John Perrin And Sons

AD Part O (Overheating) Compliancy Report

30 Queens Crescent, Bishops Stortford CM23 3RR

25 March 2024

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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 Queens Crescent site. The project was fully modelled using IES software following the Part O guidelines. 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, and as such, Watt Energy are confident that thermal comfort is likely to be achieved for the bedrooms, living room and kitchen when employing the design variables contained within this report. The parameters required for Part O compliance are:

Building fabric as outlined in section 3

30-degrees openable side hung windows in living areas when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

Openable sliding door window on the side elevation when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

90-degrees openable side hung door/ window to the kitchen when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

Openable sliding door window on the side elevation when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

20-degrees openable side hung door/ window to the kitchen when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

35-degrees openable side hung windows in bedrooms when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

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.

2 Methodology

2.1 Weather Data

Figure 1. Location of site

The site is located in Bishops Stortford, therefore the weather file used within the model was the CIBSE Design Summer Year (DSY1) for London Gatwickr, 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.

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.

2.2 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 26ºC 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:

Ground Floor Windows –1.2 W/m2K (Double-glazed), ≤ 0.37 g-value.

Top Floor Windows –1.2 W/m2K (Double-glazed), ≤ 0.61 g-value.

External Wall – 0.18 W/m2k

Ground Floor –0.11 W/m2K

Flat Ceilings – 0.09 W/m2K

Sloped Ceilings – 0.13 W/m2K

Air test – 3.00 m3.ph.m2 @ 50Pa

3.2 Infiltration and Ventilation

An infiltration rate of 0.15 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 3 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: $T_{outdoor} < T_{indoor} > 22°C$;

During nighttime for periods with extremely hot weather, expected for a few days a year.

3.3 Window Openings

Apertures have been included for all Living / Kitchens and Bedrooms, to be openable to a 30-degree angle in Bedrooms and Living areas, 90-degree angle in the Kitchen and retractable single pane windows. Additionally, the frame percentage of openable windows has been set to 10%.

As part of the Part O modulating profiles for occupied rooms, windows are set to open when the internal temperature is above 22ºC and be fully open once internal temperature exceeds 26ºC. Similarly, the profile will start to close the windows once temperatures fall below 26ºC and eventually be fully closed at 22ºC.

The Noise Impact Assessment has been taken into consideration when modelling window openings, the nine southern facades facing Manchester Road that include noise constraints overnight have been modelled as closed overnight.

The following window opening types have been modelled:

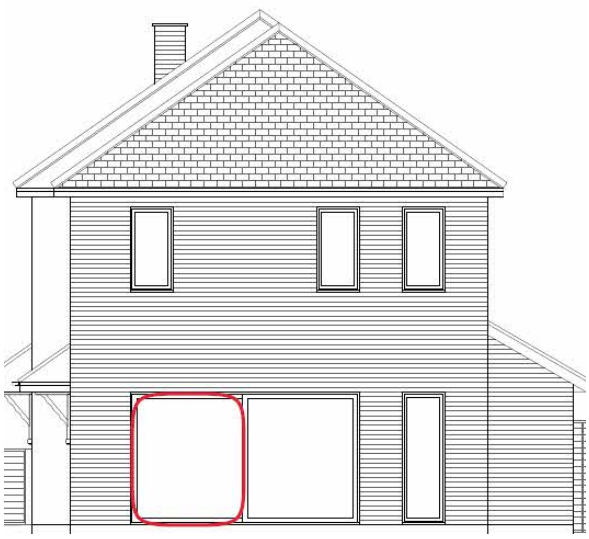
1. Side Hung Windows in Living Area

Openable Area	90%
Angle of Opening	30 ºC

2. Side Hung Windows in Bedrooms

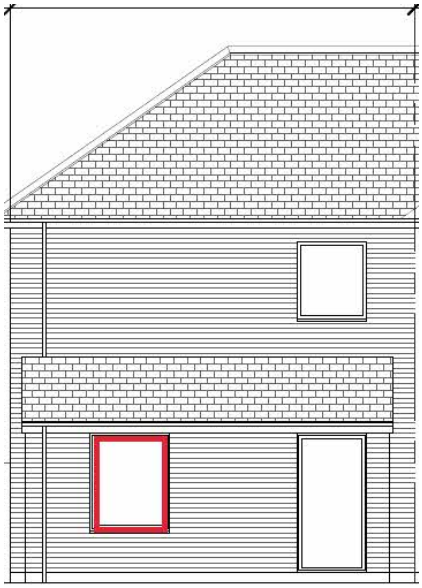
Openable Area	90%
Angle of Opening	35 ºC

3. Sliding Pane Doors in Living Area



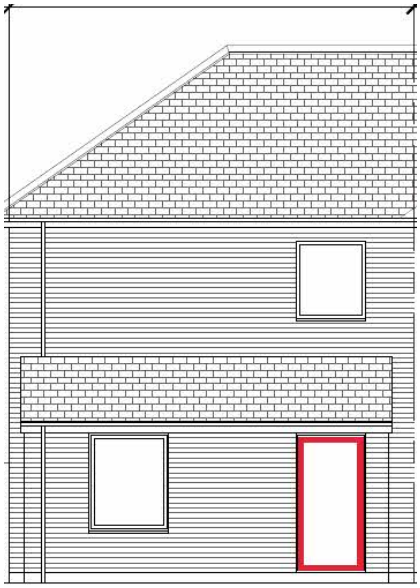
Openable Area	100%
Angle of Opening	-

4. Bottom Hung Window Living Area



Openable Area	90%
Angle of Opening	20 ºC

5. Side Hung Opening Door Kitchen



Openable Area	90%
Angle of Opening	90 ºC

4 Results Summary

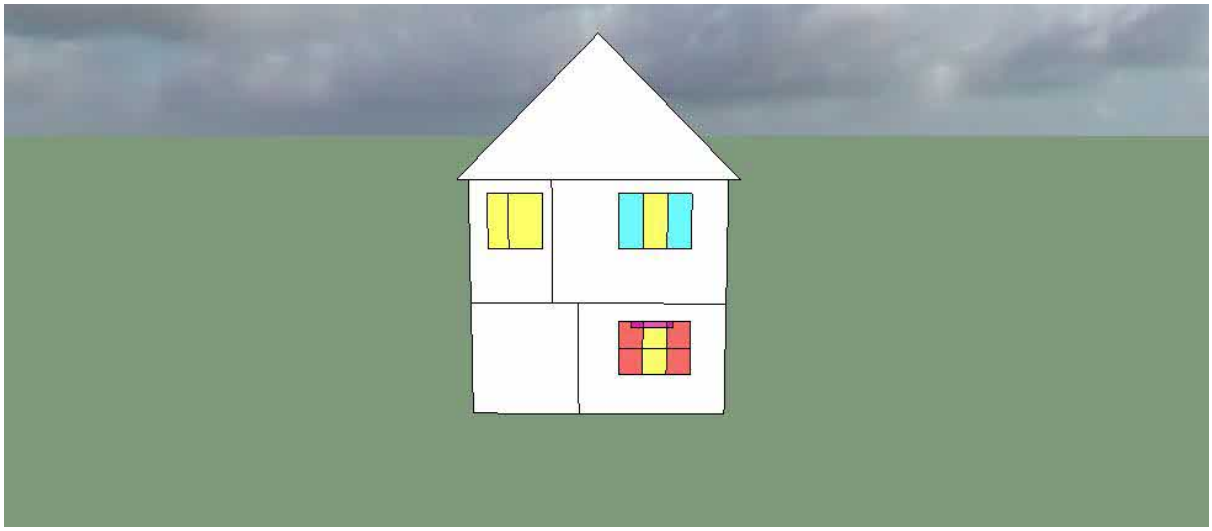
This report outlines the parameters which have been included within the thermal model for the Queens Court site, located in Bishops Stortford, in order to achieve compliance with The Building Regulations 2010 Overheating Approved Document O (Part O).

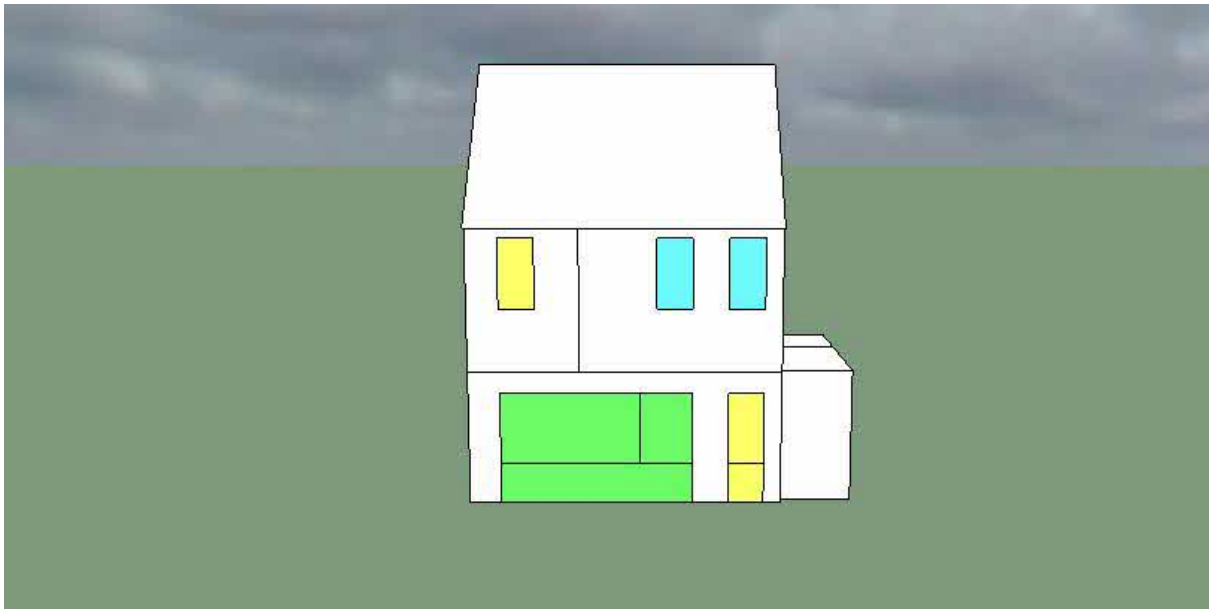
A compliant strategy has been provided for all dwellings, and as such, Watt Energy are confident that thermal comfort is likely to be achieved for all bedrooms, living rooms and kitchens when employing the design variables contained within this report. The parameters required for Part O compliance are:

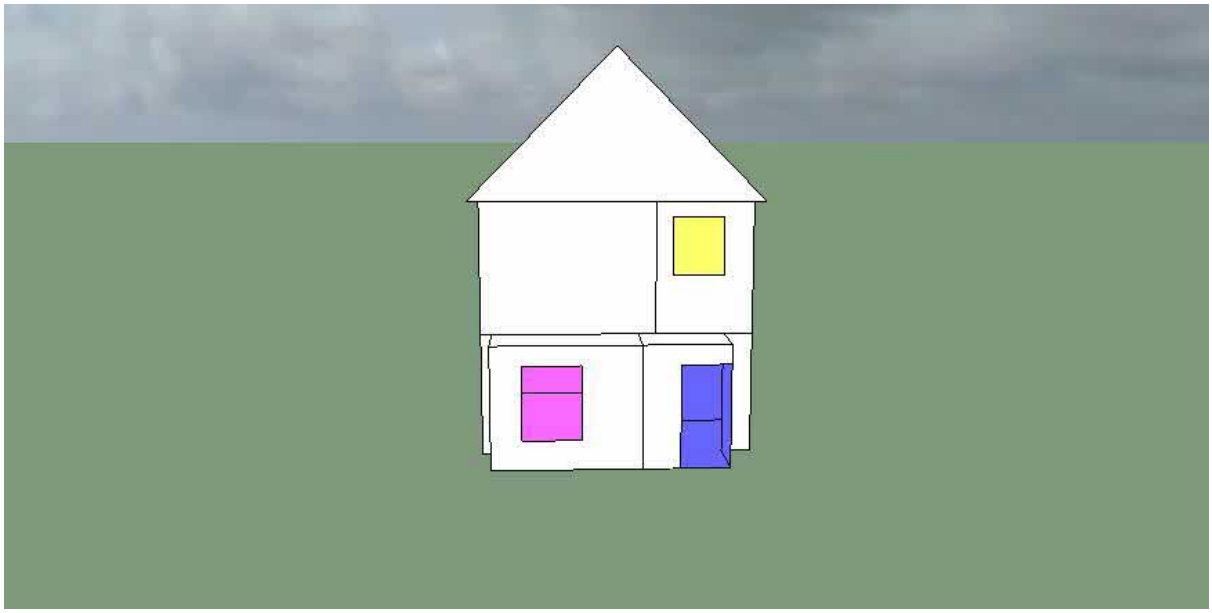
Building fabric as outlined in section 3
30-degrees openable side hung windows in living areas when temperatures exceed 22ºC and close when external temperatures exceed 26ºC
Openable sliding door window on the side elevation when temperatures exceed 22ºC and close when external temperatures exceed 26ºC
90-degrees openable side hung door/ window to the kitchen when temperatures exceed 22ºC and close when external temperatures exceed 26ºC
Openable sliding door window on the side elevation when temperatures exceed 22ºC and close when external temperatures exceed 26ºC
20-degrees openable side hung door/ window to the kitchen when temperatures exceed 22ºC and close when external temperatures exceed 26ºC
35-degrees openable side hung windows in bedrooms when temperatures exceed 22ºC and close when external temperatures exceed 26ºC

This assessment will need to be revised and refined as the design develops and certain parameters are finalised to ensure that compliance can be found throughout the development.

Appendix A – Macroflo Opening Types (IESVE)







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Energy & Consulting Engineers

Approved Document O report
Overheating risk in residential buildings
for

Building details

Project name:	Date: 25-03-2024 13:20:21
Location: London Heathrow , United Kingdom	
Address:	
Building use:	
Are there any security, noise, or pollution issues:	

Designer's details

Designer's name:
Designer's organisation:
Designer's address:

Dynamic thermal model

Software: IESVE version 2023.4.1.0	
Weather file: London_GTW_DSY1_2020High50.epw	
Results file: Queens Crescent 18.aps	
Number of rooms analysed: 4	
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:	

Summary

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

- Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which T 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
BEDROOM 1	Pass	Pass	-	-
BEDROOM 2	Pass	Pass	-	-
KITCHEN	Pass	N/A	-	-
LIVING AREA	Pass	N/A	-	-

Naturally ventilated rooms – criterion (a)

Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which T 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 T 1°K	% Occupied hours T 1°K	Criterion a check
BEDROOM 1	3672	34	0.9	Pass
BEDROOM 2	3672	111	3.0	Pass
KITCHEN	1989	55	2.8	Pass
LIVING AREA	1989	45	2.3	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
BEDROOM 1	14	3	17	Pass
BEDROOM 2	16	9	25	Pass
KITCHEN	N/A	N/A	N/A	N/A
LIVING AREA	N/A	N/A	N/A	N/A

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

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 m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
BEDROOM 1	13.7	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
BEDROOM 2	8.0	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
KITCHEN	8.81	TM59 - 2 Bedroom - Kitchen	Kitchen Occupancy	Kitchen Equipment	18-23h
LIVING AREA	23.17	TM59 - 2 Bedroom - Living	Living Occupancy	Living Equipment	18-23h

Modelled openings

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
BEDROOM 1	8.78	0.6144	0.88, 0.88	90.0, 90.0	11.56	ADO.Section_26ab
BEDROOM 2	17.35	0.6144, 0.6144	0.88, 0.63, 0.63, 0.63	20.0, 90.0, 20.0, 90.0	17.95	ADO.Section_26ab, ADO.AlwaysOff
KITCHEN	22.62	0.372	2.1	90.0	21.45	ADO.Section_26ab
LIVING AREA	37.04	0.372, 0.372, 0.372	1.42, 7.61, 0.63, 0.63, 0.63, 1.8	20.0, 50.0, 90.0, 20.0, 90.0, 90.0	30.08	ADO.Section_26ab, ADO.AlwaysOff

Modelled ventilation

Room name	Infiltration rate ACH	Mech vent flow rate ACH
BEDROOM 1	0.15	0
BEDROOM 2	0.15	0
KITCHEN	0.15	0
LIVING AREA	0.15	0