Archway Road, London Borough of Haringey

Overheating Assessment Report

Version 1.0

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Prepared by: Omar Almeida

Reviewed by : Stratos Tsimpiridis

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Contents

1 Introduction

This report assesses the overheating potential of the proposed development of Archway Road N6 4HX, in order to meet the sustainability requirements of the London Plan 2021, and Part O of the Building Regulations 2021.

The site is situated in the London Borough of Haringey. The proposed development comprises the demolition of existing structures to erect a three storey residential development and two semi-detached dwellings. The site area is shown in Figure 1-1 below.

Figure 1-1 – Archway Road site Location

2 Guidance

2.1 London Borough of Haringey Local Plan

As a residential development comprising of 14 residential units and 2 dwellings, Archway Road is not a major development and therefore policies relating to major developments do not apply.

2.1.1 SP4: Working Towards a Low Carbon Haringey

1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:

   a) From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO_2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and

   b) From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.

2. The Council will promote low- and zero-carbon energy generation through the following measures:

   a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;

   b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;

   c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and

   d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on-site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy

2.2 Part O – Requirement O1 : Overheating mitigation

The aim of requirement O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

In the Secretary of State's view, requirement O1 is met by designing and constructing the building to achieve both of the following.

a. Limiting unwanted solar gains in summer.

b. Providing an adequate means of removing excess heat from the indoor environment.

2.3 CIBSE TM 59 - Design methodology for the assessment of overheating risk in homes

TM 59 outlines specific criteria for assessing overheating in residential buildings. In the case for homes with restricted windows openings, the following criteria must be passed in order to ensure the building does not overheat :

• All occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied annual hours.

For homes predominantly naturally ventilated, both of the following criteria must be passed for all relevant rooms in order to ensure the building does not overheat, including homes that have mechanical ventilation with heat recovery (MVHR), both of the following criteria must be passed for all relevant rooms in order to ensure the building does not overheat.

1. Criteria 1: For living rooms, kitchens and bedrooms: The number of hours during which temperature difference between the actual operative temperature in the room and the limiting maximum acceptable temperature (ΔT) is greater than or equal to one degree during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

2. Criteria 2: 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. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

3 Overheating

3.1 Part O Section 3 : Ensuring the overheating mitigation strategy is usable

3.1.1 Noise

In locations where external noise may be an issue, the overheating mitigation strategy should take account of the likelihood that windows will be closed during the time that Part O set as sleeping hours (11pm to 7am).

In the Noise Assessment report provided by Anderson Acoustics, it is reported that openable windows in some of bedrooms during the night would take the noise levels over the limits, and for that reason they have been assumed closed, during the sleeping hours, in the model. Due to the nature of the location of the building, a risk in some of the rooms during the night is expected. Therefore, open windows during the night would take the noise levels over the limits that has been set by Part O, and for that reason they have been considered closed in some rooms within the assessment.

3.1.2 Air quality Assessment

The report on the air quality assessment conducted by Anderson Acoustics shows that the development comply with the relevant national, regional and local planning policy and air quality does not present a constraint to the development proposal.

3.2 Cooling Hierarchy

3.2.1 Reduce the amount of heat entering a building

The development is surrounded by a number of other dwellings nearby, which will provide shading to lower floors of the building. The development has some external shading from nearby dwellings on the SW facade.

Moreover, the development has been proposed with a reduced g-value for glazing, to reduce solar gains even further. The development will have highly insulated external walls, which minimise any heat gain through conduction.

3.2.2 Minimise internal heat generation

Internal heat generation will be minimised throughout the development. Highly efficient LED lighting will be required as part of the energy strategy, which minimises internal heat generation.

3.2.3 Manage the heat within the building

The development is currently assumed to consist of a brick and block construction for external walls. This construction provides a significant amount of thermal mass and as such, a damping effect. Allowing the development to buffer itself from extremely high external temperatures.

3.2.4 Passive ventilation

All occupied rooms are provided with openable windows. However, occupants may choose to close the windows at night if noise levels are above the acceptable levels defined by Part O.

Results of acoustic study show that the overheating strategy needs to be effective when windows are closed due to noise sensitivity which will affect particular times of day etc, however there will still be some passive ventilation opportunities from the windows at less noise sensitive times of day/whilst rooms are not in use.

3.2.5 Mechanical ventilation

The development has been specified with MVHR which can be used to provide background ventilation rates to the development. This means ventilation is possible even in situations when occupants cannot leave windows open, as well as allowing ventilation to rooms that do not have external windows, such as bathrooms. The ventilation rates are mentioned in the Appendix.

3.2.6 Active cooling systems

A mechanical cooling system has been deemed necessary for the residential section of the development, where the openable windows need to be modelled as closed during sleeping hours as the levels of internal noise exceed the limits that are mentioned in Part O. Even though the windows can be opened at the occupant's will, the development needs to incorporate measures that will guarantee an indoor environment that is comfortable for people in all circumstances.

The cooling system has been assumed to have a cooling capacity of 1.5kW in each room it serves, with a cooling setpoint at 20°C. It has been modelled to start working when the outdoor air temperature exceeds or is equal to 23°C, and the indoor exceeds or is equal to 20°C. The cooling capacity of 1.5kW has been assumed based on the design-build guidelines as a minimum based on per floor area and the design team will need to calculate the actual cooling requirement of the apartments once they are built.

4 Assessment Methodology

The assessment was undertaken using IES Virtual Environment software. A model was created in the IES ModelIt module of the proposed development using drawings provided by the architect. The surrounding buildings have been modelled based on satellite imagery and information provided in the drawings. An indicative model of the proposed adjacent development has also been included.

A dynamic thermal assessment was conducted using the IES Apache module, which is a CIBSE AM11 compliant thermal modelling software.

The assessment has been carried out for all the different apartment units and dwellings. The Design Summer Year 1 (DSY 1), DSY 2 and DSY 3, London Heathrow, high emission, 50% percentile weather file have been used from 2020 for the current scenarios.

The three DSY scenarios represent different types of hot summers

- DSY1 – moderately warm summer, with a return period of seven years.
- DSY2 – short, intense warm spell, about the same length as the moderate summer year but with a higher intensity.
- DSY3 – long, less intense warm spell, which is less intense than the high-intensity year, but longer and more intense than the moderate summer year.

To examine the efficiency of both the passive and active measures that have been incorporated in the development to comply with the criteria set by Part O and TM 59, different sets of results have been produced.

Table 5-1: Case 1, a hypothetical case based on only passive measures, where all openable windows remain open throughout the night and no active measures are included, has been modelled in order to show the effectiveness of the passive measures discussed in the cooling hierarchy above.

Table 5-2: Case 2, in this case the results represent the strategy, incorporating both the passive and active measure. The rooms with noise issues are assessed under the conditions, assuming windows are opened during the day by the occupants when the internal temperature exceeds 22 degrees and the internal temperature is higher than the outside temperature, but remain closed at night due to noise levels exceeding Part O limits. Since the strategy incorporates passive and active measures outlined in the cooling hierarchy, rooms with noise issues are evaluated under the criteria for predominantly mechanically ventilated buildings, while others are assessed under naturally ventilated criteria.

5 Results

The results for the overheating assessment using 2020 weather data is outlined in table 5-1, and 5-2, below.

Naturally ventilated rooms

Case 1	DSY1	
	Criteria 1	Criteria 2
Requirement	=<3.0 %	=<32hrs
Result	44 / 44	44 / 44
Pass Percentage	100%	100%

Table 5-1 – Case 1

Case 2	DSY1		DSY2		DSY3	
	Criteria 1	Criteria 2	Criteria 1	Criteria 2	Criteria 1	Criteria 2
Requirement	=<3.0%	=<32hrs	=<3.0%	=<32hrs	=<3.0%	=<32hrs
Result	36 / 36	20 / 20	27 / 36	8 / 20	16 / 36	0 / 20
Pass Percentage	100%	100%	75%	40%	44.44%	0%

Table 5-2 – Case 2

Mechanically ventilated rooms

Case 2	DSY1	DSY2	DSY3
	Criteria 1	Criteria 1	Criteria 1
Requirement	=<3.0 %	=<3.0 %	=<3.0 %
Result	8 / 8	8 / 8	0 / 8
Pass Percentage	100%	100%	0%

Table 5-3 – Case 2

6 Discussion

These results demonstrate the effectiveness of the active and passive cooling measures:

- Case 1: A hypothetical case which permits windows to be opened at the sleeping hours. This case has been included in the assessment to test the efficiency of all the passive measures incorporated in the development. Here 100% of the spaces comply with the overheating criteria assessed under the DSY1 weather conditions, indicate that the passive measures are sufficient to achieve 100% compliance. This proves that the passive measures would be able to provide comfortable indoor conditions for all of the spaces if the windows could remain open during sleeping hours.

- Case 2 : In this case a realistic window operation profile has been used for rooms with noise issues, that allows the windows to open only when the indoor temperature exceeds 22°C and it is higher than the outdoor temperature, but still keeps the windows closed at night due to the noise limits. And the remainder of the rooms have been assessed with window operational profile as set out in the TM59 criteria. Hence, all the passive measures and active measures that have been used are capable to achieve complete compliance under DSY1 weather conditions.

7 Conclusion

This report assesses the overheating potential of the proposed development of Archway Road, in order to meet the sustainability requirements of the London Plan and Part O. Action was taken at each stage of the cooling hierarchy in order to minimise overheating.

A TM 59 assessment undertaken using IES Virtual Environment software, which is a CIBSE AM11 compliant thermal modelling software. The DSY 1, DSY 2 and DSY 3, London Heathrow, high emission, 50% percentile weather files were used to assess current overheating potential. All the rooms were assessed to determine the building's risk for overheating.

The results indicate that, with the efficient passive measures provided to the building in Case 1 (naturally ventilated), all the spaces meet the criteria of Part O, under the DSY 1 weather scenario.

As the development is modelled with both passive and active measures, the rooms with noise issues have the windows closed at night, to keep the internal conditions comfortable for the tenants during sleeping hour. For this reason, an active cooling system (Case 2), which is more energy efficient than traditional mechanical cooling systems have been introduced in such rooms. To assess the effectiveness of the system in prevention of overheating conditions a more realistic window operational profile have been used and in that case the assessed rooms achieve 100% compliance with the criteria set by TM 59 and Part O.

8 Appendix

8.1 Model Assumptions

The building and modelling assumptions used in the assessment are outlined below. The building fabric used are outlined in Table 8-1.

Building Element	U – Value (W/m²K)	G - Value
External Walls	0.13	
Roof (Flat roof / Sloped roof)	0.12	
External Glazing	0.8	0.37

Table 8-1 – Building fabric properties

Spaces were generally modelled in line with the internal gain and occupancy profiles outlined in CIBSE TM 59. Auxiliary ventilation was modelled within the units, providing flowrate to bedrooms, bathrooms, utility stores, kitchens, and living rooms as per the table below,

Apartment / Dwellings	Supply (l/s)	Extract (l/s)
1 Bed Apt.		
Bedroom	15	-
Living room	10	-
Bathroom	-	8
Utility cupboards	-	5
Kitchen	-	13
2 Bed Apt.		
Bedrooms	8	-
Living room	9	-
Bathroom	-	8
Utility cupboards	-	4
Kitchen	-	13
3 Bed houses		
Bedrooms	7	-
Living room	9	-
Bathroom	-	8
Utility cupboards	-	4
Kitchen	-	13

Table 8-2 – Ventilation

8.2 Detailed Results

Rooms	DSY1	
	Crit 1	Crit 2
	=<3.0%	=<32hrs
00_1B2PWCH_BEDROOM 1	0.5	17
00_1B2PWCH_BEDROOM 2	0.5	18
00_1B2P WCH_LKD 2	1.4	N/A
00_3B4PH_LKD 3	2.1	N/A
00_3B4PH_LKD 4	2.2	N/A
01_2B4P_LKD 8	1.2	N/A
00_1B2P WCH_LKD 1	1.6	N/A
01_2B4P_LKD 7	1.2	N/A
01_2B4P_BEDROOM 7.2	0.5	21
01_2B4P_BEDROOM 7.1	1.2	17
01_2B4P_BEDROOM 8.2	0.5	25
01_2B4P_BEDROOM 8.1	1.3	15
01_2B4P_LKD 9	1.2	N/A
01_2B4P_BEDROOM 9.1	0.5	24
01_2B4P_BEDROOM 9.2	1.3	17
01_2B4P_LKD 10	1.8	N/A
01_2B4P_BEDROOM 10.2	1.2	14
01_2B4P_BEDROOM 10.1	0.5	21
01_3B4PH_DOUBLEBED 6	0.3	23
01_3B4PH_DOUBLEBED 5	0.3	23
01_3B4PH_SINGLE BED 5.1	0.7	23
01_3B4PH_SINGLE BED 5.2	0.7	22
01_3B4PH_SINGLE BED 6.2	0.7	22
01_3B4PH_SINGLE BED 6.1	0.7	23
02_2B4P_LKD 8	1.3	N/A
02_2B4P_LKD 7	1.5	N/A
02_2B4P_BEDROOM 7.2	0.5	22
02_2B4P_BEDROOM 7.1	1.3	17
02_2B4P_BEDROOM 8.2	0.5	23
02_2B4P_BEDROOM 8.1	1.2	15
02_2B4P_LKD 9	1.4	N/A
02_2B4P_BEDROOM 9.1	0.5	22
02_2B4P_BEDROOM 9.2	1.3	17
02_2B4P_LKD 10	1.7	N/A
02_2B4P_BEDROOM 10.2	1.4	14
02_2B4P_BEDROOM 10.1	0.5	22
03_1B2P_BEDROOM 7.1	0.7	N/A
03_1B2P_BEDROOM 8	0.7	17
03_1B2P_LIVING/KITCHEN 7	1.8	17
03_1B2P_LIVING/KTCHEN 8	1.7	N/A
03_1B2P_BEDROOM 9	0.7	N/A
03_1B2P_LKD 9	1.7	17
03_1B2P_BEDROOM 10	0.7	N/A
03_1B2P_LKD 10	2.5	16
Total	44	28
	44	28
	100%	100%

Table 8-3 – Case 1

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<u>Naturally ventilated rooms</u>

Rooms	DSY1		DSY2		DSY3	
	Crit 1	Crit 2	Crit 1	Crit 2	Crit 1	Crit 2
	=<3.0%	=<32hrs	=<3.0%	=<32hrs	=<3.0%	=<32hrs
00_1B2PWCH_BEDROOM 1	0.5	17	1.4	35	2	53
00_1B2PWCH_BEDROOM 2	0.5	18	1.4	35	2	53
00_1B2P WCH_LKD 2	1.4	N/A	3	N/A	4.9	N/A
00_3B4PH_LKD 3	2	N/A	3.6	N/A	5.7	N/A
00_3B4PH_LKD 4	2	N/A	3.6	N/A	5.7	N/A
01_2B4P_LKD 8	1.2	N/A	2.7	N/A	4.2	N/A
00_1B2P WCH_LKD 1	1.6	N/A	3.1	N/A	5	N/A
01_2B4P_LKD 7	1.1	N/A	2.6	N/A	4.2	N/A
01_2B4P_BEDROOM 7.2	0.4	20	1.4	41	1.9	63
01_2B4P_BEDROOM 8.2	0.5	24	1.4	46	2.2	67
01_2B4P_BEDROOM 8.1	1.3	15	2.1	28	3.2	38
01_2B4P_LKD 9	1.2	N/A	2.6	N/A	4.2	N/A
01_2B4P_BEDROOM 9.1	0.5	24	1.4	46	2.2	67
01_2B4P_BEDROOM 9.2	1.3	17	2.1	30	3.1	42
01_2B4P_LKD 10	1.6	N/A	3.2	N/A	4.7	N/A
01_2B4P_BEDROOM 10.1	0.4	19	1.4	41	1.9	63
01_3B4PH_DOUBLEBED 6	0.2	22	1	51	1.3	72
01_3B4PH_DOUBLEBED 5	0.2	22	1	51	1.4	74
02_2B4P_LKD 8	1.3	N/A	2.8	N/A	4.4	N/A
02_2B4P_LKD 7	1.4	N/A	3	N/A	4.5	N/A
02_2B4P_BEDROOM 7.2	0.5	20	1.4	46	2.1	66
02_2B4P_BEDROOM 8.2	0.5	22	1.4	46	2.2	66
02_2B4P_BEDROOM 8.1	1.2	15	2.1	28	3.2	36
02_2B4P_LKD 9	1.4	N/A	2.9	N/A	4.4	N/A
02_2B4P_BEDROOM 9.1	0.5	22	1.4	46	2.2	66
02_2B4P_BEDROOM 9.2	1.3	17	2.1	29	3.2	42
02_2B4P_LKD 10	1.6	N/A	3.3	N/A	4.6	N/A
02_2B4P_BEDROOM 10.1	0.5	20	1.4	46	2.1	66
03_1B2P_BEDROOM 7.1	0.7	17	1.7	31	2.5	48
03_1B2P_BEDROOM 8	0.7	17	1.7	31	2.5	48
03_1B2P_LIVING/KITCHEN 7	1.8	N/A	3.2	N/A	5	N/A
03_1B2P_LIVING/KTCHEN 8	1.7	N/A	3.1	N/A	4.9	N/A
03_1B2P_BEDROOM 9	0.7	17	1.7	31	2.4	48
03_1B2P_LKD 9	1.7	N/A	3.1	N/A	4.9	N/A
03_1B2P_BEDROOM 10	0.7	15	1.6	31	2.3	45
03_1B2P_LKD 10	2.5	N/A	3.9	N/A	5.8	N/A
Total	36	20	27	8	16	0
	36	20	36	20	36	20
	100%	100%	75%	40%	44.44%	0%

Table 8-4 – Case 2

<u>Mechanically ventilated rooms</u>

Rooms	DSY1	DSY2	DSY3
	Criteria 1	Criteria 1	Criteria 1
	=<3.0%	=<3.0%	=<3.0%
01_2B4P_BEDROOM 7.1	1	2.4	3.9
01_2B4P_BEDROOM 10.2	0.8	2.3	3.6
01_3B4PH_SINGLE BED 5.1	0.5	2.1	3.2
01_3B4PH_SINGLE BED 5.2	0.5	2	3.1
01_3B4PH_SINGLE BED 6.2	0.5	2	3.1
01_3B4PH_SINGLE BED 6.1	0.5	2.1	3.2
02_2B4P_BEDROOM 7.1	1.5	2.7	4.2
02_2B4P_BEDROOM 10.2	1.1	2.6	3.9
TOTAL	8	8	0
	8	8	8
	100%	100%	0%

Table 8-5 – Case 2

8.3 Mechanical cooling system Specifications

The building and modelling assumptions used in the assessment are outlined below. The system specifications and assumptions used are outlined in Table 8-6.

Rooms	Cooling Unit capacity (kW)	Operation profile
Bedrooms	0.25	Cooling is switched on when the room temperatures increase above 23 degrees.
Living rooms/kitchens	0.25	

Table 8-6 – System specifications

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