15 Shorts Garden

Overheating Assessment

March 2025

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Document Control Sheet		Disclaimer
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1 Executive Summary

NRG Consulting have been commissioned to undertake an Overheating Assessment at **15 Shorts Garden/2-3 Neals Yard, London, WC2H 9AT.**

The assessed scheme is an existing basement and ground floor commercial unit including a restaurant with kitchen and seating area for which an overheating test is required to verify the need of active cooling as per the requirements of Camden Council.

The following guidelines have been followed to assess the proposed development:

- GLA Guidance on preparing Energy Statements (June 2022)
- CIBSE TM52:2013 – The limits of thermal comfort: avoiding overheating in European buildings
- CIBSE TM49: Design Summer Years for London

This assessment has been performed based on the follow specification, details of which are contained within this report:

- U-Values of thermal elements.
- Window specification including U-Value, G-Value and opening details.
- The ventilation strategy, infiltration and air permeability rates.

Based on the information and statement made within this report, we have run a dynamic thermal analysis of the proposed habitable rooms in order to assess compliance against the requirements without cooling. This assessment failed for the rooms with the proposed cooling. The cooling hierarchy was then reviewed before the assessment was re-run with mechanical cooling.

This report has been written to address Camden Council Policy:

- Local Plan Policy CC2, para. 8.41 and;
- Camden Planning Guidance: Energy efficiency and adaptation for further information and guidance.

Therefore, based on this report, passive measures have been investigated but are not sufficient to avoid overheating without mechanical cooling due to the location, orientation and size and large amount of glazing as well as the number of proposed people within the occupied spaces.

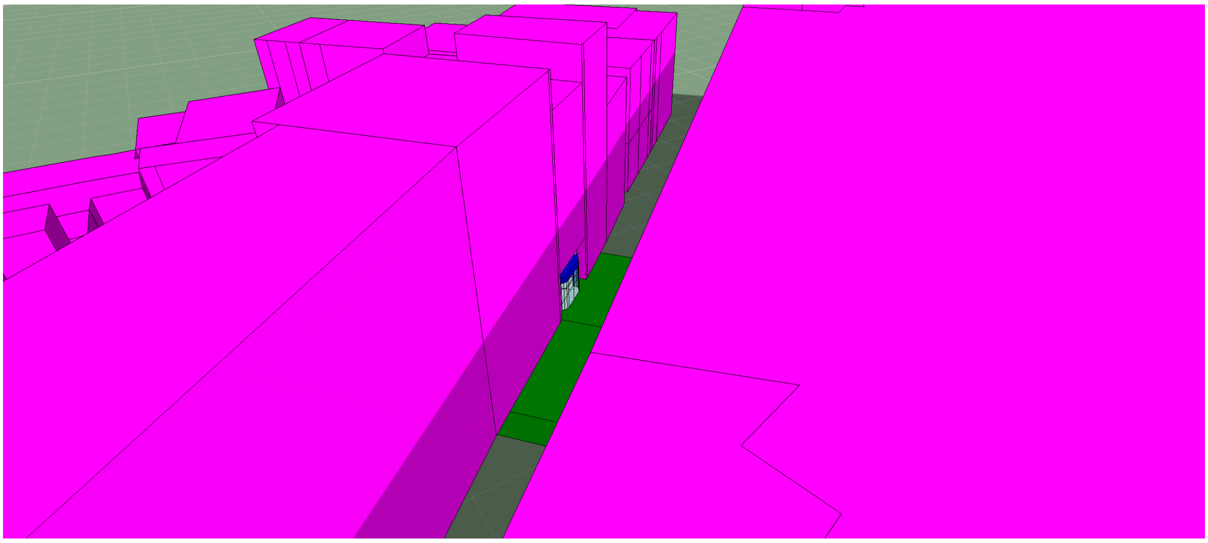

Figure 1: 3D model of the proposed building

2 Overheating Risk Guidance

2.1 CIBSE TM52:2013

CIBSE TM52 entitled 'The Limits of Thermal Comfort: Avoiding Overheating in European Buildings', provides guidance on predicting overheating in buildings. It is intended to inform designers, developers and others responsible for defining the indoor environment in buildings and it is recommended that this is considered when carrying out modelling. In addition, defined thresholds to provide a pass / fail result are clearly provided as written in the results section.

Test	Assessment Criterion	Acceptable Criterion	Investigated Period	Weather File
Criterion 1	The frequency of the time when operative temperature is higher than maximum acceptable temperature	3% of occupied hours	May-September	CIBSE London DSY
Criterion 2	Peak daily weighted exceedance	6	May-September	
Criterion 3	An absolute operative temperature for the room is not exceeded 4K higher than maximum acceptable temperature	0 Hour	May-September	

Table 1: TM52 overheating criteria

TM52 sets three criteria by which a building can be classed as overheating:

Hours of exceedance: The operative temperature tmax is not exceeded by 1K for more than 3% of occupied hours during a typical non-heating season (1st May – 30th September).

Daily weighted exceedance: Sets a daily limit for acceptability for temperature rise and duration.

Upper limit temperature: Sets an absolute maximum acceptable daily temperature for the room, beyond which the level of overheating is unacceptable (4K higher than maximum acceptable temperature).

A room or building that fails any two of the three criteria is classed as overheating.

2.2 Operative Temperature

The principal metric for thermal comfort is specified based on operative temperature (to), which is an expression of the temperature you experience or feel. The operative temperature can be expressed as a function of air temperature (ta), radiant temperature (tr) and air speed (v) and CIBSE suggests the following formula (CIBSE 2015).

$$t_o = \frac{t_a\sqrt{(10v)} + t_r}{1 + \sqrt{(10v)}}$$

2.3 CIBSE Guide A: 2015 and BS EN 15251:2007

For free-running naturally ventilated buildings, BS EN 15251:2007 [Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (BSI, 2007)] specifies indoor environmental parameters which have an impact on the energy performance of buildings. The CIBSE Guide A (2015) recommendations for testing for the presence or likelihood of overheating follows the methodology and recommendations of BS EN 15251 (2007).
The method used in the BS to define overheating in buildings sets acceptable temperature ranges for naturally ventilated buildings based on the sensitivity of occupants and their comfort expectation.
Expectation levels are set out in the following categories:

- Category I: High level of expectation (only used for spaces occupied by very sensitive and fragile persons).
- Category II: Normal expectation (for new buildings and renovations).
- Category III: Moderate expectation (used for existing buildings).

This report assesses the proposed development against Category II criteria.

2.4 Naturally Ventilated Buildings

For naturally ventilated buildings the designer should aim for an indoor operative temperature close to that calculated from the running mean of the outdoor temperature, in accordance with the following equation:

$$tcom = 0.33\ trm + 18.8$$

Where tcom is the comfort operative temperature and trm is the running mean outdoor air temperature.

The upper limit conditions for avoiding overheating, tmax, in a Category II expectation level is represented by the following formula:

$$tmax = tcom + 3$$

CIBSE TM52 sets three criteria by which a building can be classed as overheating. It should be noted that, according to BS EN 15251, it is possible to increase comfort temperature upper limits if the operative temperature is higher than 25°C and internal air speed is higher than 0.1 m/s, by the use of personal fans for example.

3 Methodology Applied & Model Inputs

This section includes the model inputs used to assess the risk of overheating within the proposed development.

3.1 Scope of Assessment

The dining areas of the proposed commercial unit have been included within the overheating analysis.

3.2 Basis for Model

Project Information	
Building Category	Category II – New Builds and Renovations
Software	IES Virtual Environment - 2023
Weather File - Location	London Weather Centre
Weather File - Details	DSY1, 2020s, High Emission, 50% percentile scenario
Summer Days	May 1st to September 30th – 153 days
Drawing Issue Date	March 2025

Table 2: Project information

3.3 Occupancy Patterns and Behaviour – CIBSE TM52 Data

In line with CIBSE guidance, realistic algorithms for occupant behaviour, the use of windows and other adaptive behaviour were used in the dynamic thermal model, as well as a realistic occupancy schedule.

Internal heat gains and mechanical ventilation flow rates are based on NCM figures summarised in the tables below.

Room	Occupancy Heat Gain (W/person)		Light Heat Gain (W/m^2)	(Other Small Power W/m^2)
	Sensible	Latent		
Seating Area	67	43	20	19

Table 3: Heat gain figures – Modelling & data inputs

3.4 Fabric Element and Ventilation Details

<table>
<tr><th>Thermal Elements</th><th>Proposed U-Value W/m²K</th></tr>
<tr><td>External Wall</td><td>2.09</td></tr>
<tr><td>Basement Floor</td><td>0.70</td></tr>
<tr><td>Roof (Small area of Flat Roof)</td><td>2.30</td></tr>
<tr><td colspan="2">U-Values are based on SAP Appendix S based on the age of the building and confirmation of construction elements.</td></tr>
<tr><th>Ventilation Type</th><td>System 4 - MVHR</td></tr>
<tr><th>Room</th><th>Ventilation Rate l/(s·m2)</th></tr>
<tr><td>Seating area</td><td>2</td></tr>
<tr><th colspan="2">Air Permeability</th></tr>
<tr><td colspan="2">0.25 ACH</td></tr>
</table>

Table 4: Fabric elements and ventilation details

3.5 Windows – Opening and Operation Details

<table>
<tr><th>Opening Type</th><th>Proposed U-Value (W/m²K)</th><th>Proposed G-Value (%)</th><th>Opening Hours</th></tr>
<tr><td>Window (Existing)</td><td>2.8</td><td>0.5</td><td rowspan="7">For the purposes of the overheating assessment, the windows have been assumed to be opened during operating hours as this is the best-case scenario for natural ventilation: 07am-11pm</td></tr>
<tr><td>Rooflights (New)</td><td>1.4</td><td>0.5</td></tr>
<tr><th>Window Type</th><th>Openable Area</th><th>Maximum Openable Angle</th></tr>
<tr><td>Fixed</td><td>-</td><td>-</td></tr>
<tr><td>Bi-folding doors (orange)</td><td>90%</td><td>-</td></tr>
<tr><td>Top hung window (green)</td><td>100%</td><td>20°</td></tr>
<tr><td>Rooflight (blue)</td><td>100%</td><td>45°</td></tr>
<tr><th>Window Reveal Depth</th><td colspan="3">N/A</td></tr>
<tr><th>External Window Shading</th><td colspan="3">Not installed</td></tr>
</table>

Table 5: Window and doors opening details

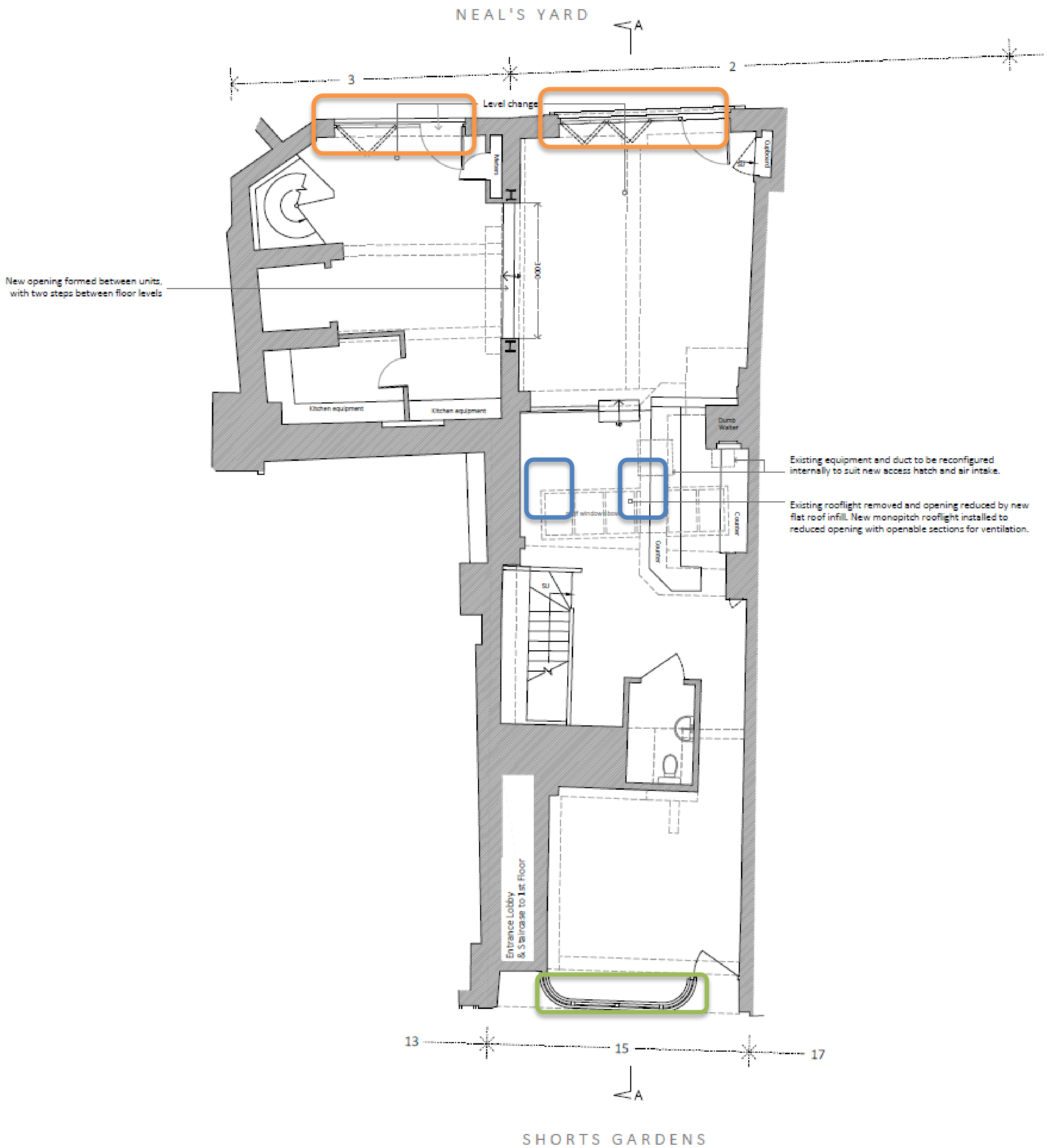

Figure 2: Window opening details

4 Results

4.1 Without Cooling

The table below shows the results of the dynamic simulation based on the current design proposals against the CIBSE TM52 criteria for non-domestic units. The results based on the current situation demonstrates that the kitchen and the seating areas as existing exceed the thresholds outlined by CIBSE TM52 and therefore overheats during the summer.

Compliance is based on passing two out of the three criterions.

CIBSE TM52 Weather File: London_LWC_DSY1_2020High50.epw				
Room	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing
Basement Seating Area	28.4	73	7	1 & 2 & 3
Ground Floor Seating Area	5.2	48	5	1 & 2 & 3

Table 6: Results without cooling (showing non-compliance with CIBSE TM52)

4.2 With Cooling

The cooling hierarchy has been reviewed for the scheme as follows:

Cooling Hierarchy	Measures Undertaken
Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.	The unit is a basement and ground floor unit in a dense urban area. There is only a small element of External Wall and Flat Roof exist. The glazing is shop frontage. Heat entering the building is reduced naturally.
	Insulation is not present due to the building age. Due to the very small area of external wall and the complications of EWI with heritage buildings, thermal upgrades are not currently proposed. Windows are existing double glazed and to the retained. New rooflights are to be installed.
Minimise internal heat generation through energy efficient design:	LED Lighting to specified in upgrade.
	Localised Heating and Cooling so limited pipework heat loss.
Manage the heat within the building through exposed internal thermal mass and high ceilings:	Very high thermal mass.
	The Floor to Ceiling Height as existing spans from 2.7m to 3.7m
Provide Passive Ventilation	Openable Windows allow for natural ventilation on ground floor
Provide Mechanical Ventilation	Mechanical Ventilation with Heat Recovery is to be installed.

As the above, all stages of the hierarchy were followed but due to the large area of glazing and the internal gains arising from the proposed use of the commercial unit (restaurant with kitchen and seating areas) active cooling is required in order to mitigate the risks of overheating.

Proposed VRF

As part of the proposals, the VRF system will be configured to allow the kitchen and trading areas to operate completely independently. The trading areas will be configured with a 3-pipe 'heat recovery' VRF type system to provide heating and cooling to the space, and also allow heat recovery across the whole trading area in order to maximise efficiency.

Heating and cooling to the spaces will be provided by means of local fan coil units. The VRF systems will be controlled by a propriety controls system (to be fully detailed by incoming tenant) located in a central location to prevent unauthorised adjustment; which can also be configured to limit setpoints to prevent excess heating/cooling of the space.

Based on current preliminary specifications the overall SCOP of a VRF system of this type would be in the region of 4.0-4.2 and an SEER of 6.0-6.5 (subject to the final design of the systems).

Results with cooling are shown below:

CIBSE TM52 Weather File: London_LWC_DSY1_2020High50.epw				
Room	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing
Basement Seating Area	0	0	0	-
Ground Floor Seating Area	0	0	0	-

Table 7: Results with cooling (showing compliance with CIBSE TM52)

5 Conclusion

Overall, based on the contents of this report, a dynamic overheating assessment has been undertaken and the results show that based on CIBSE TM52 the seating areas are at risk of overheating with only passive design measures. The cooling hierarchy has been reviewed to ensure that passive measures have been included before cooling has been introduced and this is the case.

In order to mitigate the risk of overheating, a VRF system is proposed and based on this assessment, it is the authors opinion that the existing property cannot be actively cooled through passive measures and thus planning permission should be granted on the basis of having cooling supplied to the commercial unit.