right is an 'En-Suite' bathroom. Below the landing is 'Bedroom 1'. A 'Full height' window is indicated on the right wall of Bedroom 1. The plan also shows various doors, windows, and built-in furniture like wardrobes and a desk.	

Block A - 2Bedroom Flat/ 1Bedroom Flat

Floor Name:	Ground Floor
Plot Number:	1, 2, 3, 4
	

Floor Name:	Second/Third Floor
Plot Number:	5, 6, 7, 8, 9, 10, 11, 12
	

Appendix C – Modelling schedules

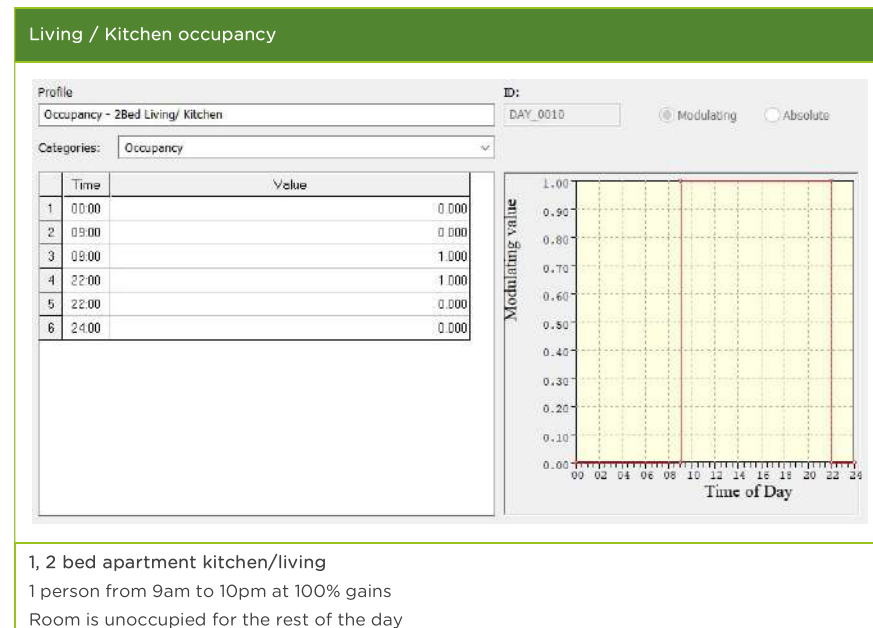
It is noted that the CIBSE TM59 method only assesses the overheating risk during occupied hours. The occupancy assumed is based on a typical lifestyle pattern for the occupants of each storey. The graphs illustrate the hours during which occupancy gains have been assumed.

The apartments have been modelled as occupied for 24 hours a day.

Kitchen / Living Rooms

Kitchen/Living rooms will be unoccupied during the sleeping hours and occupied during the rest of the day. This is the worst-case scenario since the room will be modelled as occupied during the hottest hours of the day.

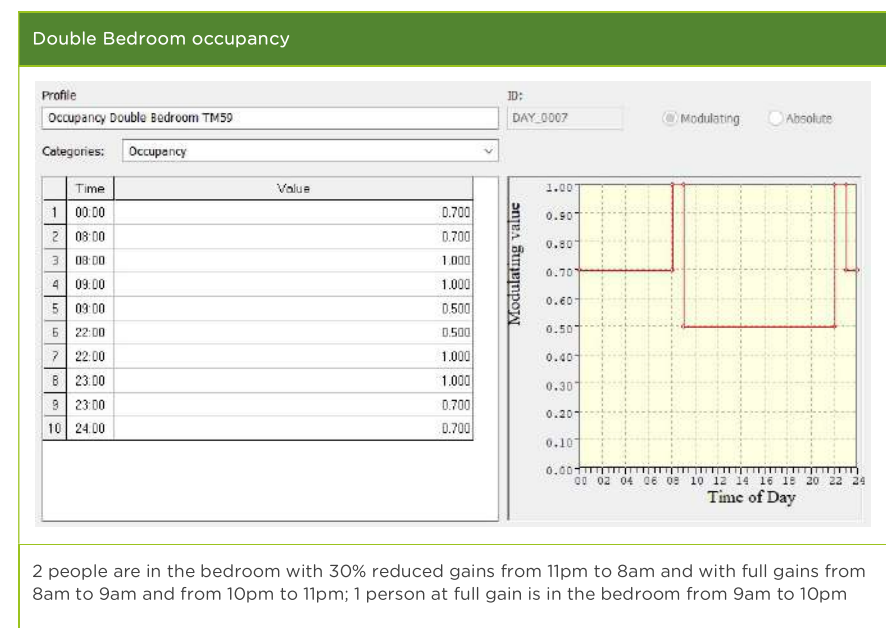
No differences between weekdays and weekend are considered.



Double bedrooms

Bedrooms will be set with a 24h occupancy profile which means that 1 person is always considered inside the room during the daytime, and two people in each double bedroom at night.

For apartments with more than 1 bedroom, 1 person will be considered during the daytime in both the bedrooms in order to assess the worst case scenario. This means that one excess person to the real number of occupants will be considered in the dwelling during the day (a visitor).

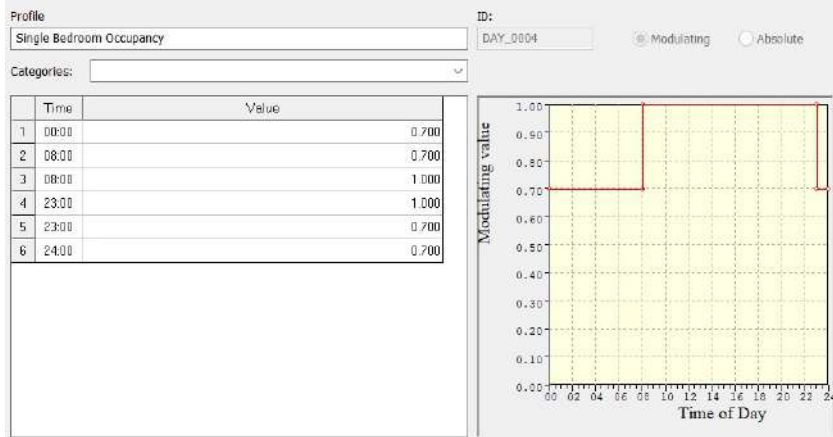


Single bedrooms

Bedrooms will be set with a 24h occupancy profile which means that 1 person is always considered inside the room during the daytime, and two people in each double bedroom at night.

For apartments with more than 1 bedroom, 1 person will be considered during the daytime in both the bedrooms in order to assess the worst case scenario. This means that one excess person to the real number of occupants will be considered in the dwelling during the day (a visitor).

Single Bedroom occupancy

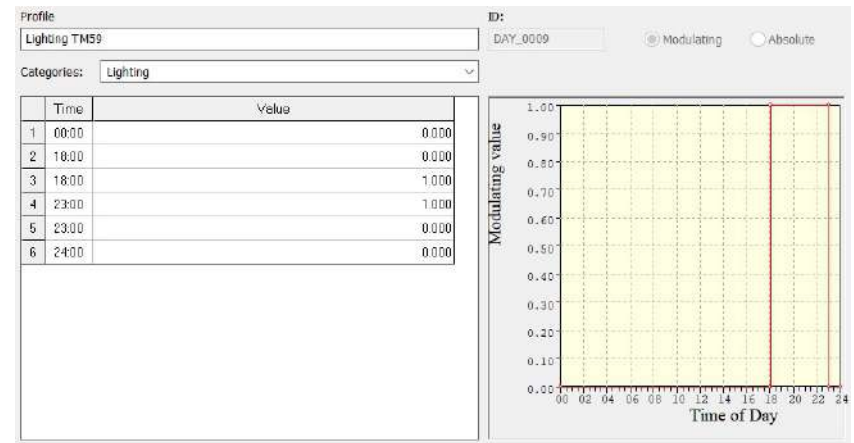


1 person is in the bedroom with 30% reduced gains from 11pm to 8am and with full gains from 8am to 11pm

Lighting

Light energy is assumed to be proportional to floor area, so W/m^2 is used for lighting load. 2 W/m^2 from 6pm to 11pm is used as default to reflect an efficient new build.

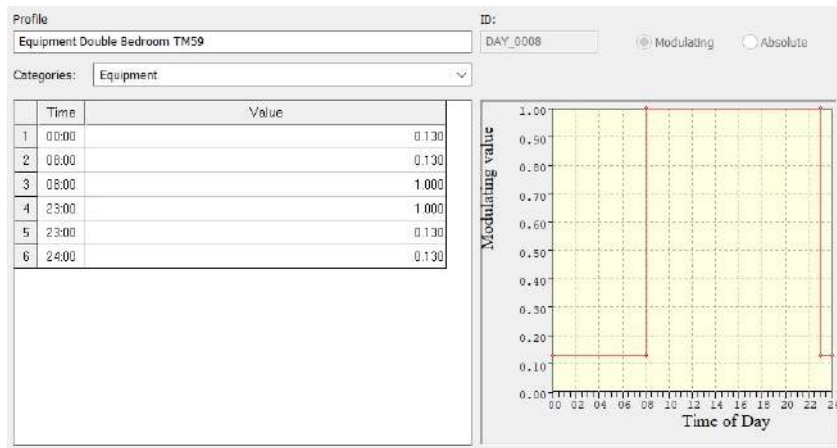
Lighting



Equipment loads and profiles

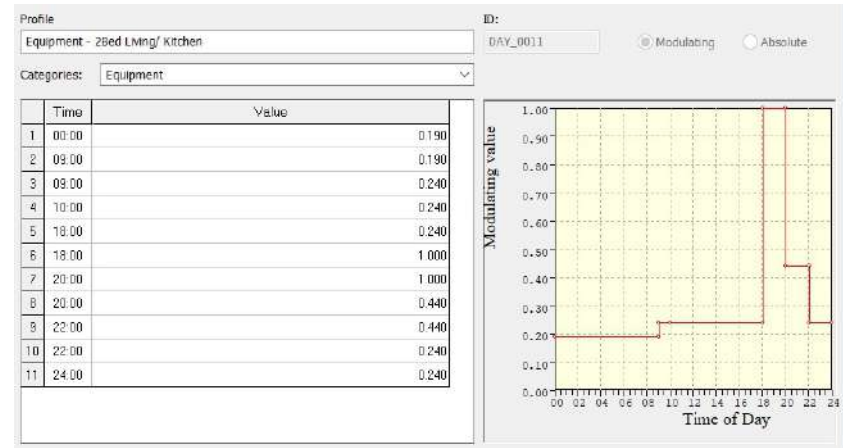
It is assumed that apartments with the same number of occupants and bedrooms are usually provided with the same appliances, therefore the heat load from appliances is assumed to be independent of floor area for the purpose of overheating risk assessment. Heat loads from appliances are defined in Watts.

Single/ Double Bedrooms



Assumed equipment in the bedroom (e.g. laptop or TV) with a peak load of 80 W from 8am to 11pm and a base load of 10 W during the sleeping hours.

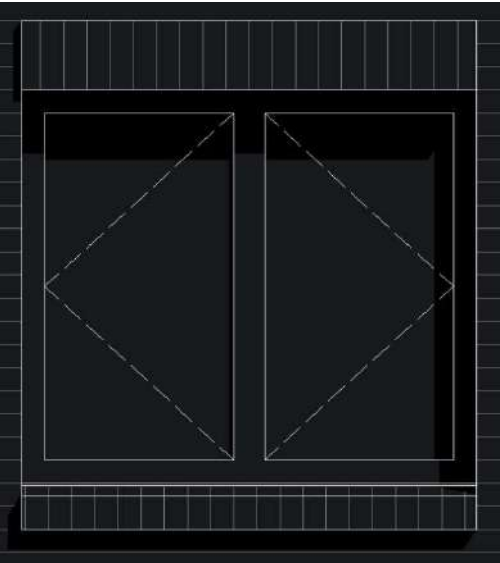
Living/Kitchen room - 1 Bedroom, 2 Bedroom Apartments

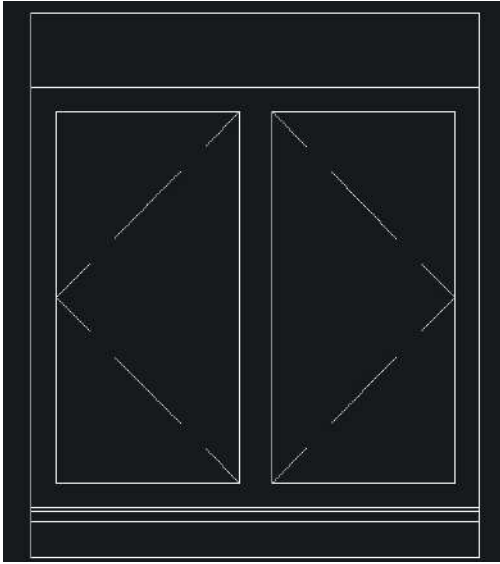


Peak load of 450 W from 6pm to 10pm. 200 W is assumed from 8pm to 10pm. 110 W is assumed from 9am to 6pm and from 10pm to 12pm. For the rest of the day a base load of 85 W is assumed.

Appendix D - Assumptions for Natural Ventilation

Windows in occupied spaces of all blocks on all four sides have been modelled as closed during the night due to noise concerns outlined in the Environmental Noise Survey report provided by Noise.co.uk noise and vibration consultancy.

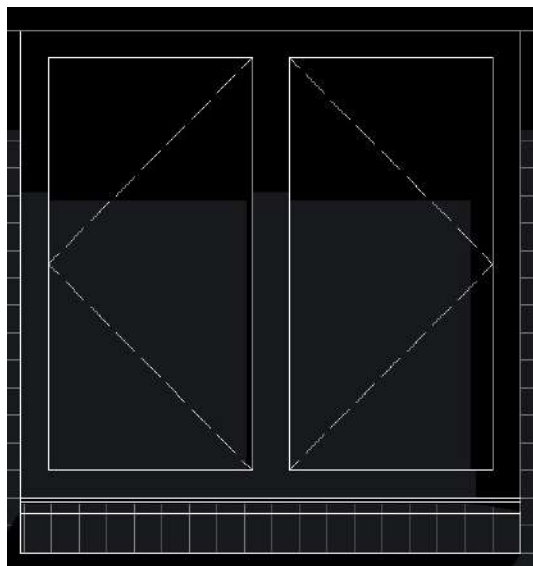
House type 23 2B4P – Dropmore/Daresbury GF House type 37 3B6P – Kelmarch GF Housetype 42 4B7P – Maxstone/ Madaley GF	
	<u>Exposure Type:</u> Semi Exposed wall <u>Category:</u> Window – Side hung <u>Openable Area:</u> 80% (frame factor 70%) <u>Max Angle Open:</u> 49° <u>Proportions:</u> 0.5 =< Length/Height < 1 <u>Equivalent area:</u> 71.742% <u>Assumed openable::</u> 08:00-23:00 Opening threshold 22°C, and internal temperature higher than ambient temperature
	Notes: Living and Kitchen room openings

Block A - All floors	
	<u>Exposure Type:</u> Semi Exposed wall <u>Category:</u> Window – side hung <u>Openable Area:</u> 80% (frame factor 70%) <u>Max Angle Open:</u> 56° <u>Proportions:</u> Length/Height < 0.5 <u>Equivalent area:</u> 72.086% <u>Assumed openable::</u> 08:00-23:00 Opening threshold 22°C, and internal temperature higher than ambient temperature
	Notes: Living/Kitchen room openings

House type 23 2B4P – Dropmore/Daresbury FF

House type 37 3B6P – Kelmarch FF

House type 42 4B7P – Maxstone/ Madaley FF



Exposure Type:

Semi Exposed wall

Category:

Windows – Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

49°

Proportions:

0.5 ≤ Length/Height < 1

Equivalent area:

71.742%

Assumed openable::

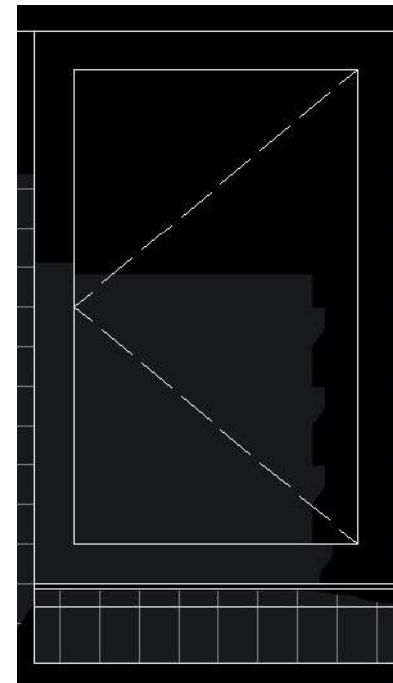
24 hours

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes: Bedroom Openings

House type 23 2B4P – Dropmore/Daresbury FF

House type 37 3B6P – Kelmarch FF



Exposure Type:

Semi Exposed wall

Category:

Window – Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

59°

Proportions:

0.5 ≤ Length/Height < 1

Equivalent area:

76.903%

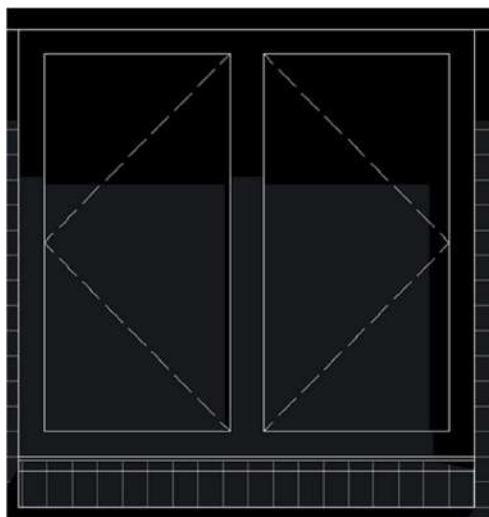
Assumed openable::

08:00-23:00

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes: Bedroom Openings – Security Issues

House type 23 2B4P – Dropmore/Daresbury FF



Exposure Type:

Semi Exposed wall

Category:

Window – Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

56°

Proportions:

Length/Height < 0.5

Equivalent area:

72.086%

Assumed openable::

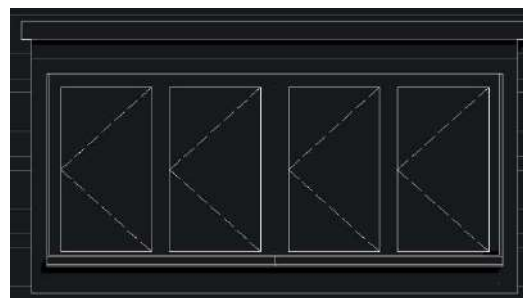
24:hours

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes: Bedroom Openings

House type 37 3B6P – Kelmarch SF

House type 42 4B7P – Maxstone/ Madaley SF



Exposure Type:

Semi Exposed wall

Category:

Window – Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

68°

Proportions:

0.5 =< Length/Height < 1

Equivalent area:

79.140%

Assumed openable::

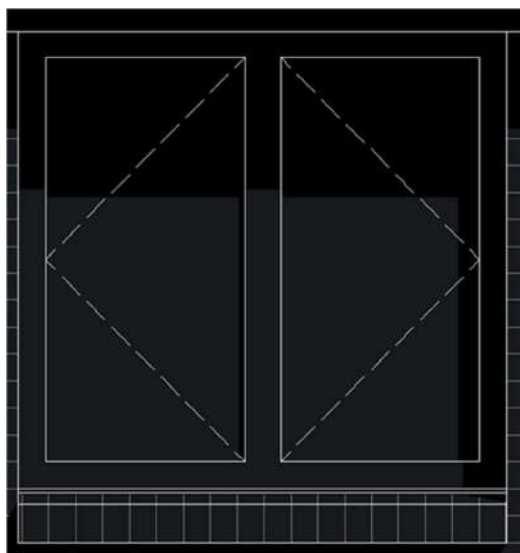
24 hours

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes: Bedroom Openings

House type 37 3B6P – Kelmarch FF

House type 42 4B7P – Maxstone/ Madaley FF



Exposure Type:

Semi Exposed wall

Category:

Window – Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

49°

Proportions:

0.5 ≤ Length/Height < 1

Equivalent area:

71.742%

Assumed openable::

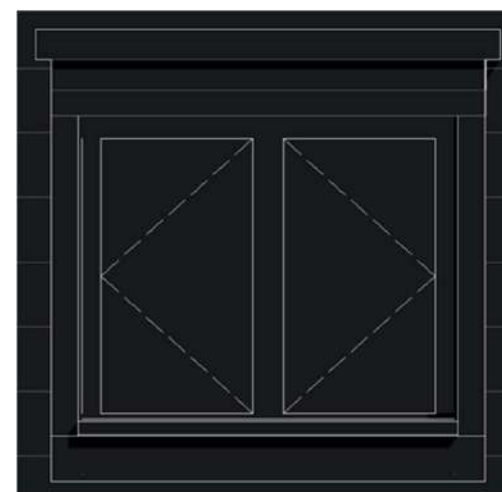
08:00-23:00

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes:

Bedroom Openings – Noise restrictions

House type 37 3B6P – Kelmarch SF



Exposure Type:

Semi Exposed wall

Category:

Doors – Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

68°

Proportions:

0.5 ≤ Length/Height < 1

Equivalent area:

79.140%

Assumed openable::

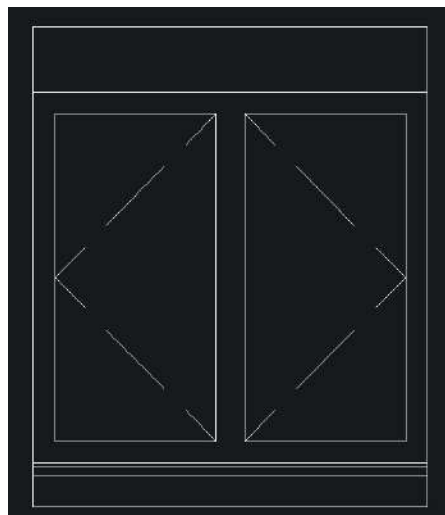
08:00-23:00

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes:

Bedroom Openings – Noise restrictions

Block A - All floors



Exposure Type:

Semi Exposed wall

Category:

Window - Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

56°

Proportions:

Length/Height < 0.5

Equivalent area:

72.086%

Assumed openable::

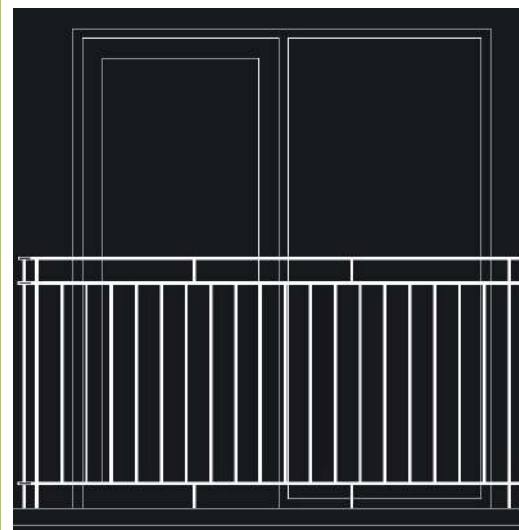
08:00-23:00

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes:

Bedroom Openings - GF Bedrooms/Noise restrictions

Block A - All floors



Exposure Type:

Semi Exposed wall

Category:

Doors - Side hung

Openable Area:

80% (frame factor 70%)

Max Angle Open:

90°

Proportions:

Length/Height < 0.5

Equivalent area:

82.581%

Assumed openable::

08:00-23:00

Opening threshold 22°C, and internal temperature higher than ambient temperature

Notes:

Living room Openings

