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Planning Statement
Overheating Analysis
Nido West Hampstead

Document information

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Introduction

Eight Associates has been appointed in order to undertake an overheating analysis of the Nido West Hampstead scheme to provide design stage guidance and maximise occupant comfort levels. Consequently, thermal modelling has been undertaken to demonstrate compliance with CIBSE TM52 and TM59 requirements. The current proposal is to minimise overheating risk by following the Cooling Hierarchy.

Building Summary

The proposed project involves extension works to the Nido West Hampstead student accommodation building, located in West Hampstead, which is part of the London Borough of Camden. The works involve a single storey roof extension at 5th and 7th, and a side extension of 3 storeys, providing an additional 65 studio rooms. The new extension has a total gross internal area of approximately 960 m^2. Please note that only the proposed extension has been assessed in this report.

Planning Context

The London Borough of Camden does not set out any specific requirement for avoiding overheating. This report is aligned with national standards and regulations.

Methodology

The methodology used within this report has been to establish the thermal comfort levels in the occupied spaces through using dynamic simulation modelling and respond with suitable passive design measures to mitigate solar gains, provide adequate ventilation and increase thermal mass. National regulations have set high standards and numerous iterations have been undertaken to determine suitable fabric improvements. All assumptions in the modelling are provided in the model inputs section of this report.

Please note that the climate change scenario has been excluded from this report. Note that external temperatures are likely to increase because of climate change. The consequences of increased summer peak temperatures could be non-compliance with the thermal comfort recommendations unless further measures were implemented.

Criteria for defining overheating

According to the CIBSE TM 52 – The limits of thermal comfort: avoiding overheating in European buildings (2013) and CIBSE Guide A – Environmental Design (2015), to reduce the risk of overheating the space has to comply with at least two of the following three criteria:

a. The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
b. The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.
c. The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

According to the CIBSE TM59: 2017 – Design methodology for the assessment of overheating risk in homes, to reduce the risk of overheating the space has to comply with the following criteria:

a. For living rooms, kitchen and bedrooms: the number of hours during which ΔT 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 (Same as Criterion 1 of TM52).
d. 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 the annual hours (1% of the annual hours between 22:00 and 07:00).

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Model Input
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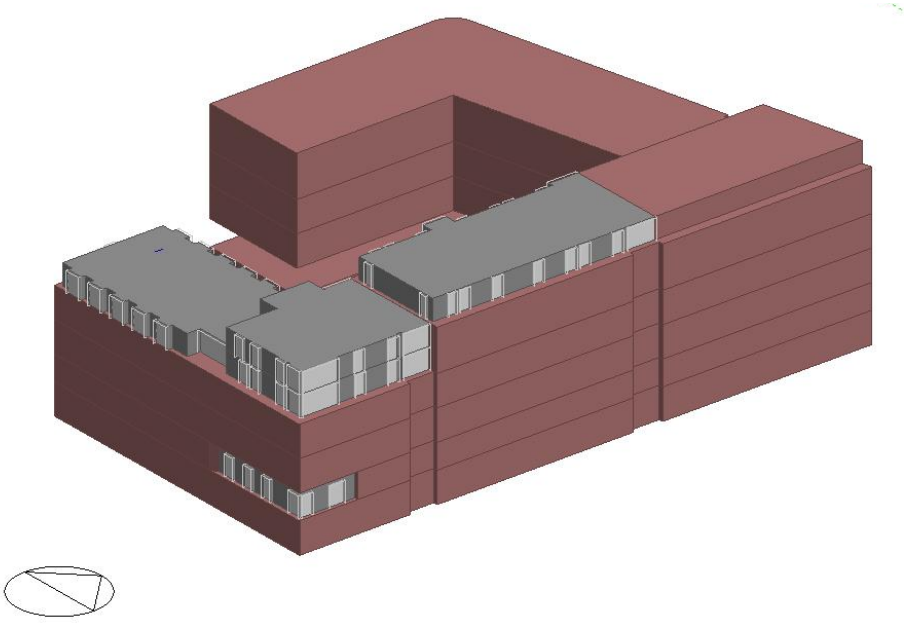
Simulation Software

An overheating analysis has been undertaken using Dynamic Simulation Modelling, Design Builder has been employed for this. Design Builder is a DCLG approved simulation environment that complies with the requirements of CIBSE Guide A. A screenshot of the model is shown below.



Weather File

The CIBSE Design Summer Year (DSY) Current Series, London Heathrow, has been used for the purposes of this report.

Building Fabric U-Values

Element	Proposed U-value (W/m2K)
External walls	0.14
Flat Roof	0.12
Openings	1.60

Internal Gains

Typical hours based on the relative activity for class use, on weekdays and weekends throughout the year have been specified for lighting, equipment and occupancy.

Space	Occupancy people/m^2	Lighting W/m^2	Small power W/m^2
Bedroom	0.09	10.0	4.3

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Passive Design Measure
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Cooling Hierarchy	Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy: 1. Minimise internal heat generation through energy efficient design; 2. Reduce the amount of heat entering a building in summer through shading, albedo, fenestration, insulation and green roofs and walls; 3. Manage the heat within the building through exposed internal thermal mass and high ceilings; 4. Passive ventilation; 5. Mechanical ventilation; 6. Active cooling systems (ensuring they are the lowest carbon options).
Cooling Strategy	The cooling strategy is to implement energy efficient lighting and appliances to reduce internal heat gains; create a super-insulated fabric with shading devices and solar control glazing to keep the heat out.
Windows	Glazing will be a crucial aspect to ensure thermal comfort of the occupied spaces. In order to minimise solar gains, and consequently cooling demand, windows with a solar factor of 0.45 have been modelled for every glazed area.
Shading	Internal blinds with medium reflective slats have been modelled to reduce solar gains. This system will operate using inside air temperature controls, shading will be activated when the inside temperature exceeds the threshold temperature of 22°C.
Mechanical Ventilation Rates	Local extract mechanical ventilation system has been specified.
Natural Ventilation Rates	Natural ventilation through openable windows has been adopted for this scheme. The ventilation rate has been calculated by the software according to the percentage of openable windows for each space and the varying environmental conditions throughout the year. The percentage of openable windows has been estimated to be 50% (tilt and turn windows). Moreover, the scheme has been modelled with a discharge coefficient rate of 0.65 and a wind factor of 1. The windows were open when the internal temperature what above 22°C and when the rooms were occupied.

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Summary of results
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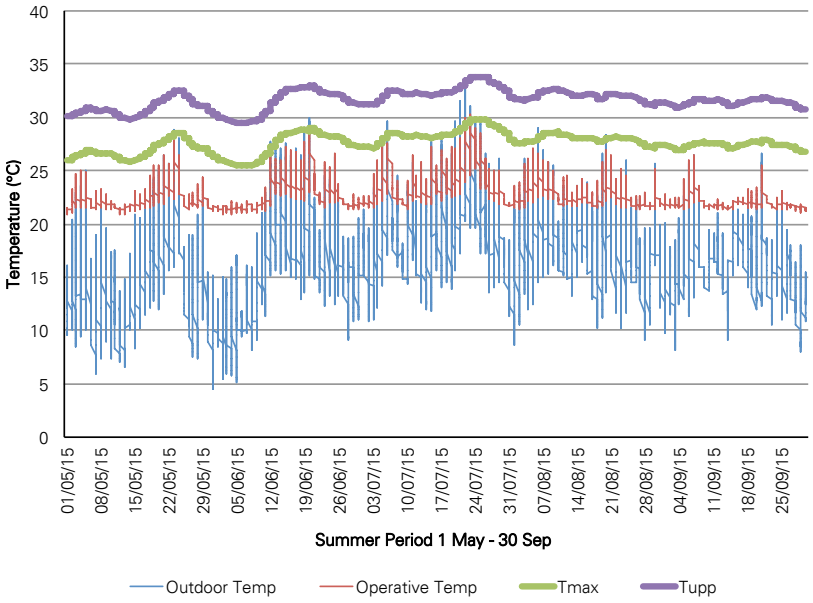
Overview of Results

The graphs below show the outdoor and indoor temperature of a sample of rooms. The graphs also show the Tmax, which is the upper range of thermal comfort, and Tupp, which is the absolute upper limit of thermal comfort.

In order to comply with the overheating criteria the building must comply with two of the following three criteria.

- Criterion 1 - The percentage of hours with temperature more than the Tmax should be less than 3%.
- Criterion 2 - The weighted exceedance shall be less than or equal to 6 in any one day
- Criterion 3 - No occupied hour of the building shall exceed the absolute upper limit temperature. (Tupp = Tmax + 4K)
- Criterion 4 - For bedrooms only: The operative temperature in bedrooms from 10 pm to 7 am shall not exceed 26°C for more than 1% of the hours

Room 7.02



Criterion 1	Criterion 2	Criterion 3	Criterion 4
0.2%	5	0	0.8%

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Summary of results
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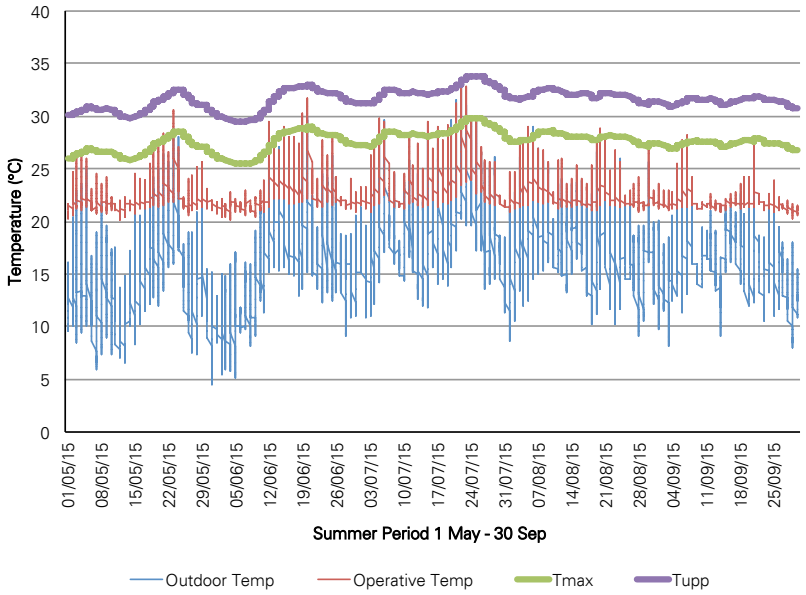
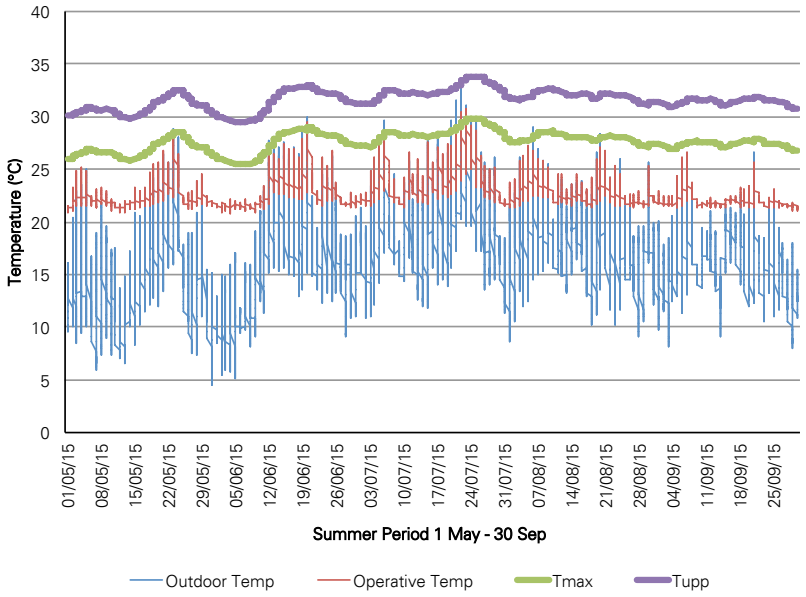
Room 7.06



Criterion 1	Criterion 2	Criterion 3	Criterion 4
1.9%	23	1	0.9%

Room 7.05



Criterion 1	Criterion 2	Criterion 3	Compliance
0.4%	6	0	1.0%

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Summary of results
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Summary of Results

Room	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Compliance
Room 1.01	0.0%	0	0	0.3%	Pass
Room 1.02	0.0%	0	0	0.3%	Pass
Room 1.03	0.0%	0	0	0.4%	Pass
Room 1.04	0.0%	0	0	0.3%	Pass
Room 5.01	0.0%	0	0	0.5%	Pass
Room 5.02	0.0%	0	0	0.5%	Pass
Room 5.03	0.0%	0	0	0.5%	Pass
Room 5.04	0.0%	0	0	0.5%	Pass
Room 5.05	0.0%	0	0	0.5%	Pass
Room 5.06	0.4%	15	0	0.5%	Pass
Room 5.07	0.0%	0	0	0.6%	Pass
Room 5.08	0.0%	0	0	0.6%	Pass
Room 5.09	0.3%	6	0	0.4%	Pass
Room 5.10	0.0%	0	0	0.7%	Pass
Room 5.11	0.0%	1	0	0.6%	Pass
Room 5.12	1.0%	14	0	0.8%	Pass
Room 5.13	0.0%	0	0	0.4%	Pass
Room 5.14	0.0%	0	0	0.4%	Pass
Room 5.15	0.0%	0	0	0.3%	Pass
Room 5.16	0.0%	0	0	0.3%	Pass
Room 5.17	0.0%	0	0	0.3%	Pass
Room 5.18	0.0%	0	0	0.3%	Pass
Room 6.01	0.0%	0	0	0.6%	Pass

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Summary of Results

Room	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Compliance
Room 6.02	0.0%	0	0	0.6%	Pass
Room 6.03	0.1%	4	0	0.7%	Pass
Room 6.04	0.9%	16	0	0.4%	Pass
Room 6.05	0.0%	0	0	0.8%	Pass
Room 6.06	0.6%	7	0	0.6%	Pass
Room 6.07	2.0%	23	1	0.9%	Pass
Room 7.01	0.3%	8	0	0.4%	Pass
Room 7.02	0.2%	5	0	0.8%	Pass
Room 7.03	0.3%	5	0	0.9%	Pass
Room 7.04	0.8%	11	0	0.8%	Pass
Room 7.05	0.4%	6	0	1.0%	Pass
Room 7.06	1.9%	23	1	0.9%	Pass
Room 7.07	0.0%	0	0	0.4%	Pass
Room 7.08	0.0%	0	0	0.7%	Pass
Room 7.09	0.0%	0	0	0.7%	Pass
Room 7.10	0.0%	0	0	0.6%	Pass
Room 7.11	0.0%	0	0	0.8%	Pass
Room 7.12	1.0%	13	0	0.7%	Pass

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Summary of results
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Explanation of Results

Criterion 1 shows that the scheme will experience temperatures above the thermal comfort T_{max} for less than 3% of the total summer occupied hours. This value is within the acceptable range.

Criterion 2 shows that the maximum weighted exceedance is up to 23 within one day (this value is a function of temperature rise and its duration). According to CIBSE Guide no one day should have a weighted exceedance more than 6. It is expected that rooms with highly glazed areas would fail in this criterion as they experience severe fluctuations in the interior temperature because of their sensitivity to solar gains.

Criterion 3 shows than there are two rooms with one hour above the absolute maximum daily temperature.

Please note that according to CIBSE TM52, the space has to comply with at least two of the three criteria. According to CIBSE TM59 the bedrooms have to comply with criterion 1 and 4. Since the scheme comprises the development of student accommodation rooms, CIBSE TM59 is considered to be a more appropriate methodology.

All the assessed rooms comply with the requirements of CIBSE TM 59.

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Conclusions
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Conclusions

The proposal has responded to CIBSE TM59 requirements relating to overheating. The report has set out how the occupied spaces perform against strict thermal comfort standards for overheating. The scheme has implemented passive design measures and the modelling results indicate that the scheme is compliant with the overheating requirements.

The proposal maximises passive design measures by responding to the local context in the following ways:

- Energy efficiency lighting and appliances have been recommended to reduce internal heat gains;
- The building fabric will be insulated over and above the standards set out by Building Regulations and reduced solar gains from a glazing solar factor of 0.45 will help to keep the heat out of the building;
- Internal shading devices to further limit solar gains;
- Extract mechanical ventilation to purge the heat;
- Natural ventilation supply fresh air to the building through openable windows (as per ventilation rates section)

Note that the analysis was performed assuming that opening windows were controlled based on the level of occupancy and the operative indoor temperature of the space. To achieve the thermal comfort levels shown in this report the level of occupant control for the opening windows would need to be optimum i.e. fully responsive to indoor temperature.