Hillingdon Gardens, Hillingdon, Overheating Assessment in Compliance with CIBSE Guidance TM59 – February 2020

1.0 Introduction

A previous Overheating Assessment was undertaken to support the detailed planning application submission in October 2019 and is contained within Appendix D of the CBC Energy Statement dated 1/10/19. Additional Overheating Assessment work has been undertaken as part of continued design development with respect to the initial design and services strategy.

Cudd Bentley Consulting has produced the following dynamic thermal model of a sample of residential units at the Hillingdon Gardens development in Hillingdon. The study has been undertaken using the datasets of CIBSE TM59 and the CIBSE weather datafile DSY1 for the geographical area in order to identify the overheating risk. The sample apartments that have been assessed for overheating are displayed within Appendix A.

The updated analysis shows that each zone complies with the CIBSE compliance criteria for the compulsory weather data file DSY 1 with a lower air change requirement from the proposed MVHR (mechanical ventilation with heat recovery) units. The overheating analysis concludes the use of MVHR units in all apartments with closed windows can comply with the requirements of TM59. However, the use of MVHR is to be minimised where possible:

- In the red and orange zones (indicated within the Acoustic note), MVHR units will be used. In the green zone, it may be possible in some dwellings to utilise natural ventilation (open windows) but the expectation is that the majority of units will require MVHR.
- In the blue and unmarked zones (indicated within the Acoustic note), there is an expectation that the majority of dwellings will be able to have overheating mitigated with the use of open windows, though this is subject to further analysis of the overheating condition, including a consideration of the duration for which such mitigation is required.

A more detailed investigation on the proposed residences due to opening windows for overheating mitigation will be determined at a later stage as this is a detailed design stage consideration. This will follow further work on the overheating assessment, which will determine the extent of overheating both in terms of duration, and location on the site, as well as taking into account air quality issues. This will in turn will determine the acceptability or otherwise of having open windows for a limited time, the strategy will insure compliance with TM59 is achieved.

The 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 SP10 which is approved software.

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 details have been used within the thermal model:
The minimum requirements as detailed in Part L1A (2013) for the residential element, as detailed below:

- External Walls - U = 0.16 W/m².K;
- Exposed Floors - U = 0.11 W/m².K;
- Exposed Roofs - U = 0.11 W/m².K;
- Glazing - U = 1.2 W/m².K; G' value of 0.36;
- Air Permeability - 3 m³/hr/m²@ 50 Pa;

Please note that the Accredited Construction Details are to achieve the details highlighted within Table K1 of Appendix K of Part L 2013.

Please note the glazing sections have been modelled with high performance opaque blinds.

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 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).
- Lighting – 2 W/m²

2.4 Ventilation Rates

Room	Mechanical Ventilation Rate
Living Room/ Kitchen	MVHR and/or openable windows to allow 3.0 – 3.5 ACH
Bedroom	MVHR and/or openable windows to allow 4.0 - 4.8 ACH

Table 2: Ventilation Rates

2.5 Weather Data

The CIBSE Design Summer Year 2020s, high emissions, 50 percentile scenario (DSY1) has been imported within the calculations to represent a typical year for the geographical location of the development.

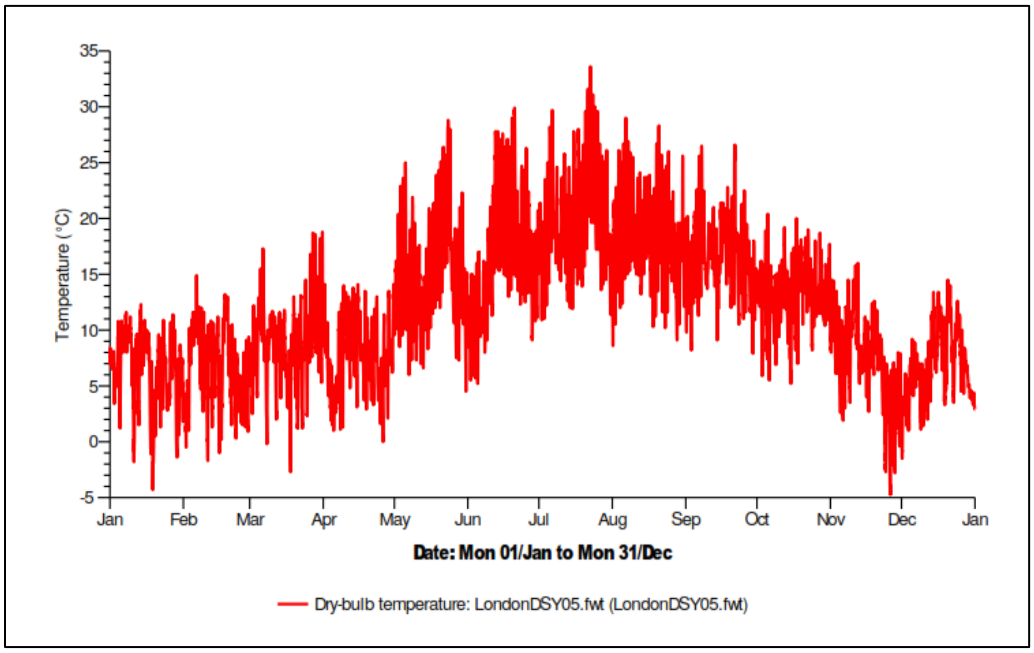

Figure 2: CIBSE Design Summer Year London

3.0 CIBSE TM59 Criteria

Compliance within the zones mechanically ventilated is based on passing both of the following criteria:

a. TM59 states that areas predominantly mechanically ventilated and with restricted window openings, the CIBSE fixed temperature test must be followed, i.e all occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied annual hours.

4.0 Results

The occupied spaces have been assessed under the CIBSE TM59 overheating criteria against the requirements identified in Sections 3.0 and 3.1.

The results to the overheating assessment are summarized in the table below.

Weather file DSY1 Results			
Sample Unit	Room	Pass/Fail	% above 3% 26°C Threshold
1	Bedroom 1	Pass	1.5 %
1	Bedroom 2	Pass	2.9 %
1	Bedroom 3	Pass	2.2 %
1	Lounge / Kitchen	Pass	2.9 %
2	Bedroom 1	Pass	1.3 %
2	Bedroom 2	Pass	2.0 %
2	Lounge / Kitchen	Pass	2.5 %
3	Bedroom 1	Pass	2.7 %
3	Lounge / Kitchen	Pass	2.4 %
4	Bedroom 1	Pass	1.5 %
4	Bedroom 2	Pass	2.8 %
4	Bedroom 3	Pass	2.2 %
4	Lounge / Kitchen	Pass	2.6 %
5	Bedroom 1	Pass	2.9 %
5	Bedroom 2	Pass	2.1 %
5	Lounge / Kitchen	Pass	2.3 %
6	Bedroom 1	Pass	2.8 %
6	Lounge / Kitchen	Pass	1.9 %
7	Bedroom 1	Pass	2.9 %
7	Bedroom 2	Pass	1.9 %
7	Lounge / Kitchen	Pass	2.6 %
8	Bedroom 1	Pass	2.1 %
8	Bedroom 2	Pass	1.8 %
8	Bedroom 3	Pass	1.4 %
8	Lounge / Kitchen	Pass	2.4 %
9	Bedroom 1	Pass	2.2 %
9	Lounge / Kitchen	Pass	2.1 %
10	Bedroom 1	Pass	1.9 %
10	Bedroom 2	Pass	2.4 %
10	Lounge / Kitchen	Pass	2.3 %
0	Corridor	Pass	0.1 %

Table 3 CIBSE TM59 Overheating Results – DSY 1

5.0 Summary

The proposed design and services strategy currently delivers one route to meeting the thermal comfort requirements in all residential units modelled as required by the CIBSE overheating guidance TM59 using CIBSE weather data files DSY1.

Appendix A – Thermal Model

Sample of Residential Units and Corrido