Technical Note – 14th November – Persephone Gardens Thermal Model Study In Compliance with CIBSE Guidance TM52

Executive Summary

Cudd Bentley Consulting have carried out thermal modelling to conduct an overheating assessment of the retirement care units at the Persephone Gardens development.

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

The thermal model demonstrates that the development design and services strategy currently does deliver thermal comfort levels in all occupied spaces in accordance with the requirements set out within TM 52.

Furthermore, the report outlines the average monthly cooling requirement for the month of July for the modelled domestic elements and the cooling demand of the actual and notional buildings for the different non domestic building elements. This is in accordance with the GLA guidance on preparing energy assessments (March 2016).

1.0 Introduction

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 software used to carry out the modelling is Bentley, HEVACOMP, Version V8i, SS1 SP5 which is approved software.

The 5 sample units assessed for overheating are shown in Figure 1-3 below.

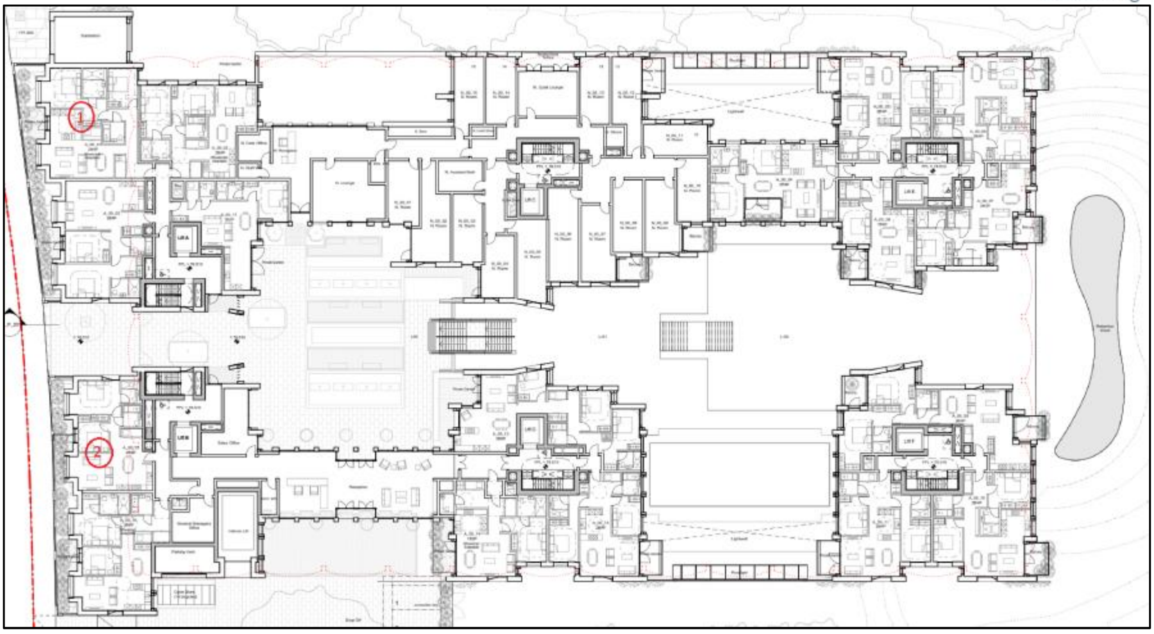


Figure 1 Persephone Gardens Level 00 sample retirement care units

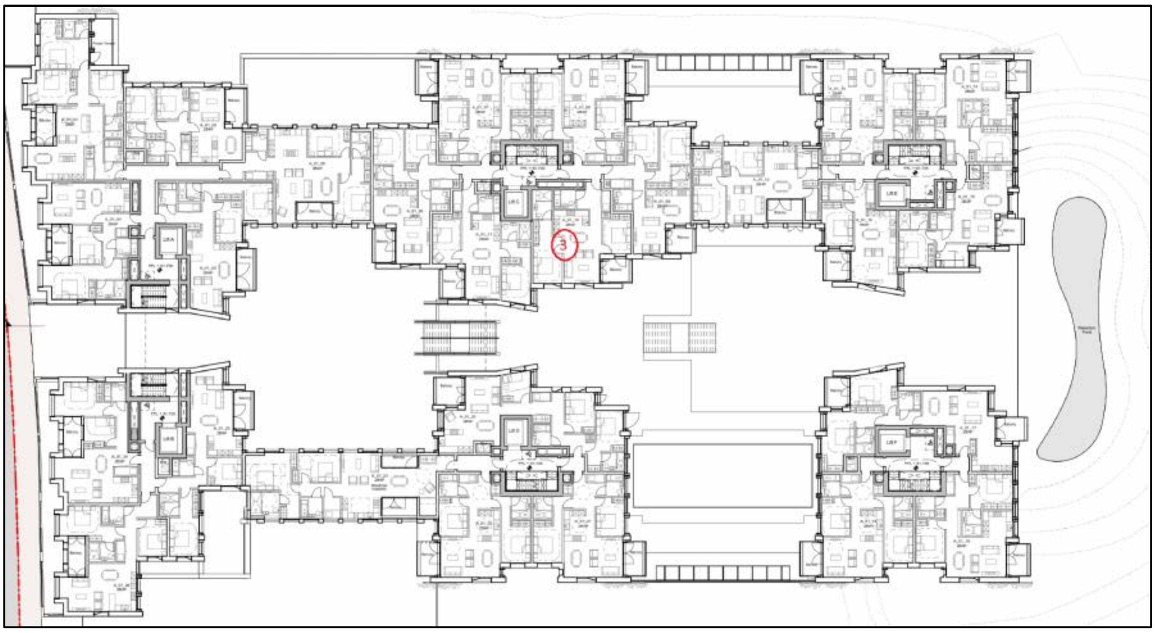


Figure 2 Persephone Gardens Level 01 sample retirement care units

Figure 3 Persephone Gardens Level 02 sample retirement care units

2.0 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:

- External Walls - U = 0.18 W/m².K;
- Exposed Floors - U = 0.13 W/m².K;
- Exposed Roofs - U = 0.13 W/m².K;
- Glazing - U = 1.4 W/m².K; G value of 0.43;
- Air Permeability - 4 $m^3/hr/m^2$@ 50 Pa;
- Accredited Construction Details in accordance with Table K1 of Appendix K.

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	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 1: Occupancy and Heat Gain Profiles

2.3 Heat Gains

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

- People – 75 Watts Sensible/ 55 Watts Latent;
- Equipment – 80 Watts (Bedrooms) 450 Watts (Lounge / Kitchen).

2.4 Windows

Windows have been modelled in accordance with drawing number A_SK_0057 and plans shown in Figure 1-3, as advised by Robin Partington & Partners Architects. The following glazing specification has been used within the model:

- Glazing 'U' Value – 1.4 W/m^{2}K;
- Light Transmittance – 0.68;
- G Value – 0.43;
- Shading Co-efficient – 0.43;
- Glazing to Frame Ratio – 0.85.

High Performance internal blinds have been specified to each retirement care unit within the thermal model as a measure to prevent solar gain. It is anticipated these would be closed by occupants when internal temperatures exceed 22^{o}c.

2.5 Ventilation Rates

Room	Mechanical Ventilation Rate	Opening Windows
Living Room/ Kitchen	N/A	Openable windows to allow 4 ACH Appendix B
Bedroom	N/A	Openable windows to allow 4 ACH Appendix B

Table 2 Ventilation Rates

2.6 Weather Data

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

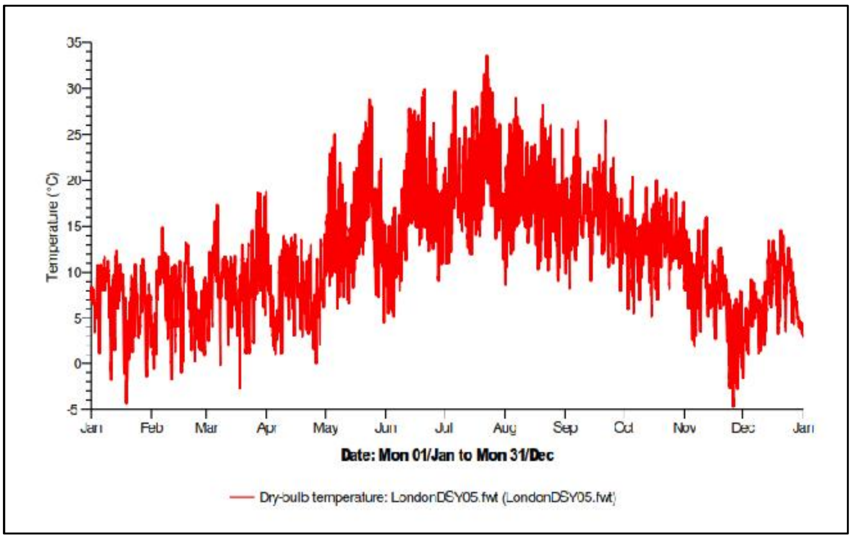


Figure 4 CIBSE Design Summer Year London

3.0 CIBSE TM52 Results

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 Results

The 5 sample retirement care units (Figure 1-3) have been assessed under the CIBSE TM52 criteria which assesses overheating against the requirements identified in Section 3.0; the results are detailed in the Table 5 found within Appendix A

4.0 Summary

The thermal model demonstrates that the development design and services strategy currently does deliver thermal comfort levels in all occupied spaces in accordance with the requirements set out within TM 52.

5.0 Next Steps

Taking into account the thermal model results detailed above, the following elements could be considered further by the Design Team to further reduce the temperatures during the summer period.

- Provision of external glazing with lower G-values and shading co-efficient in order to limit excessive solar gains;
- Decrease the area of glazing;
- Provide external shading (Brise Soliel);

- Provision of comfort cooling systems which, though not achieving full air conditioning temperatures, can provide enough coolth to provide acceptable levels of comfort;
- Provide additional ventilation to achieve higher air change rates.

6.0 Active Cooling

6.1 Domestic Cooling Demand

The following table 3 outlines the average monthly cooling requirement for the month of July for the modelled dwellings as part of the assessment. The maximum July cooling demand for the development is also provided. This is in accordance with the GLA guidance on preparing energy assessments (March 2016) section 12.15.

Average Domestic Cooling Demand for July kWh/m^2	Maximum Domestic Cooling Demand for July kWh/m^2
136.82 kWh/m^2	155.20 kWh/m^2

Table 3 Average & Maximum Cooling Demands for July

6.2 Non Domestic Cooling Demand

The following table 4 compares the cooling demand of the actual and notional buildings for the different building elements. It can be seen that for both non domestic spaces of the development the area weighted average actual cooling demand is less than the area weighted notional cooling demand. This is in accordance with the GLA guidance on preparing energy assessments (March 2016) section 12.18. The 'HVAC Systems Performance' tables can be found in Appendix D.

Area Weighted Average Building Cooling Demand (MJ/m^2)		
	Commercial Space	**Nursing Home**
Actual	258.94 MJ/m^2	199.78 MJ/m^2
Notional	259.52 MJ/m^2	218.22 MJ/m^2

Table 4 Area weighted average cooling demands for non domestic building elements

SBEM & SAP calculations have been used to check compliance with Building Regulations; summertime temperature. Current SBEM models and SAP calculations confirm that the risk of overheating is considered to be within acceptable limits. The GLA's overheating checklist has been completed and can be found in Appendix C.

Appendix A

Month	*He*	Occupied Hours	*We*	*Tupp*	Pass/ Fail
			1.LOUNGE		
May	0	403	0	0	**Pass**
June	0	390	0	0	
July	0	403	0	0	
August	0	403	0	0	
September	0	390	0	0	
Totals	**0**	**1989**	**0**	**0**	
			1.BED1		
May	0	744	0	0	**Pass**
June	0	720	0	0	
July	0	744	0	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**0**	**3672**	**0**	**0**	
			1.BED2		
May	0	744	0	0	**Pass**
June	0	720	0	0	
July	0	744	0	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**0**	**3672**	**0**	**0**	
			2.LOUNGE		
May	0	403	0	0	**Pass**
June	0	390	0	0	
July	0	403	0	0	
August	0	403	0	0	
September	0	390	0	0	
Totals	**0**	**1989**	**0**	**0**	
			2.BED1		
May	0	744	0	0	**Pass**
June	0	720	0	0	
July	0	744	0	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**0**	**3672**	**0**	**0**	

2.BED2					
May	0	744	0	0	**Pass**
June	0	720	0	0	
July	0	744	0	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**0**	**3672**	**0**	**0**	
3.LOUNGE					
May	0	403	0	0	**Pass**
June	0	390	0	0	
July	0	403	0	0	
August	0	403	0	0	
September	0	390	0	0	
Totals	**0**	**1989**	**0**	**0**	
3.BED1					
May	0	744	0	0	**Pass**
June	0	720	0	0	
July	0	744	0	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**0**	**3672**	**0**	**0**	
3.BED2					
May	0	744	0	0	**Pass**
June	0	720	1	0	
July	77	744	7	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**77**	**3672**	**8**	**0**	
4.LOUNGE					
May	0	403	0	0	**Pass**
June	0	390	0	0	
July	0	403	0	0	
August	0	403	0	0	
September	0	390	0	0	
Totals	**0**	**1989**	**0**	**0**	
4.BED1					
May	0	744	1	0	**Pass**
June	6	720	4	0	
July	93	744	10	0	

August	0	744	1	0	
September	0	720	0	0	
Totals	**100**	**3672**	**16**	**0**	
5.LOUNGE					
May	0	403	0	0	**Pass**
June	0	390	0	0	
July	0	403	0	0	
August	0	403	0	0	
September	0	390	0	0	
Totals	**0**	**1989**	**0**	**0**	
5.BED1					
May	0	744	0	0	**Pass**
June	1	720	2	0	
July	62	744	7	0	
August	0	744	1	0	
September	0	720	0	0	
Totals	**63**	**3672**	**10**	**0**	
5.BED2					
May	0	744	0	0	**Pass**
June	0	720	0	0	
July	12	744	4	0	
August	0	744	0	0	
September	0	720	0	0	
Totals	**12**	**3672**	**4**	**0**	

Table 5 CIBSE TM52 Results

Appendix B

The following outlines the requirements as per Approved Document F for the requirements for natural ventilation through openable windows:-

Appendix B: Purge ventilation

Introduction

Adequate ***purge ventilation*** may be achieved by the use of openable windows and/or external doors. This Appendix provides details of necessary window and door sizes. The diagrams highlight the window dimensions of importance.

Windows

- For a hinged or pivot window that opens 30° or more or for parallel sliding windows (e.g. vertical sliding sash windows), the height x width of the opening part should be at least 1/20th of the floor area of the room.
- For a hinged or pivot window that opens between 15° and 30°, the height x width of the opening part should be at least 1/10th of the floor area of the room.
- If the window opens less than 15° it is not suitable for providing ***purge ventilation*** and other arrangements should be made.
- If the room contains more than one openable window, the areas of all the opening parts may be added to achieve the required proportion of the floor area. The required proportion of the floor area is determined by the opening angle of the largest window in the room.
- Note that Approved Document B includes provisions for the size of escape windows. The larger of the provisions in Approved Document B or F should apply in all cases.

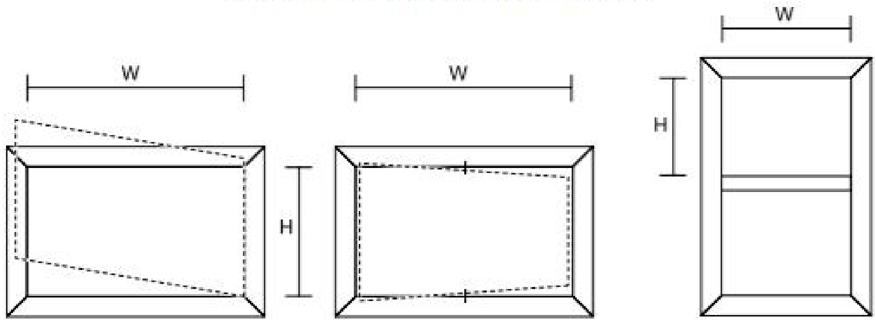
External doors (including patio doors)

- For an external door, the height x width of t opening part should be at least 1/20th of th floor area of the room. If the room contains more than one external door, the areas of al the opening parts may be added to achieve at least 1/20th of the floor area of the room.
- If the room contains more than one externa door, the areas of all the opening parts may be added to achieve at least 1/20th of the floor area of the room.
- If the room contains a combination of at lea one external door and at least one openabl window, the areas of all the opening parts may be added to achieve at least 1/20th of the floor area of the room.

Window dimensions

Window opening area = H x W

(H and W are the dimensions of the open area)



(a) Side hinged (b) Centre pivot (about vertical axis) (c) Sash window

Approved Document F 2010 (2013 Amendments) Page 4

Appendix C

Section 1 - Site features affecting vulnerability to overheating		Yes or No
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	Yes
	Railways / Overground / DLR	Yes
	Airport / Flight path	Yes
	Industrial uses / waste facility	Yes
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	Yes
	Are residents likely to be at home during the day (e.g. students)?	Yes
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	Yes
	If yes, is this to allow acceptable levels of daylighting?	Yes
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Yes
	Vulnerable areas identified by the Police Architectural Liaison Officer	No
	Other	

Section 2 - Design features implemented to mitigate overheating risk		Please respond
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	Yes
	Will green roofs be provided?	Yes
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	Ponds provided in courtyards – refer to landscape plans
Materials	Have high albedo (light colour) materials been specified?	Yes – refer to CGIs in Design and Access Statement
Dwelling aspect	% of total units that are single aspect	2.5
	% single aspect with N / NE / NW orientation	0
	% single aspect with E orientation	0
	% single aspect with S / SE / SW orientation	2.5
	% single aspect with W orientation	0
Glazing ratio - What is the glazing ratio (glazing; internal floor area) on each facade?	N / NE / NW	TBC
	E	TBC
	S / SE / SW	TBC
	W	TBC
Daylighting	What is the average daylight factor range?	Refer to Daylight Report
Window opening	Are windows openable?	Yes
Window opening	What is the average percentage of openable area for the windows?	Refer to drawing issued
Window opening - What is the extent of the opening?	Fully openable	Yes – Dependent on location
	Limited (e.g. for security, safety, wind loading reasons)	Yes – Dependent on location
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time	

Section 2 - Design features implemented to mitigate overheating risk		Please respond
	natural ventilation method been provided (e.g. ventilation grates)?	
Shading	Is there any external shading?	Yes – note the balconies that provide shading to areas of principle glazing
	Is there any internal shading?	Yes
Glazing specification	Is there any solar control glazing?	Yes
Ventilation - What is the ventilation strategy?	Natural – background	Yes
	Natural – purge	Yes
	Mechanical – background (e.g. MVHR)	No
	Mechanical – purge	No
	What is the average design air change rate	4 ACH
Heating system	Is communal heating present?	Yes
	What is the flow/return temperature?	70-50°C
	Have horizontal pipe runs been minimised?	Yes
	Do the specifications include insulation levels in line with the London Heat Network Manual	Yes, (Insulation to be specified in accordance with BS5422:2009 Annex G and Table 5 of The Domestic Building Services Compliance Guide 2013)

Appendix D HVAC System Performance

Nursing Home

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	58.7	98.9	20.1	0	3.9	0.81	0	0.91	0
	Notional	82.8	163.3	28.1	0	1.9	0.82	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	10.5	230.3	3.6	8.1	35.8	0.82	7.91	0.91	8.37
	Notional	21.3	245.3	7.2	18.9	27.2	0.82	3.6	----	----
[ST] No Heating or Cooling										
	Actual	114.6	116.3	0	0	0	0	0	0	0
	Notional	100.5	133.1	0	0	0	0	0	----	----
[ST] No Heating or Cooling										
	Actual	15.8	50.4	0	0	0	0	0	0	0
	Notional	9.7	97.5	0	0	0	0	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	7.6	422.7	2.5	15.3	47.8	0.84	7.69	0.91	8.37
	Notional	10.5	517.1	3.5	39.9	32.9	0.82	3.6	----	----

Commercial Space

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	191.1	73.1	0	0	0	0	0	0	0
	Notional	250.9	166.3	0	0	0	0	0	----	----
[ST] No Heating or Cooling										
	Actual	55	33.8	0	0	20.1	0	0	0	0
	Notional	52.9	33.2	0	0	24.2	0	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	3.5	365.1	1.2	13.2	38.3	0.84	7.69	0.91	8.37
	Notional	12.7	404.9	4.3	31.2	30.7	0.82	3.6	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	19.5	488.8	6.5	17.6	87.7	0.84	7.69	0.91	8.37
	Notional	17.9	475.4	6.1	36.7	66.2	0.82	3.6	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	4.9	151.8	1.6	5.5	72.8	0.84	7.69	0.91	8.37
	Notional	8.9	165.2	3	12.7	65	0.82	3.6	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	6.7	60.5	2.2	2.2	41.4	0.84	7.69	0.91	8.37
	Notional	10	63.8	3.4	4.9	38	0.82	3.6	----	----
[ST] No Heating or Cooling										
	Actual	186.2	80.2	0	0	0	0	0	0	0
	Notional	236.1	144.6	0	0	0	0	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	5.3	295.7	1.8	10.7	56.3	0.84	7.69	0.91	8.37
	Notional	54.7	371.5	18.6	28.7	51.8	0.82	3.6	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	100.8	2129.8	9.5	197.9	27.7	2.94	2.99	3	4
	Notional	92	2161.1	10.5	166.7	33.3	2.43	3.6	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0	533.2	0	19.3	45.2	0	7.69	0	8.37
	Notional	2.4	604.9	0.8	46.7	43.2	0.82	3.6	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	9.4	0	0	0	0
	Notional	0	0	0	0	11.3	0	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	53.2	4.4	17.6	0.2	65.9	0.84	7.69	0.91	8.37
	Notional	180.3	25	61.2	1.9	69.5	0.82	3.6	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	72.7	85.2	23.6	0	18.5	0.86	0	0.91	0
	Notional	114.4	174.9	38.8	0	31.4	0.82	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	32.4	449.9	10.7	16.2	55	0.84	7.69	0.91	8.37
	Notional	19.8	412.5	6.7	31.8	36.1	0.82	3.6	----	----