
Great Places

AD Part O (Overheating) Compliancy Report

63-65 Upper Chorlton Road

22 February 2024

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Appendix A – Macroflo Opening IESVE

Appendix B - Part O Compliance Document (Nighttime opening windows)

Appendix C – Part O Compliance Document (Daytime fixed windows Kitchen/Living)



1 Executive Summary

Watt Energy & Consulting Engineers have been appointed to carry out the Approved Document Part O (Overheating) Dynamic Simulation Method assessment for the 63-65 Upper Chorlton Road site. The project was fully modelled using IES software following the Part O guidelines, sample flat 5 was selected for testing due to their orientation and position in the building. The IES thermal model includes all the habitable occupied spaces i.e. - the kitchen-living rooms and bedrooms. All associated heat gains to non- habitable spaces, including communal risers, bathrooms, (HIU) Heat Interface Units' cupboards and communal corridors have been accounted for in the IES model as outlined in Part O.

The intention of this report is to assess the building against the overheating criteria set out in the Building Regulations Approved Document Part O (referred to as Part O). Part O is intended to limit excessive solar gains and if necessary, ensure means are provided to remove excess heat.

This report details the Dynamic Thermal Modelling approach used to assess the building for Part O compliance. The CIBSE TM59 modelling procedure is used, which models the indoor temperature of each room included in the analysis against set temperature limits, using CIBSE Design Summer Year (DSY) weather data. The results will determine at design stage if a passive cooling strategy will be successful or if mechanical cooling will be required.

The development has been modelled using the Dynamic Simulation Modelling (DSM) Software Integrated Environmental Solutions Limited, "Virtual Environment" (VE) version 2022.3.0.0. The software is fully compliant with the requirements of CIBSE guide AM11: *Building Performance modelling (2015b.)*

Following the DSM modelling, the dwelling was found to **comply with the overheating requirement of Part O** on the basis that all assumptions outlined in the methodology section (regarding building fabric performance, G-values of glazing, and ventilation rates) are incorporated into the design.

A compliant strategy has been provided for all apartments, and as such, Crookes Walker Consulting are confident that thermal comfort is likely to be achieved for all bedrooms, living rooms and kitchens when employing the design variables contained within this report. The parameters required for Part O compliance are:

- Building fabric as outlined in section 3
- Openable top hung windows on the rear elevation when temperatures exceed 22°C and close when external temperatures exceed 26°C

- Openable top windows on the front elevation during **nighttime hours only** when temperatures exceed 22°C and close when external temperatures exceed 26°C.

A Noise Impact Assessment has been completed for the development, confirming the Upper Chorlton Road facing elevation includes noise constraints during daytime hours, due to traffic on the main road. This has been taken into consideration for the Part O assessment.

Part F minimum ventilation flow rates were included in the Part O calculations for the proposed Gateway development, and ventilation rates were increased for apartments that were failing the Part O criteria. Table 1.2 from 'Building Regulations ADF' below includes the minimum ventilation rates from Part F.

Table 1.2 Minimum extract ventilation rates for continuous extract systems ⁽¹⁾		
Room	High rate (l/s)	Continuous rate
Kitchen	13	The sum of all extract ventilation in the dwelling on its continuous rate should be at least the whole dwelling ventilation rate given in Table 1.3
Utility room	8	
Bathroom	8	
Sanitary accommodation	6	
NOTE:		
1. If the continuous rate of ventilation provided in a room is equal to or higher than the minimum high rate specified in the table, no extra ventilation is needed.		

The Kitchen/ Living rooms require increased mechanical ventilation above the minimum Part F ventilation requirements, to achieve compliance with Part O. Table 2 below includes the increased ventilation flow rates required.

Room Name	Increased Ventilation Flow Rate required for Part O compliance (l/s)	Total Apartment Ventilation Flow Rate (l/s)
Kitchen/Living	25	33

Table 2. Increased Ventilation Strategy

This report serves to predict the internal temperature within the occupied areas based on the parameters set from the IES thermal modelling.



The report should not be used as an actual measurement of internal temperature but as a report that uses the appropriate modelling software to demonstrate the potential internal air temperatures of the assessed areas.

Two separate simulations found in Appendix B and C were run to determine compliance with part O due to acoustic restrictions. Appendix B details the nighttime simulation where windows can be opened for overheating and Appendix C details the daytime simulation where windows cannot be opened for overheating in Kitchen/Living.

2 Methodology

For this overheating analysis a DSY1 weather file was used for the year 2020 high emission scenario. Summers will have a 1 in 7 chance of being equal or hotter than this scenario.

The weather file used within the model was the CIBSE Design Summer Year (DSY1) for Manchester, for the 2020s, high emissions, 50% percentile scenario as the most appropriate data set for the location of the development and makes allowance for future elevated temperatures due to climate change.

2.1 CIBSE TM59

Following the final simulation results, the overheating is compared to CIBSE TM59 guidelines for the entire year (1st of January 31st of December).

TM59 provides a method of assessment for the risk of residential overheating, with separate methodologies for homes that are naturally ventilated, mechanically ventilated and extra criterion for communal corridors if applicable. The correct methodology is selected automatically within IESVE 2022 software to undertake the necessary calculations, which in this case is **naturally ventilated**.

Criterion A is based on the principals of TM52, which quantifies the percentage of hours that cannot exceed the target temperature, based on the running mean average.

Criterion B is based on CIBSE Guide A's number of hours exceeding 26 degrees Celsius in bedrooms at night (the temperature above which sleep patterns are likely to be CIBSE TM59 overheating methodology for predominately mech vent rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours).

The TM59 Criterion definitions are as follows:

- **Criterion A** - For living rooms, kitchens and bedrooms: the number of hours during which DT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours.
- **Criterion B** - For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 C for more than 1% of annual hours.

Requirements for residential areas with communal corridors calculates the number of annual hours for which an operative temperature of 28 C is exceeded. There is no criterion or requirement to comply with this information, however if an operative temperature of 28 C is exceeded for more than 3% of total annual hours, the calculated corridor could be identified as being at high risk of overheating.

3 Specification

3.1 Fabric

As the results table demonstrates, all rooms have achieved compliance under Criterion A & B of the CIBSE TM59 guidelines. The following specification has been used within calculations:

- Windows –0.8 W/m²K (Double-glazed), **≤0.7 g-value**.
- External Wall – 0.18 W/m²k
- Ground Floor –0.15 W/m²K
- Flat Ceilings New – 0.12 W/m²K
- Flat Ceilings Existing – 0.15 W/m²K
- Air test – 6.00 m³.ph.m² @ 50Pa

3.2 Infiltration and Ventilation

An infiltration rate of 0.30 air changes per hour (ACH) has been used in the model. This infiltration rate has been derived from CIBSE Guide A 2015 for a building with an air permeability of 6 m³/hm² at 50Pa.

Purge ventilation through openable windows is shown to have significant effect in reducing internal temperatures as well as removing high concentrations of pollutants and water vapour. However this cannot be accounted for in the overheating model due to the acoustic constraints on the site.

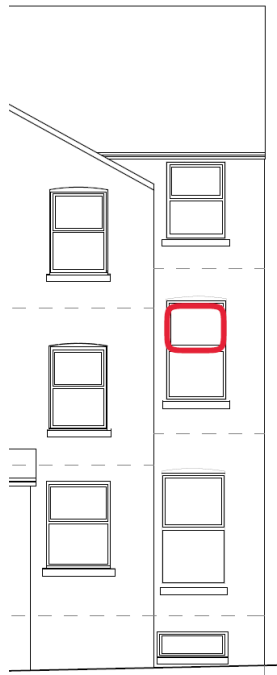
To maintain thermal comfort conditions, natural ventilation from windows opening is recommended when:

- External Wall – 0.18 W/m²k
- External temperature is lower than the internal temperature: $T_{\text{outdoor}} < T_{\text{indoor}} > 22^{\circ}\text{C}$;
- During nighttime for periods with extremely hot weather, expected for a few days a year.

3.3 Window Openings

The following window opening types have been modelled:

1. Top Hung Windows



Openable Area	100%
Angle of Opening	10

3.4 Acoustic Restrictions

RS Acoustic Engineering Ltd have commissioned an assessment of noise ingress via opening windows to bedrooms to control overheating. The results of the acoustic study show that the Kitchen/Living windows during daytime time hours could not be used to mitigate the impact of overheating:

“Front elevation (open-plan living rooms)

4.24 Daytime façade sound pressure levels are approximately 65 to 66 dB LAeq,16hour.

4.25 When assessing noise ingress through an open window, it is appropriate to correct the measured sound levels at the façade by approximately -3 dB to give an equivalent free-field sound level.

4.26 The corresponding ‘free-field’ sound pressure levels are therefore 62 to 63 dB LAeq,16hour during the daytime.

4.27 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 47 to 48 dB LAeq,16hour during the daytime.

63 dB LAeq,16hour – 15 dB = 48 dB LAeq,16hour

4.28 The daytime sound level target will therefore be exceeded with windows open.”

This acoustic requirement specifically addresses criteria a: For living rooms, kitchens and bedrooms: the number of hours during which DT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours.

Simulation one assumes openable windows during night (Appendix B) achieving a pass on both criteria a and b of part O. To consider the acoustic restrictions at nighttime, a second simulation was run with Kitchen/Living windows modelled as fixed. As Appendix C illustrates it complies with daytime overheating.

3.5 Mechanical Ventilation

Part O is intended to limit excessive solar gains and if necessary, ensure means are provided to remove excess heat. Where passive measures are unsuccessful, mechanical cooling is required.

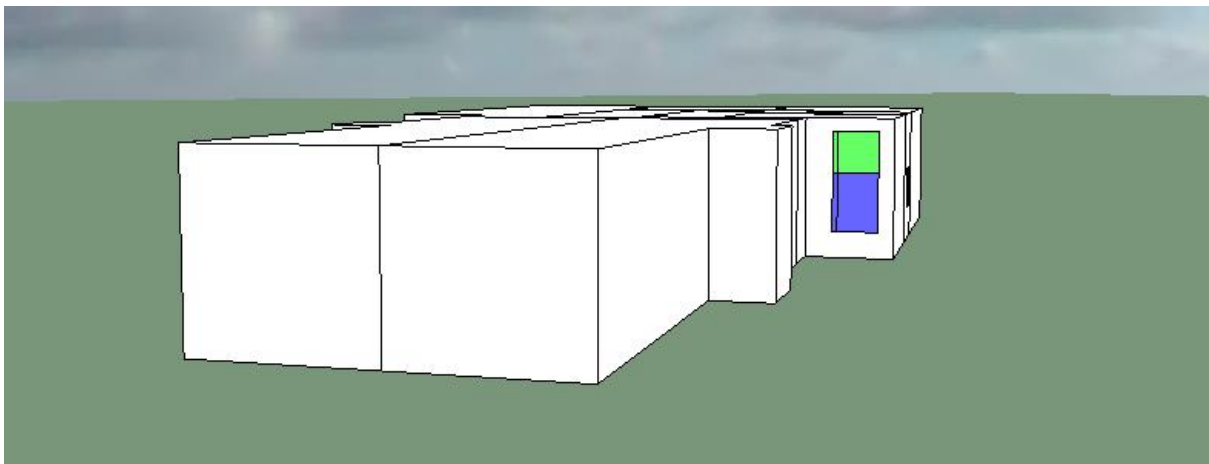
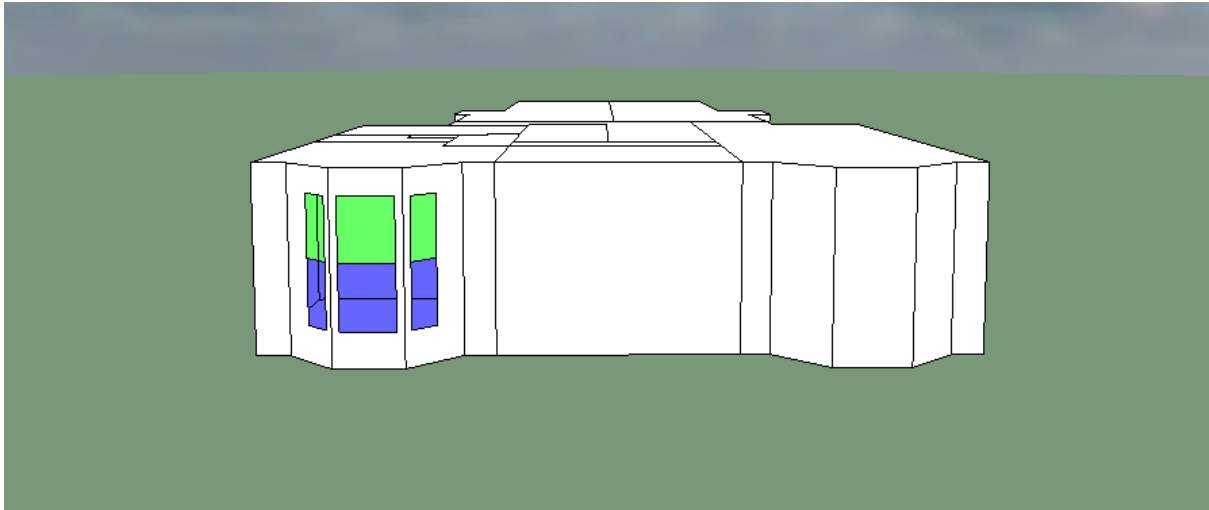
The dwellings will utilise the highly efficient wall mounted heat recovery units with boosted mechanical flow rates to mitigate overheating. See below for requirements:

Kitchen/ Living: 25 l/s

The MVHR creates a simple solution to overheating in summer months, by using the cooler indoor air to cool the incoming air whilst providing a high standard of indoor air quality.

Appendix A – Macroflo Opening Types (IESVE)







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Overheating risk in residential buildings
for
Nighttime Simulation

Nighttime Simualtion

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Building details

Project name: Nighttime Simualtion	Date: 22-02-2024 16:09:03
Location: Manchester , United Kingdom	
Address: 63-65 Upper Chorlton Road	
Building use: Residential	
Are there any security, noise, or pollution issues: Traffic on Upper Chorlton Road	

Designer's details

Designer's name: Jude Darnborough
Designer's organisation: Watt Energy
Designer's address: 40 King Street M2 6BA

Dynamic thermal model

Software: IESVE version 2023.3.1.0	
Weather file: Manchester_DSY1_2020High50_.epw	
Results file: 10 Degrees.aps	
Number of rooms analysed: 2	
TM59: summer elevated air speed: 0.1	
TM59: occupant category: Category II (normal)	
Overheating mitigation strategy:	
Has the building construction proposal been modelled accurately?	YES
Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)?	YES
Designer's signature:	

Nighttime Simulation

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Summary

CIBSE TM59 overheating methodology for predominantly naturally ventilated rooms assesses against two criteria, (a) and (b) (for Category I occupancy, T_{max} is reduced by 1K):

- Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours
- Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Approved document O applies limits to CIBSE TM59 section 3.3 (openings); these requirements are applied by appropriate assignment of MacroFlo types / scripted profiles in the model (see Modelled Openings Section).

CIBSE TM59 overheating methodology for predominantly mechanically ventilated rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

CIBSE TM59 also states that the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. While there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of the total annual hours this should be identified as a significant risk.

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
Living/kitchen	Pass	N/A	-	-
Bedroom	Pass	Pass	-	-

Naturally ventilated rooms – criterion (a)

Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours.

Room name	Occupied hours	No. hours $\Delta T \geq 1^\circ\text{K}$	% Occupied hours $\Delta T \geq 1^\circ\text{K}$	Criterion a check
Living/kitchen	1989	12	0.6	Pass
Bedroom	3672	0	0.0	Pass

Naturally ventilated rooms – criterion (b)

Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Any rooms that are not bedrooms are therefore not assessed, hence the corresponding N/A values.

Room name	No. hours > 26°C 22:00-24:00	No. hours > 26°C 00:00-07:00	Total hours > 26°C	Criterion b check
Living/kitchen	N/A	N/A	N/A	N/A
Bedroom	0	0	0	Pass

Mechanically ventilated rooms

CIBSE TM59 overheating methodology for predominantly mech. vent. rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
No mech vent rooms	N/A	N/A	N/A

Nighttime Simulation

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Communal corridors

CIBSE TM59 states that whilst there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of annual hours, then this should be identified as a significant risk within the TM59 overheating report.

Room name	No. hours > 28°C	% Annual hours > 28°C	Corridor overheating risk check
No corridors	N/A	N/A	N/A

Modelled details & overheating mitigation strategy

Approved document O: Providing Information & Appendix B requires information about the model and the overheating mitigation strategy. The following tables detail the modelling method and mitigation strategies applied to each analysed room. Where multiple active openings per space (windows & louvres) exist they are all listed. Occupancy, equipment and lighting profiles for occupied rooms comply with TM59 section 5.

Modelled occupancy

Room name	Floor area m ²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
Living/kitchen	18.65	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
Bedroom	13.01	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h

Modelled openings

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
Living/kitchen	13.97	0.7075, 0.7075, 0.7075	0.54, 0.56, 0.96, 1.0, 0.54, 0.56	0.0, 0.0, 0.0, 0.0, 0.0, 0.0	0.0	ADO.Section_26ab
Bedroom	14.06	0.7075	0.99, 1.4	100.0, 0.0	7.61	ADO.Section_26ab

Modelled ventilation

Room name	Infiltration rate ACH	Mech vent flow rate ACH
Living/kitchen	0.3	1.51
Bedroom	0.3	0



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Overheating risk in residential buildings
for
Daytime Simulation

Daytime Simulation

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Building details

Project name: Daytime Simulation	Date: 22-02-2024 16:07:09
Location: Manchester , United Kingdom	
Address: 63-65 Upper Chorlton Road	
Building use: Residential	
Are there any security, noise, or pollution issues: Traffic on Upper Chorlton Road	

Designer's details

Designer's name: Jude Darnborough
Designer's organisation: Watt Energy
Designer's address: 40 King Street M2 6BA

Dynamic thermal model

Software: IESVE version 2023.3.1.0	
Weather file: Manchester_DSY1_2020High50_.epw	
Results file: 10 Degrees - Fixed.aps	
Number of rooms analysed: 2	
TM59: summer elevated air speed: 0.1	
TM59: occupant category: Category II (normal)	
Overheating mitigation strategy:	
Has the building construction proposal been modelled accurately?	YES
Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)?	YES
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Daytime Simulation

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Living/kitchen	Pass	N/A	-	-
Bedroom	Pass	Pass	-	-

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Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours.

Room name	Occupied hours	No. hours $\Delta T \geq 1^\circ\text{K}$	% Occupied hours $\Delta T \geq 1^\circ\text{K}$	Criterion a check
Living/kitchen	1989	58	2.9	Pass
Bedroom	3672	0	0.0	Pass

Naturally ventilated rooms – criterion (b)

Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Any rooms that are not bedrooms are therefore not assessed, hence the corresponding N/A values.

Room name	No. hours > 26°C 22:00-24:00	No. hours > 26°C 00:00-07:00	Total hours > 26°C	Criterion b check
Living/kitchen	N/A	N/A	N/A	N/A
Bedroom	0	0	0	Pass

Mechanically ventilated rooms

CIBSE TM59 overheating methodology for predominantly mech. vent. rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
No mech vent rooms	N/A	N/A	N/A

Daytime Simulation

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Communal corridors

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Modelled openings

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
Living/kitchen	13.97	0.7075, 0.7075, 0.7075	0.54, 0.56, 0.96, 1.0, 0.54, 0.56	0.0, 0.0, 0.0, 0.0, 0.0, 0.0	0.0	ADO.Section_26ab
Bedroom	14.06	0.7075	0.99, 1.4	100.0, 0.0	7.61	ADO.Section_26ab

Modelled ventilation

Room name	Infiltration rate ACH	Mech vent flow rate ACH
Living/kitchen	0.3	1.51
Bedroom	0.3	0