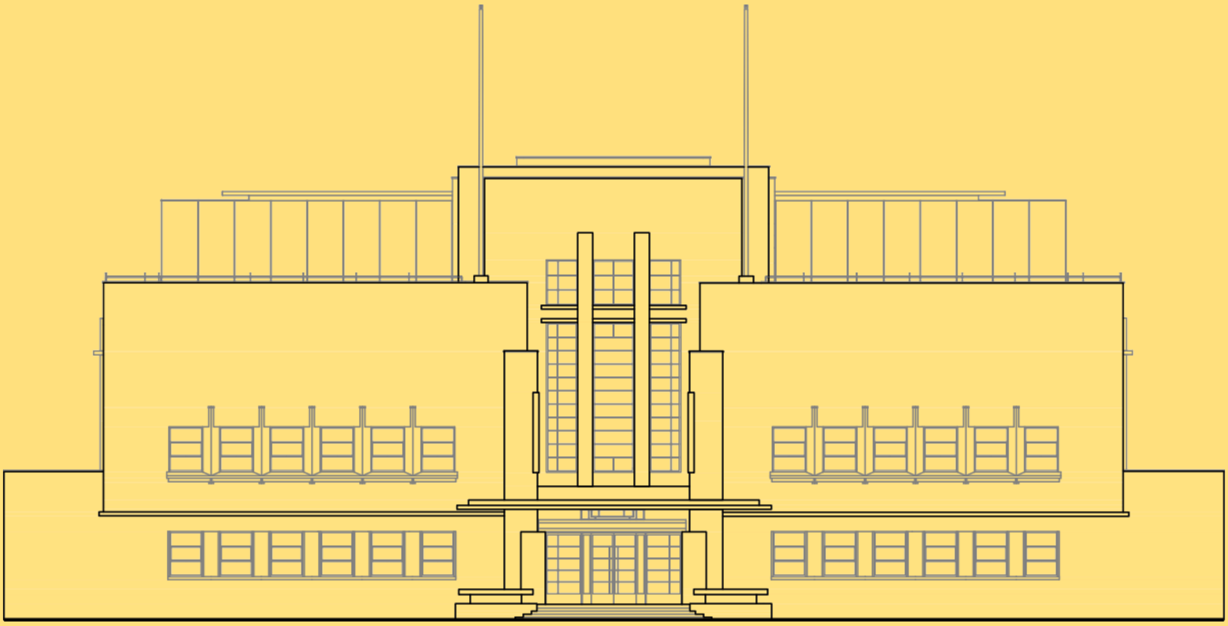

RAVENSCOURT PARK

FORMER ROYAL MASONIC HOSPITAL

T·T

Cudd Bentley Consulting

Overheating Report

6391-CBC-IC-RP-S-005 P01

November 2023

CONTENTS

RECORD OF REVISIONS.		
Date.	Revision.	Description of change.
14/11/2023	1	Final Issue.

1 INTRODUCTION

Cudd Bentley Consulting has produced the following dynamic thermal model in order to review the buildings overheating and cooling performance for the safety and comfort of its residents, with respect to CIBSE TM59. A sample of proposed residential units representing a typical floor are assessed. The study has been undertaken in accordance with The Greater London Authority (GLA), The London Plan Policy SI 4 (Managing heat risk), Hammersmith and Fulham local plan (Adopted February 2018), Approved Document O (2022) and has been conducted using the datasets of CIBSE TM59 in order to identify the overheating risk.

Thermal modelling has been undertaken by a Cudd Bentley CIBSE Low Carbon Energy Assessor, who is registered to carry Level 5 Energy Assessments. Level 5 energy assessments account for dynamic thermal modelling, which are preferred when a building has a more complex design and incorporating specialist building fabric design. The SBEM software used to carry out the modelling is Bentley, HEVACOMP, Version V8i, SS1 SP5 which is approved software.

The initial drawing used for the thermal model was retrieved from SPPARC. The Hevacomp model showing the sample units that were assessed for the overheating analysis are displayed below in Figure 1.1, the reason these apartments have been selected is because, single and dual aspect south facing facades will absorb the most energy from the sun, which means that if these facades comply with the TM59 criteria then a healthy assumption can be made that all facades will comply. In addition, a mark-up has been done on Bluebeam highlighting the chosen apartments that have been modelled, this can be seen in Figure 1.2 (highlighted in blue).

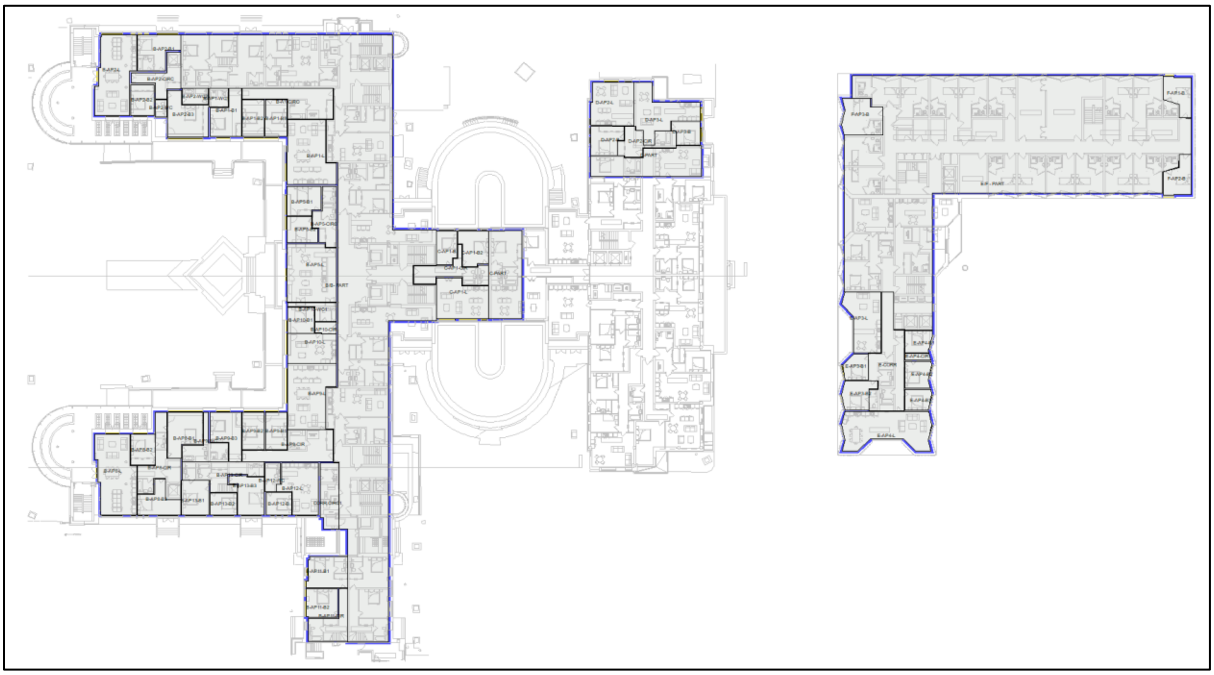

Figure 1.1: 15 Ravenscourt Park Hospital (Sample apartments)

Figure 1.2: 15 Ravenscourt Park Hospital (Sample apartments Mark-Up)

2 DESIGN PARAMETERS

The following design parameters have been utilised to create the thermal model.

2.1 CONSTRUCTION ELEMENTS

The following U- values and construction detailed have been used within the thermal model:

Blocks B, C & D

- External Walls - U-value = 0.55 W/m².K;
- Exposed Floors - U-value = 0.25 W/m².K;
- Glazing - U-value = 1.2 W/m².K; g-value= 0.36;

Blocks E & F

- External Walls - U-value = 0.18 Block E, U-value = 0.16 Block F W/m².K;
- Exposed Floors - U-value = 0.15 Block E, U-value = 0.25 Block F W/m².K;
- Glazing - U-value = 1.2 W/m².K; g-value= 0.36;

2.2 ROOM OCCUPANCY AND HEAT GAIN

Table 1 below outlines the occupancy and heat gain profiles utilised within the thermal model.

Number of people	Description	Peak load (W) Sensible	Latent	Period 00–01	01–02	02–03	03–04	04–05	05–06	06–07	07–08	08–09	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21–22	22–23	23–24
				Hour-ending 1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.7
2	Studio occupancy	150	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
1	1-bed: living occupancy	75	55	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
1	1-bed: kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	2-bed: living occupancy	150	110	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
2	2-bed: kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3	3-bed: living occupancy	225	165	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
3	3-bed: kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
	Single bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Double bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Studio equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living/kitchen equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living equipment	150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1	1	1	1	0.4	0.4
	Kitchen equipment	300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	1	1	0.17	0.17	0.17	0.17
	Lighting profile	2 (W/m2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

Table 2.1: Occupancy and Heat Gain Profiles

2.3 HEAT GAINS

The following heat gains have been implemented within the thermal model:

- Equipment – 80 Watts (Bedrooms) 450 Watts (Living Rooms).
- Lighting – 2W/m^2

2.4 WINDOWS

The windows are modelled with the following glazing properties:

- Glazing ‘U’ Value – 1.2 W/m^2K;
- Light Transmittance – 0.50;
- G Value – 0.36;
- Shading Co-efficient – 0.41;
- Glazing to Frame Ratio – 0.85.

Daylight

High levels of natural daylight will be provided, wherever possible, through effective window design. The glazing specification for the new development will be optimised to ensure that the glazed elements provide excellent thermal performance combined with optimum solar reflectance to minimise summer solar heat gains along with high daylight transmittance factors to maximise daylight factors. Encouraging the correct quality and quantity of daylight to penetrate the building is key to reducing the amount of light required from artificial sources and hence energy requirements.

2.5 VENTILATION RATES

Room	Natural Ventilation	Mechanical Ventilation Rate	Cooling System
Lounges	Windows allowed to be openable as per acoustic report undertaken by Noise Consultants.	MVHR to allow background ventilation with summer boost mode (only applicable for new built rooms).	Cooling system proposed for superior apartments (as per the client's request).
Bedrooms	Windows allowed to be openable as per acoustic report undertaken by Noise Consultants.	MVHR to allow background ventilation with summer boost mode (only applicable for new built rooms).	Cooling system proposed for superior apartments (as per the client's request).

The development has a variety of ventilation strategies due to the different natures of the rooms within the development. Summary as follows:

1. All rooms within Block E and F are new built and are equipped with an MVHR unit.
2. Level 5 on Block B and C are new built and are equipped with an MVHR unit.
3. Level 3 and 4 on Block D is also new built and are equipped with an MVHR unit.
4. Remaining rooms (lower levels on Block B,C & D) are existing elements where incorporating ventilation systems presents challenges, as it requires careful consideration to minimise impact on the buildings historic nature. MEV has been proposed to comply with Part F of building regulations.

Cooling systems have been proposed to be installed within superior apartments (these are apartments within the development which will be high-priced as deemed "luxury" by the client). Within this sample of flats used for the analysis, the superior apartments are 2 and 8. Cooling can be environmentally friendly when it is implemented in a way that minimizes negative impacts on the environment. Here are some reasons why cooling can be considered environmentally friendly:

- Energy Efficiency: Environmentally friendly cooling solutions prioritize energy efficiency. When cooling systems are designed to consume less energy, they reduce the demand for electricity, which in turn reduces greenhouse gas emissions from power generation.

- Reduced Emissions: Environmentally friendly cooling technologies release fewer greenhouse gases and pollutants into the atmosphere. This helps mitigate climate change and air quality issues.

- Smart Technologies: Using smart technologies can optimize cooling operations, reduce energy waste, and improve overall system efficiency.

2.6 WEATHER DATA

The CIBSE Design Summer Year London 2020s, high emissions, 50 percentile scenario, DSY 1, has been imported within the calculations to represent a typical year for the Hammersmith geographical location of the development.

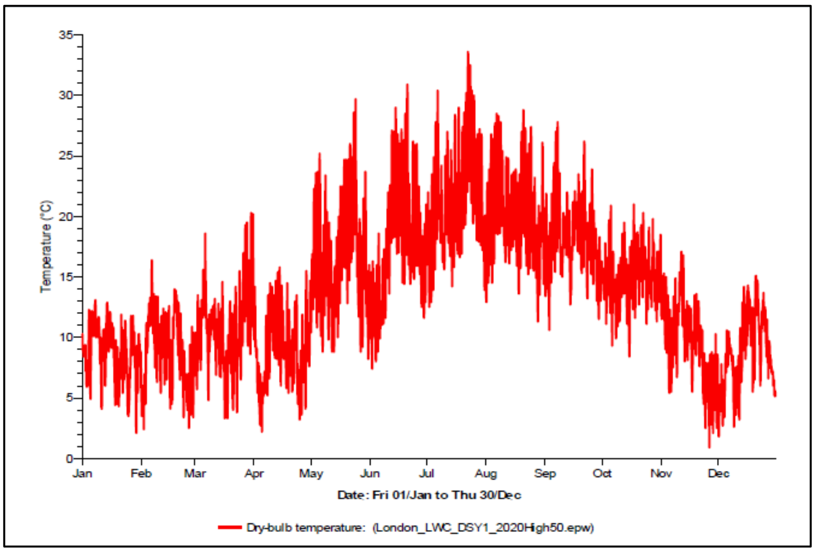

Figure 2.1: CIBSE Design Summer Year London – DSY1

3 OVERHEATING REQUIREMENTS

CIBSE TM59 requirements

Compliance with CIBSE TM59 for residential space that are predominantly mechanically ventilated is based on the following criteria:

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

Compliance with CIBSE TM59 for residential space that are predominantly naturally ventilated is based on the following criteria:

- For living rooms, kitchens and bedrooms: the number of hours during which the change in temperature is greater than or equal to one degree (K) during period May to September inclusive shall not be more than 3% of occupied hours.
- For bedrooms only: to guarantee thermal comfort during sleeping hours the operative temperature in the bedroom from 10pm to 7am 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 hours above 26°C will be recorded as a fail).

CIBSE TM52 requirements

TM52 states that in hot periods people's perception of heat is better coped with during long periods exposed to warmth. In order to assess this, TM52 requires an analysis of the following:

- Hours of Exceedance (He);
- Daily Weighted Exceedance (We);
- Upper Limit Temperature (Tupp).

The above analysis should then be assessed against the following criteria within TM52 which states that should any two of the three criteria fail, a building or room is classed as overheating:

- 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). This is further detailed within TM52 as the *He* shall not exceed 3% of the total occupied hours.
- 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. This is further detailed within TM52 as the *We* shall be less than or equal to 6 in any one day.
- The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable. This is further detailed within TM52 as the *Tupp* shall not exceed 4K.

3.1 APPROVED DOCUMENT 0

Requirement O1 Overheating Mitigation

1. Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to -
    a) Limit unwanted solar gains in summer;
    b) Provide an adequate means to remove heat from the indoor environment

2. In meeting the obligations in paragraph (1) –
    a) Account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and
    b) Mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.

Paragraph 2.8

Although internal blinds and curtains provide some reduction in solar gains, they should not be taken into account when considering whether requirement O1 has been met.

4 RESULTS

This section looks at the simulation results for naturally and mechanically ventilated scenarios. The simulation was run using 3 scenarios as follows:

- Natural ventilation only (for existing apartments within Block B,C and D)
- MVHR unit alongside natural ventilation (for new built apartments)
- MVHR unit with a cooling system (for the superior apartments only)

4.1 NATURALLY VENTILATION ONLY

The thermal model demonstrates that for DSY 1 CIBSE weather data the development's design and services strategy delivers thermal comfort levels in all rooms including lounges and bedrooms.

Room	Pass/Fail	% above 1% 26°C Threshold (Bedrooms)	% above 3% 26°C Threshold (Lounges)
B-AP1-L	Pass		
B-AP1-B1	Pass		
B-AP1-B2	Pass		
B-AP1-B3	Pass		
B-AP5-L	Pass		
B-AP5-B1	Pass		
B-AP5-B2	Pass		
B-AP10-L	Pass		
B-AP10-B1	Pass		
B-AP9-L	Pass		
B-AP9-B1	Pass		
B-AP9-B2	Pass		
B-AP9-B3	Pass		
C-AP1-L	Pass		
C-AP1-B1	Pass		
C-AP1-B2	Pass		
D-AP2-L	Pass		
D-AP2-B1	Pass		
D-AP3-L	Pass		
D-AP3-B1	Pass		

Table 4.1: CIBSE TM59 and TM52 Results – DSY1 (Naturally ventilation Only)

To note, for the existing apartments assessed within this section, blinds have been adopted within the model to mitigate overheating and achieve compliance with the TM59 criteria.

4.2 NATURALLY VENTILATED WITH MVHR (3 AIR CHANGES)

The thermal model demonstrates that for DSY 1 CIBSE weather data the development's design and services strategy deliver thermal comfort levels in all occupied new built spaces in accordance with the requirements set out within TM52 and TM59 CIBSE Guides, when an MVHR system is utilized alongside natural ventilation. This simulation was run using an MVHR at 3 air changes.

Room	Pass/Fail	% above 1% 26°C Threshold (Bedrooms)	% above 3% 26°C Threshold (Lounges)
E-AP3-L	Pass		
E-AP3-B1	Pass		
E-AP3-B2	Pass		

E-AP3-B3	Pass		
E-AP4-L	Pass		
E-AP4-B1	Pass		
E-AP4-B2	Pass		
E-AP4-B3	Pass		
F-AP1-B	Pass		
F-AP2-B	Pass		
F-AP3-B	Pass		

Table 4.2: CIBSE TM59 and TM52 Results – DSY1 (Naturally ventilated with MVHR at 3 air changes)

4.3 COOLING SYSYTEM

The thermal models demonstrates that for DSY 1 CIBSE weather data the development's design and services strategy deliver thermal comfort levels in Apartments 2 and 8 (superior apartments) when use of a cooling system is added to the simulation.

Room	Pass/Fail	% above 3% 26°C Threshold (Lounges/ Bedrooms)
B-AP8-L	Pass	
B-AP8-B1	Pass	
B-AP8-B2	Pass	
B-AP8-B3	Pass	
B-AP2-L	Pass	
B-AP2-B1	Pass	
B-AP2-B2	Pass	
B-AP2-B3	Pass	

Table 4.3: CIBSE TM59 Results – DSY1 (Cooling)

5 CONCLUSION

From running the simulation, it is evident that the current proposed ventilation strategy is compliant with TM59 criteria for all of the rooms within the development. Summary of the overheating results is as follows:

1. All rooms within Block E and F (new built element of the development) are complying with CIBSE TM59 and Part O criteria, through use of passive measures such as openable windows and MVHR.
2. Level 5 on Block B and C is new built and is complying with TM59 and Part O criteria.
3. Level 3 and 4 on Block D is new built and is also complying with TM59 and Part O criteria.
4. All rooms within the existing historic element of the building are compliant with TM59 overheating criteria.

Compliance with TM59 of building regulations can be particularly challenging for historic buildings due to their unique characteristics and preservation requirements. Therefore, through the proposed design, overheating has been mitigated across all existing rooms within Block B, C and D through use of blinds and openable windows.

In conclusion, it can be confirmed that the proposed scheme is compliant with the TM59 overheating criteria, and the results can be found within section 4.

APPENDIX A – OVERHEATING CHECKLIST

Ravenscourt Park Hospital

Section 1 - Site features affecting vulnerability to overheating		
Site location	Urban – within central London or in a high density conurbation	Yes
	Peri-urban – on the suburban fringes of London	No
Air quality and/or Noise sensitivity – are any of the following in the vicinity of buildings?	Busy roads / A roads	No
	Railways / Overground / DLR	Yes (Tube Station)
	Airport / Flight path	Yes (Circa 12 miles from London Heathrow Airport)
	Industrial uses / waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	The residential development is likely to have a mixed demographic of occupants (e.g. elderly, disabled, young children)
	Are residents likely to be at home during the day (e.g. students)?	The residential development is likely to have a mixed demographic of occupants
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	No
	If yes, is this to allow acceptable levels of daylighting?	N/A
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Not that we are aware of so far.
	Vulnerable areas identified by the Police Architectural Liaison Officer	N/A
	Other	N/A

Ravenscourt Park Hospital

Section 2 - Design features implemented to mitigate overheating risk		
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	TBC at detailed design
	Will green roofs be provided?	Yes
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	Logika to confirm.
Materials	Have high albedo (light colour) materials been specified?	Specific materials have not been specified yet. We will have concrete pavers on the terraces and the roof and a perimeter zone of pebbles on the roof. Logika to confirm for landscape design.
Dwelling aspect	% of total units that are single aspect	Single Aspect: 47% (65 units)
	% single aspect with N / NE / NW orientation	Single Aspect: 39%
	% single aspect with E orientation	Single Aspect: 48%
	% single aspect with S / SE / SW orientation	Single Aspect: 55%
	% single aspect with W orientation	Single Aspect: 47%
Glazing ratio - What is the glazing ratio (glazing; internal floor area) on each facade?	N / NE / NW	13:98
	E	12:79
	S / SE / SW	33:182
	W	13:13
Daylighting	What is the average daylight factor range?	TBC

Window opening	Are windows openable?	Yes
Window opening	What is the average percentage of openable area for the windows?	25%
Window opening - What is the extent of the opening?	Fully openable	30°
	Limited (e.g. for security, safety, wind loading reasons)	Yes
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	No
Shading	Details of any external shading?	From surrounding Blocks
	Details of any internal shading?	N/A
Glazing specification	Is there any solar control glazing?	1.2 W/m².K for residential and G' value of 0.36
Ventilation - What is the ventilation strategy?	Natural – background	Yes (Trickle Vents)
	Natural – purge	Yes
	Mechanical – background (e.g. MVHR)	MEV & MVHR
	Mechanical – purge	Yes
	What is the average design air change rate	3
Heating system	Is communal heating present?	Yes
	What is the flow/return temperature?	TBC
	Have horizontal pipe runs been minimised?	Yes

	Do the specifications include insulation levels in line with the London Heat Network Manual	Yes