

## Hillingdon Gardens, Hillingdon, Overheating Study in Compliance with CIBSE Guidance TM59 – January 2020

### 1.0 Introduction

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 in order to identify the overheating risk against additional weather data files DSY2 and DSY3, as requested within the GLA Post Stage 1 Response dated 20/01/20.

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.

The sample apartments and commercial elements that have been assessed for overheating are displayed within Appendix A.

### 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/m<sup>2</sup>.K;
- Exposed Floors - U = 0.11 W/m<sup>2</sup>.K;
- Exposed Roofs - U = 0.11 W/m<sup>2</sup>.K;
- Glazing - U = 1.2 W/m<sup>2</sup>.K; G' value of 0.36;
- Air Permeability - 3 m<sup>3</sup>/hr/m<sup>2</sup>@ 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)		Period																							
		Sensible	Latent	Hour-ending																							
				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
				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	1	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	1	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/m<sup>2</sup>

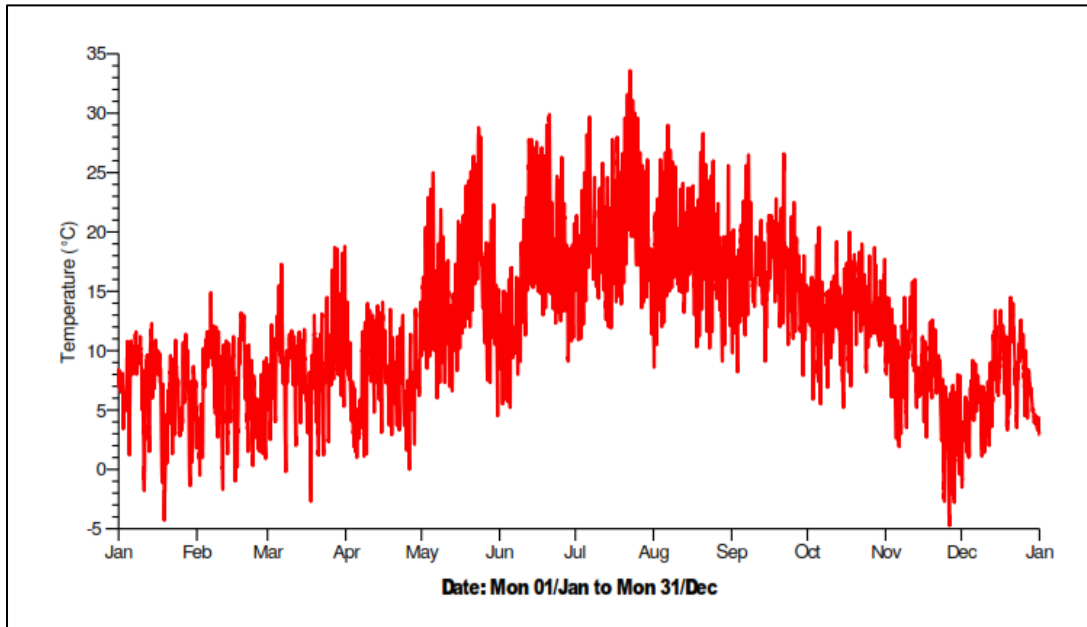
## 2.4 Ventilation Rates

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

**Table 2: Ventilation Rates**

## 2.5 Weather Data

The CIBSE Design Summer Year 2020s, high emissions, 50 percentile scenario (DSY2 and DSY3) have 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.

This report presents the results to the overheating assessment using the CIBSE weather data files DSY2 and DSY3, as requested by the GLA Post Stage 1 comments. Please note that compliance using DSY2 and DSY3 is not compulsory as stated within the GLAs Energy Assessment Guidance (2018), however the risk of overheating has been reduced as far as practicable and is discussed within Section 5.0.

Weather file DSY2			
Sample Unit	Room	Pass/Fail	% above 3% 26°C Threshold
1	Bedroom 1	Fail	0.1 %
1	Bedroom 2	Fail	1.7 %
1	Bedroom 3	Fail	1.0 %
1	Lounge/Kitchen	Fail	2.4 %
2	Bedroom 1	Pass	0 %
2	Bedroom 2	Fail	0.5 %
2	Living/Lounge	Fail	0.8 %
3	Bedroom 1	Fail	1.1 %
3	Living/Lounge	Fail	0.7 %
4	Bedroom 1	Pass	0 %
4	Bedroom 2	Fail	1.6 %
4	Bedroom 3	Fail	1.9 %
5	Bedroom 1	Fail	1.6 %
5	Bedroom 2	Fail	0.7 %
5	Living/Lounge	Fail	0.6 %
6	Bedroom 1	Fail	1.6 %
6	Living/Lounge	Fail	0.2 %
7	Bedroom 1	Fail	1.5 %
7	Bedroom 2	Fail	0.2 %
7	Living/Lounge	Fail	0.4 %
8	Bedroom 1	Fail	0.4 %
8	Bedroom 2	Fail	0.1 %
8	Bedroom 3	Pass	0 %
8	Living/Lounge	Fail	0.7 %
9	Bedroom 1	Fail	0.7 %
9	Living/Lounge	Fail	0.3
10	Bedroom 1	Fail	0.3 %
10	Bedroom 2	Fail	1.1 %

10	Living/Lounge	Fail	0.6 %
N/a	Sample Corridor	Pass	0 %

**Table 3 CIBSE TM59 Overheating Results – DSY 2**

Weather file DSY3			
Sample Unit	Room	Pass/Fail	% above 3% 26°C Threshold
1	Bedroom 1	Fail	1.6 %
1	Bedroom 2	Fail	3.4 %
1	Bedroom 3	Fail	2.3 %
1	Lounge/Kitchen	Fail	5.1 %
2	Bedroom 1	Fail	1.2 %
2	Bedroom 2	Fail	1.9 %
2	Living/Lounge	Fail	2.4 %
3	Bedroom 1	Fail	2.5 %
3	Living/Lounge	Fail	2.4 %
4	Bedroom 1	Fail	1.5 %
4	Bedroom 2	Fail	3.2 %
4	Bedroom 3	Fail	2.2 %
5	Bedroom 1	Fail	3.3 %
5	Bedroom 2	Fail	2.0 %
5	Living/Lounge	Fail	2.3 %
6	Bedroom 1	Fail	2.9 %
6	Living/Lounge	Fail	2.0 %
7	Bedroom 1	Fail	3.2 %
7	Bedroom 2	Fail	1.7 %
7	Living/Lounge	Fail	2.5 %
8	Bedroom 1	Fail	1.9 %
8	Bedroom 2	Fail	1.6 %
8	Bedroom 3	Fail	1.3 %
8	Living/Lounge	Fail	2.4 %
9	Bedroom 1	Fail	0.7 %
9	Living/Lounge	Fail	2.1 %
10	Bedroom 1	Fail	1.8 %
10	Bedroom 2	Fail	2.3 %
10	Living/Lounge	Fail	2.4 %

**Table 4 CIBSE TM59 Overheating Results – DSY3**

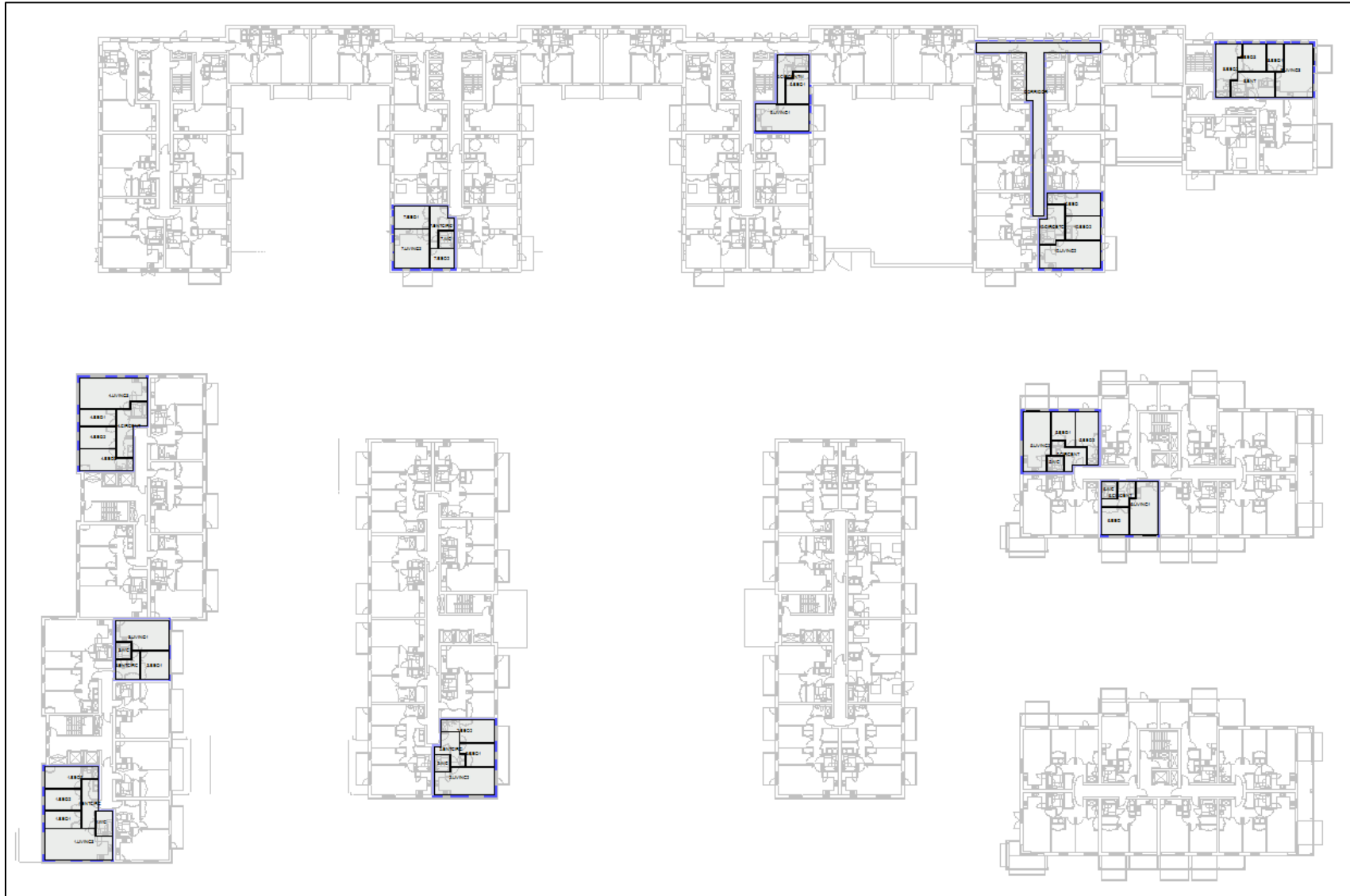
## 5.0 Mitigation Measures

The risk of overheating has been addressed and reduced as far as practically possible through the following mitigation measures:

- Effective glazing specification of G-value 0.36,
- Reduced glazing via solid spandrel panels in bedroom areas,
- Mechanical ventilation with heat recovery (MVHR) in all lounges and bedroom,
- Furthermore, residents will be informed on the use of dehumidifiers and fans to facilitate air flow to cope in extreme weather events.

## Appendix A – Thermal Model

### Sample of Residential Units and Corridor



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