BEAM PARK

Overheating Analysis – Phase 2A (Informative)

Phase 2A Reserved Matters Application (Works within the London Borough of Havering) - Submission to the GLA

July 2019

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Beam Park Phase 2A (RMA LBH GLA)

Overheating Analysis - Informative

July 2019

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1.0 Executive Summary

MWL have been appointed to carry out an overheating study based on industry guidelines defined under CIBSE TM59: 2017 "Design Methodology for the Assessment of Overheating risk in Homes" which is directly associated with CIBSE TM52: 2013 ''The limits of thermal comfort: avoiding overheating in European buildings".

The overheating study forms part of the reserved matters application relative to Phase 2A of the Beam Park development connected to hybrid planning permission GLA 2933a/05, seeking agreement to detailed site access, appearance, landscaping, layout and scale.

The report is demonstrating the dynamic thermal modelling results of apartment blocks and analyses the internal gains for service apartments and communal corridors located on different floors within the Phase 2A, under the London weather file for the 2020s.

The analysis is based on the design currently progressed by the Design Team. Figure 1 illustrates the Phase 2 revised scheme consented in August 2018. Figure 2 illustrates the Phase 2A GLA reserved matters application boundary.

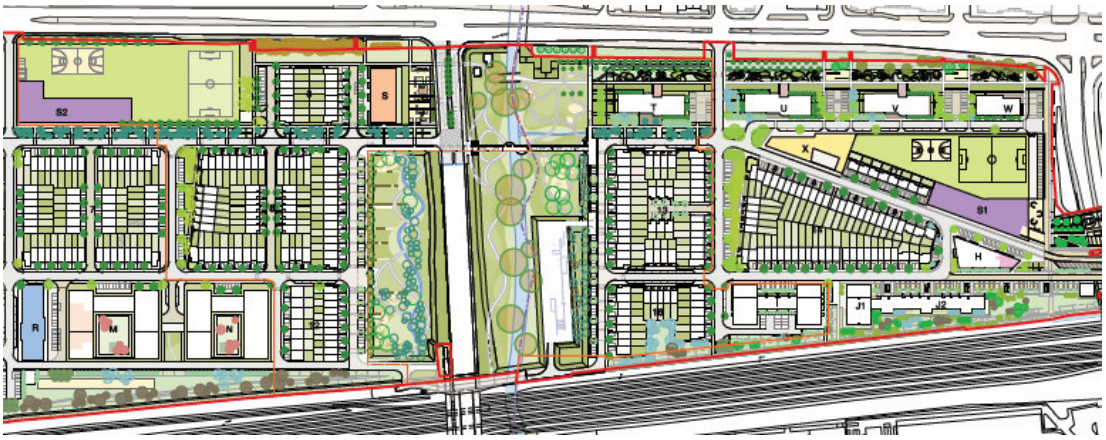


Figure 1. Phase 2 revised scheme consented

Figure 2. Phase 2A GLA reserved matters application boundary

As part of the analysis, several scenarios were modelled, to define the final overheating mitigation strategy for London weather file 2020s scenario, as presented below:

Weather file London DSY1 2020s - Apartments and Communal Corridors

CIBSE TM 59 requires overheating analysis should refer to the latest CISBE design summer year (DSY) weather files and the analysis is required to pass using the DSY1 most appropriate to the site location, for 2020s, high emission, 50% percentile scenario.

The report demonstrates that with a G-value of 55 % a large number of habitable rooms fail to comply with the CIBSE overheating criteria on hot days. Thus, the following strategy is proposed:

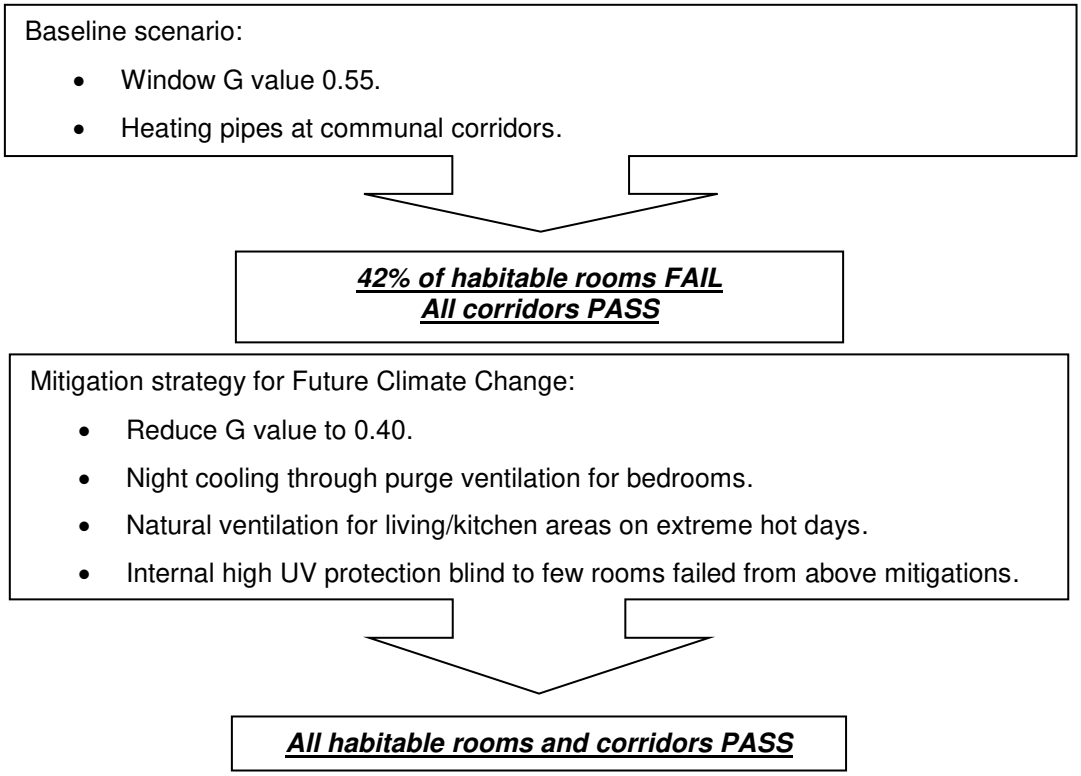
Mitigation Strategy for weather file London DSY1 2020s

- Reduce G value to 0.40.
- Night cooling through purge ventilation for bedrooms.
- Purge ventilation for living/kitchen areas on extreme hot days.
- Internal high UV protection blind to few rooms failed from above mitigations.

*After introducing the above mitigation strategy, all habitable rooms in the apartments and communal corridors **PASS** the overheating requirements of CIBSE TM 59.*

Chart illustration

Weather file London DSY1 2020s:



2.0 Introduction

In the Beam Park phase 2A revised scheme, there are two house blocks of 13 and 16, and two apartment blocks of Block T and Block I that involve in total 323 habitable rooms (kitchen/dining/living rooms and bedrooms) and 19 communal corridors (Figure 3).

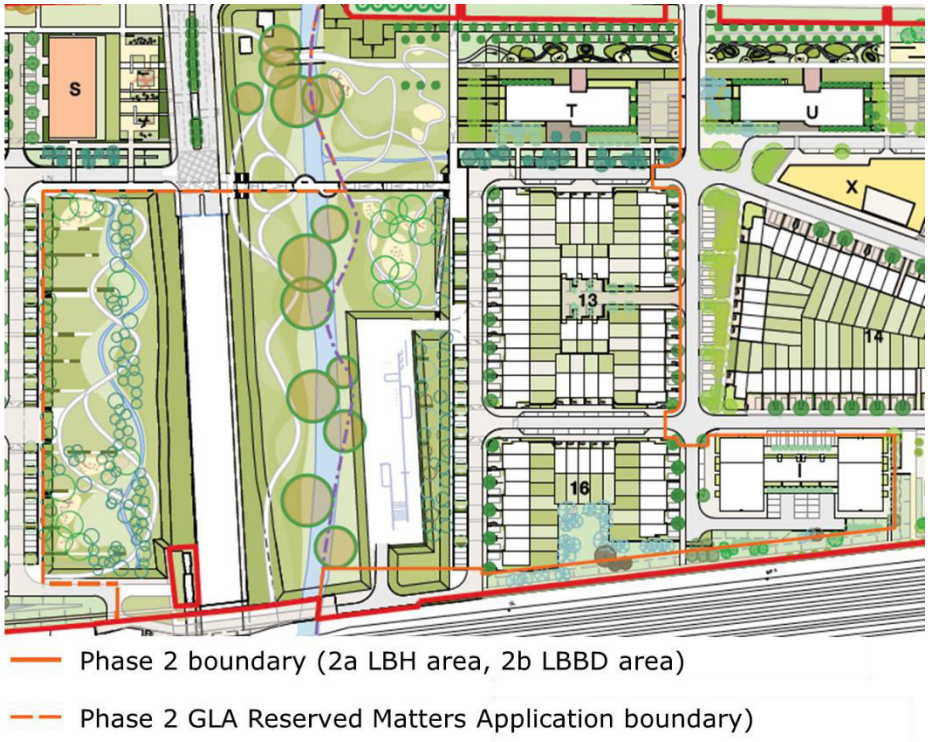


Figure 3. Phase 2A GLA reserved matters application scheme

A full overheating analysis has been completed for all residential units and communal corridors of blocks T and I.

This report seeks to investigate the overheating potential and proposes an alternative solution to improve the thermal comfort of areas identified with a risk of overheating, specifically for kitchen/dining/living rooms and bedroom areas of all the residential units.

This report also seeks specifically to identify a strategy to mitigate the internal and external gains for the units mentioned above. All the apartments within the increased mass/height have been considered in the analysis. The overheating results are presented in detail in Appendix 2-3.

3.0 Requirements

3.1 CIBSE TM59: 2017

The overheating criteria for buildings that are not mechanically cooled, during summer period, are defined in CIBSE TM 59: 2017 "Design Methodology for the Assessment of Overheating risk in Homes" which is directly associated with CIBSE TM52: 2013 "*The limits of thermal comfort: avoiding overheating in European buildings"* as follows:

- **Criterion A: For Kitchens, Living rooms and bedrooms**

  CIBSE TM52 Criterion 1: Hours of Exceedence

  The number of hours (He) that delta T is greater than or equal to one degree (K) during the period between May and September, shall not be more than 3 % of occupied hours.

- **Criterion B: 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).

In order to demonstrate the proposed units are not at risk of overheating, these two criteria must be met.

- **Communal Corridors**

  As per CIBSE TM 59 assessment criteria for communal areas, the overheating analysis for communal corridors is based on the number of annual hours for which an operative temperature of 28°C is exceeded; whilst there is no mandatory target, any corridor where an operative temperature of 28°C is exceeded for more than 3% of total annual hours is flagged as a significant overheating risk.

4.0 CIBSE methodology

4.1 Identification of risk

This methodology is based on the use of dynamic thermal modelling for the treatment and assessment of overheating risk in residential buildings. This methodology is proposed for all residences and should especially be considered for:

- large developments;
- developments in urban areas, particularly in southern England;
- blocks of flats;
- dwellings with high levels of insulation and airtightness;
- single aspect flats.

Individual houses and developments with a low risk of overheating may not require the use of dynamic thermal modelling. Professional judgement must be used when taking the decision to omit dynamic thermal modelling to test overheating. The risk must be considered in the context of the project and the decision should be taken jointly with the client, design team and planners. A list of risk factors for identifying properties at high risk of overheating is provided in *Energy Planning — Greater London Authority guidance on preparing energy assessments* (GLA, 2018) and in BRE's *Home Quality Mark* (BRE, 2015).

4.2 CIBSE- Methodology overview

The assessment should follow the following steps:

1. A suitable sample of units within a development should be selected.
2. Zoning: all sample units should be zoned into the separate rooms including kitchens, living rooms, bedrooms, bathrooms and halls.
3. Building constructions should be modelled as proposed, accurately reflecting thermal properties, such as thermal mass, insulation and solar transmittance for glazing.
4. Standard profiles should be applied for occupancy, lighting and equipment gains.
5. Guidance on the treatment of communal corridors.
6. Pipework and equipment, e.g. heat interface unit gains from community heating systems.
7. Operable windows should be included in the model.
8. Any internal or external shading provision should be included in the model.
9. Additional mechanical ventilation including mechanical ventilation with heat recovery (MVHR) or extract systems should be included in the model.
10. Air speed assumptions should be based on the guidance.

11. The weather file used for the methodology should be the DSY1 (design summer year) file most appropriate for the site location for the 2020s, high emissions, 50% percentile scenario.
12. The assessment should be undertaken using hourly dynamic simulation modelling, which includes all the relevant features of the building.

4.3 CIBSE- Sample size

The assessment should try to identify all the dwellings that are at risk of overheating. These are likely to be those:

- with large glazing areas,
- on the topmost floor,
- having less shading,
- having large, sun-facing windows,
- having a single aspect, or
- having limited opening windows.

At least one corridor should be included in the assessment if the corridors contain community heating distribution pipework.

4.4 CIBSE- Weather data

CIBSE Hourly Weather Data for Test Reference Years (TRYs) and Design Summer Years (DSYs) are available for 14 locations across the UK.

The dynamic weather file used for the analysis was CIBSE Design Summer Year (LondonDSY20.fwt) for London, as per the most suitable to address the current weather conditions.

CIBSE weather file DSY1 of 2020s, high emission and 50% percentile is used as reference for comfort study only. However, some other weather files including the more extreme DSY2 and DSY3, as well future files i.e. 2050s and 2080s could be used to further test design of particular concern, such as the presence of vulnerable occupants and/or where required in the client's brief.

5.0 Analysis

5.1 Software

Dynamic thermal analysis has been performed across the residential units to assess the conditions during a summer period. The analysis accounts for the characteristics of each space (living rooms & bedrooms) including the internal gains, building fabric details, building orientation and external weather conditions.

The thermal model of the proposed development was constructed using Integrated Environmental Solutions (IES-VE) version 2018, which complies with CIBSE Applications Guide AM11 '*Building Energy and Environmental Modelling*.

The following tools of the software were used:

- **Model IT** – to model the geometry of the building;
- **Apache** – to assign constructions, material properties, internal conditions and occupancy patterns;
- **SunCast** – to calculate solar shading and provide data for thermal calculations;
- **MacroFlo** – to assign ventilation templates for the openable windows that provide natural ventilation;
- **Apache-Sim** – to simulate internal conditions and perform the overheating analysis.

5.2 Building Geometry

The models' geometry and analysed spaces are based on drawings received from Patel Taylor Architects, main drawings are as follows:

- 448-PTA-I-ZZ-DR-A-1100_P07 – Building I–GLA Phase 2A RMA Ground Floor Plan;
- 448-PTA-I-ZZ-DR-A-1103_P07 – Building I-GLA Phase 2A RMA Floor levels 01-07;
- 448-PTA-I-ZZ-DR-A-1300_P01 – Building I–GLA Phase 2A RMA Building Elevations 1 of 2;
- 448-PTA-I-ZZ-DR-A-1301_P01 – Building I–GLA Phase 2A RMA Building Elevations 2 of 2;
- 448-PTA-T-ZZ-DR-A-1100_P07 – Building T-Typical GA plans GLA Phase 2A RMA;
- 448-PTA-T-ZZ-DR-A-1300_P02 – Building T–Building Elevations GLA Phase 2A RMA.

5.3 Building Fabric

The following construction details have been used in the analysis:

Element	Value
External Walls (U-value)	0.19 W/m²K
Roof (U-value)	0.13 W/m²K
Floors (U-value)	0.13 W/m²K
Windows (Including Frame) (U-value)	1.3 W/m²K
Glazing total solar transmission (G-value)	55%
Air tightness	5.0 m³/h.m² @ 50Pa

5.4 Internal Conditions

Internal conditions, (room gains from lights, equipment, occupants, infiltration rates and plant) are grouped together in profiles which are applied to the modelled zones.

All internal gains are based on CIBSE TM59:2017, Table 1, Table 2 and Figure 1.

Gains are modelled by resolving them into radiant and convective portions. The convective portion is injected into the zone air, whilst the radiant gains are distributed amongst the zone's surfaces.

Infiltration, ventilation and air movement between the various zones of the building causes a transfer of heat between the appropriate air masses which is represented by terms involving the mass flow, the temperature difference and the specific heat capacity of air.

Solar radiation entering a zone through transparent building components falls on internal surfaces, where it may be absorbed, reflected or transmitted depending on the surfaces' properties. Distribution of reflected and transmitted solar radiation continues until all the radiation has been accounted for.

The design conditions, which are provided by TM 59 and have been included in the modelling analysis are presented in Table 1 and their usage profiles/periods are demonstrated in Appendix 2:

Table 1. Internal gains for bedrooms and kitchen/living rooms

Location	Occupancy	Occupancy sensible/latent (W/person)	Lighting (W/m²)	Equipment (W)
1 bed Bedroom	1	75/55	2	80
2 beds Bedroom	2	75/55	2	80
Kitchen/Living room	2-3	75/45	2	450

5.5 Occupancy Patterns

Occupancy patterns are presented in Table 2 below:

Table 2. Occupancy schedule for examined spaces- May to September

Habitable space	Occupancy (Weekdays)	Occupancy (Weekends)
Bedroom	Full day	Full day
Kitchen/Living room	9am to 10pm[1]	9am to 10pm

[1] CIBSE TM59:2017, Table 2, Page 7.

Determining *'occupied hours'* is critical to the results of the analysis. In a domestic situation, the occupation of rooms cannot easily be determined and varies widely.

The details of occupancy profiles/periods are demonstrated in Appendix 2.

5.6 Mechanical ventilation and Natural Ventilation Openings

The proposed mechanical and natural ventilation strategy incorporates only the thermal properties of the glazed parts of the dwellings combined with continuous mechanical extract ventilation (cMEV) for Block T and North facing units of Block I and mechanical ventilation with heat recovery (MVHR) for the south facing units of Block I exposed to train airborne noise.

There is also a need to provide purge ventilation as well by opening windows. The projection of the climate change predictions under the 2020s high emissions scenario, show that the external temperatures are significantly higher with higher solar gains, therefore, purge ventilation for passive cooling purposes is applicable only when external temperatures are lower than the internal ones.

Regarding the south facing mechanically ventilated residential units of Block I, to avoid overheating it is necessary to introduce more natural ventilation through window opening on extreme hot days.

The control of the windows can rely to manual control from the occupants, who may use a thermostat to record the internal temperature and open the windows accordingly.

High UV prevention internal blinds are the further measure to cope with the potential overheating issues for all blocks.

The schedule for opening windows, to avoid the high accumulated internal gains (future climate change scenario), and the details of the openings and the mechanical ventilation system are presented in Table 3:

Table 3. Details of natural and mechanical ventilation

Dwelling Mechanical Ventilation:	cMEV at 29-37 l/s in all residential units of Block T and north facing units of Block I. MVHR at 29-37 l/s to south facing residential units of Block I exposed to train airborne noise.
Window Opening Schedule:	When internal temperatures over 22°C AND the external temperature lower than internal ones. cMEV Units: Time Conditions: Kitchen/dining/living windows/balcony doors open during occupied (daytime) hours when the above temperature conditions are met. Time Conditions: Bedroom windows/balcony doors open during full day when the above temperature conditions are met. MVHR Units: Time Conditions: Night cooling provision via openable windows/balcony doors in all habitable rooms between 23.00 – 07.00.
Opening Details:	Opening at 25° for top hung windows and 90° for side hung balcony doors.
Communal Corridor Ventilation:	Communal corridor AOVs automatically open when the internal temperature is over 22°C. Communal corridor doors remain open with magnetic lock when the temperature is over 22°C and there is no event of fire. Communal corridor windows to open manually at extreme hot days and when there is no event of fire.

6.0 Results and Analysis

6.1 Weather file DSY1 2020s (High emissions, 50% percentile)

The latest CIBSE design summer year (DSY1) weather file for London that is the most appropriate to the site location for the 2020s, high emissions and 50% percentile scenario has been used as required by CIBSE TM 59: 2017.

Proposed Baseline Option:

- DSY1 2020s weather file.
- Solar energy transmittance (G-value) 55%.
- Low emissivity glass.
- cMEV and purge ventilation to Block T and north facing residential units of Block I.
- MVHR and night cooling to south facing residential units of Block I.
- AOV to communal corridors.

The overheating analysis shows that based on the above proposed option, **57.5%** of the rooms **pass** (186 out of 323) Criterion A, and **68.9%** of bedrooms **pass** CIBSE TM 59 Criterion B (Table 4).

Table 4. Summary of analysis – London weather file 2020s before mitigation

Location	No. Rooms Tested	Criterion A - No. Rooms with overheating issues	Criterion B - No. Rooms with overheating issues
Bedrooms	203	67	63
Kitchen/Dining/Living Room	120	70	n/a
TOTAL	323	137	63

In this analysis, a large number of rooms fail to meet the overheating criteria in both blocks. The failing units experience high solar gains, due to the large glazing areas and limited provision of fresh air for the residential units with MVHR ventilation system.

Suitable mitigation measures to address the overheating issues would be the G-value reduction to 40%, allowance of natural ventilation through openable windows during the extreme hot days and installation of blinds to the remaining failing rooms after the aforementioned mitigation measures.

Mitigation for the Proposed Option:

To mitigate the overheating issues, the following measures are introduced to the model:

- Solar energy transmittance (G-value) 40%.
- Natural ventilation to kitchen/dining/living rooms and bedrooms to south facing residential units of Block I on extreme hot days.
- Internal high UV protection blinds to few rooms failed from above mitigations.
- AOV to communal corridors.

The overheating analysis shows that based on the above proposed option, 100% of the rooms **pass** Criterion A, and 100% of bedrooms **pass** CIBSE TM 59 Criterion B (Table 5).

Table 5. Summary of analysis – London weather file 2020s after mitigation

Location	No. Rooms Tested	Criterion A – No. Rooms with overheating issues	Criterion B - No. Rooms with overheating issues
Bedrooms	203	0	0
Kitchen/Dining/Living Room	120	0	n/a
TOTAL	323	0	0

Communal Corridor Analysis:

The overheating analysis, as per the above analysis of CIBSE Criteria A & B, shows that all assessed communal corridors pass the applicable requirement (Table 6).

Table 6. Summary of results for communal corridors - London weather file 2020s after mitigation

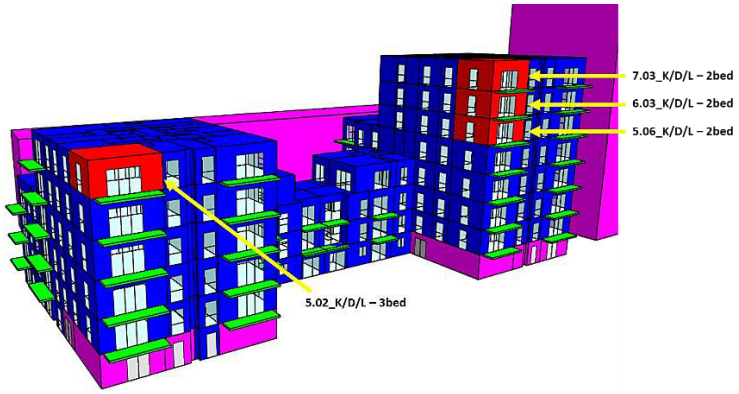
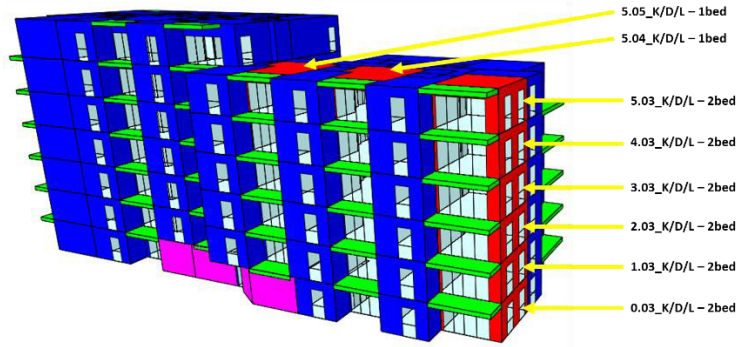
Location	No. Corridors Tested	No. Corridors >28°C for more than 3% of total annual hours
Communal Corridors	19	0
TOTAL	19	0

The dynamic simulation process was completed, after several iterations and simulations through the modelling process.

Table 5 and Table 6 show that after finalising the overheating strategy and taking into consideration measures to be applied for weather file 2020s, all assessed habitable spaces and all corridors comply with the overheating criteria set under CIBSE TM 59:2017 which directly associated with TM 52 2013 *''The limits of thermal comfort: avoiding overheating in European buildings''.*

Table 7 demonstrates rooms for which internal high UV protection blind is necessary to avoid potential overheating for future climate change scenario.

Table 7. Weather file DSY1 2020s: suggested location of internal blinds

Block Name	Room Name	Room Description
Block I	5.02_K/D/L - 3bed 5.06_K/D/L - 2bed 6.03_K/D/L - 2bed 7.03_K/D/L - 2bed	
Block T	0.03_K/D/L - 2 bed 1.03_K/D/L - 2 bed 2.03_K/D/L - 2 bed 3.03_K/D/L - 2 bed 4.03_K/D/L - 2 bed 5.03_K/D/L - 2 bed 5.04_K/D/L - 1 bed 5.05_K/D/L - 1 bed	

Those K/D/Ls listed in the Table 7 that have large glazing area on two facades would receive large amount of solar gains though long daytime hours in summer period.

6.2 Typical Room Analysis

All the service apartments and communal corridors in Block I (Figure 4) & Block T (Figure 5) have been modelled and assessed.

After introducing the mitigations, for the habitat zones, all assessed rooms including kitchen/living and bedrooms pass the CIBSE TM59:2017 overheating requirement. For corridors zones, all of them pass the CIBSE TM59 requirement.

This section of the report discusses the results for some examples of the assessed rooms and corridors.

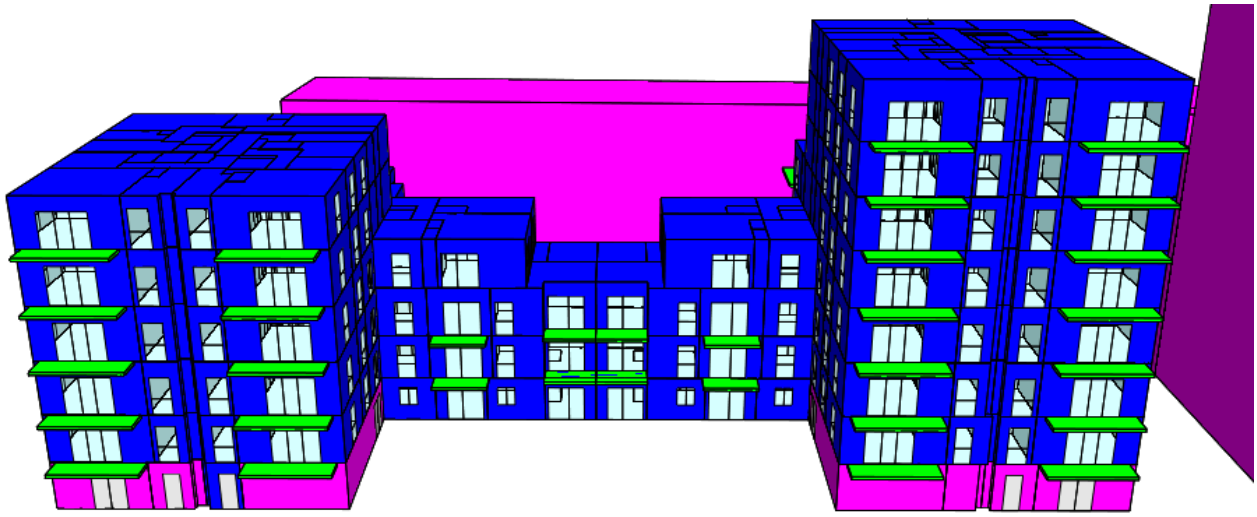


Figure 4. Thermal modelling design of Block I for the overheating study

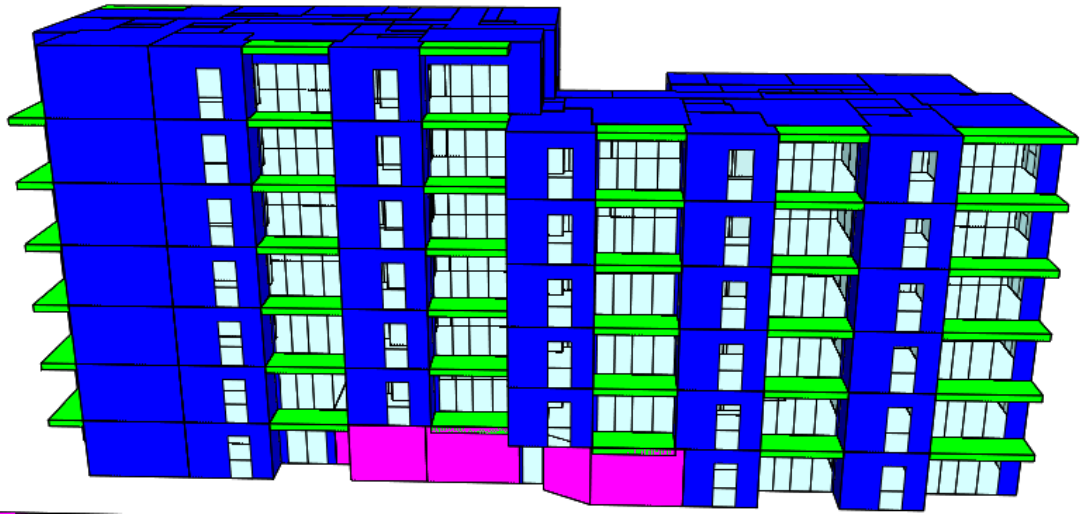


Figure 5. Thermal modelling design of Block T for the overheating study

6.2.1 Kitchen/Dining/Living Room

Block I:

An example Kitchen/Dining/Living room (K/D/L) located on the fourth floor of Block I (4.01_K/D/L–2bed) is reviewed in detail. This room features a south facing glazing balcony door, partly shaded by the balcony extension of the upper floor, and an east facing window. The room is highlighted in red in Figure 6.

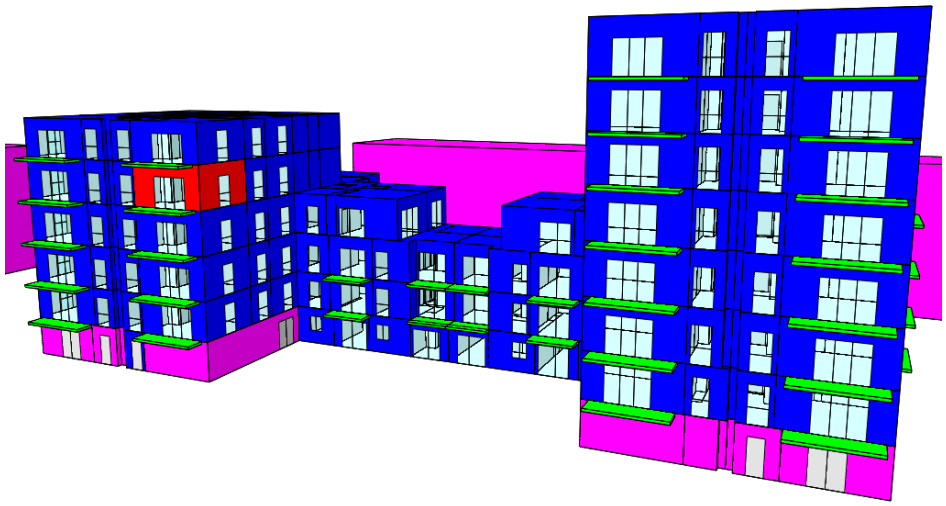


Figure 6. Example K/D/L in Block I (4.01_K/D/L-2bed)

The room is analysed on the hottest summer day (22nd of July) with a G-value of 40% and no internal blinds. As illustrated in Figure 7, solar gains reach a peak of 0.76 kWh at 10.30. The internal gains from people, lighting and equipment hit a maximum of 0.65 kWh in the evening. The operative temperature can be seen to rise throughout the day following this, reaching a peak temperature of 31.7°C at 18.30.

For low thermal mass or low conductivity (i.e.: highly insulating) elements, very little of the surface heat is conducted away internally. This means that the rise in temperature at the surface is much higher, leading to most heat being lost immediately by radiation and convection to the room. This has an impact on both air and mean radiant temperatures within a space. In the same way, the absorbed and radiated solar heat gains through glazing will be absorbed by the internal surfaces and is released into the room with a time-lag. Which explains the time shift of the peak solar heat gains and indoor operative temperature in the chart below.

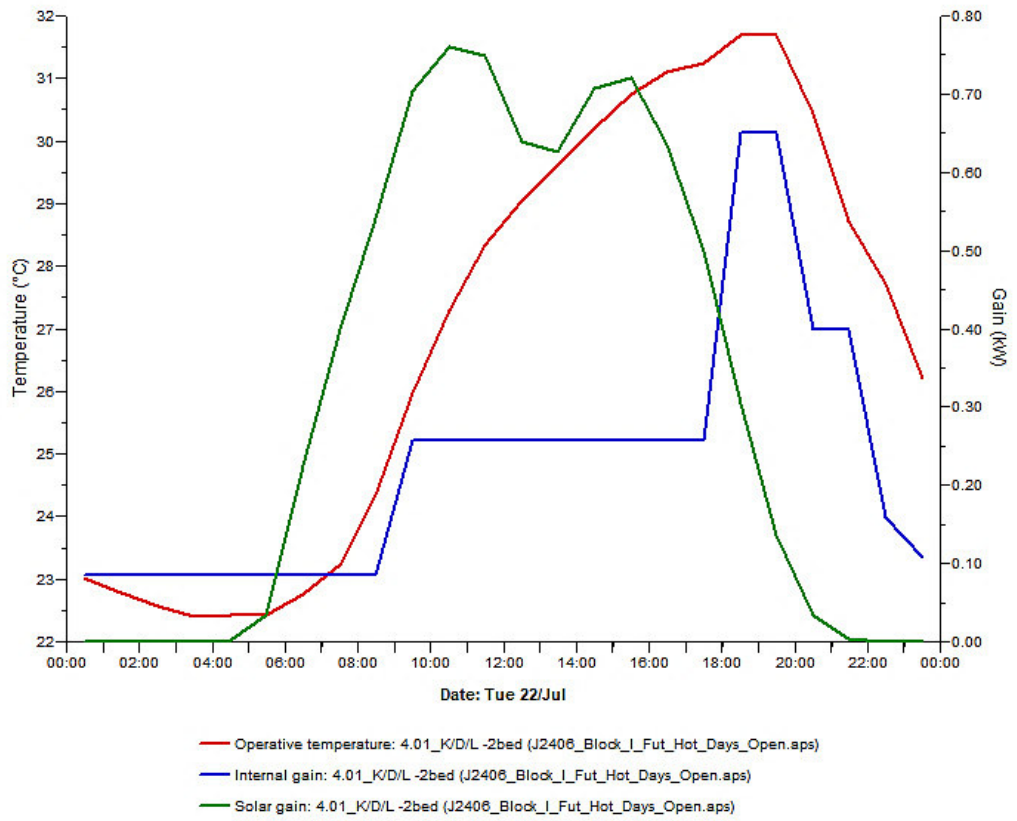


Figure 7. Future weather data chart of operative temperature, internal and solar gains for Plot 4.01_K/D/L-2bed on the 22nd of July

However, the total number of hours over maximum adaptive temperature is 1.8% which is less than 3% TM 59 requirement. This is shown as below:

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)
4.01_K/D/L-2bed	100	1.8

Block I:

An example Kitchen/Dining/Living room (K/D/L) located on the fifth floor of Block T (5.08_K/D/L–1bed) is reviewed in detail. This room features an east facing glazing balcony door and benefits from the balcony above that provides shading. The room is highlighted in red in Figure 8.

As illustrated in Figure 9, on the hottest summer day (22nd of July), when the outdoor temperature reaches 32°C, the indoor temperature is 30°C. An increase in the indoor temperature is observed at 19.30, right after the solar gains are at their peak (1.27 kWh at 18.30).

The total number of hours over maximum adaptive temperature is 2.0% against 3% of TM 59 requirement as shown below:

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)
5.08 K/D/L-1 bed	100	2

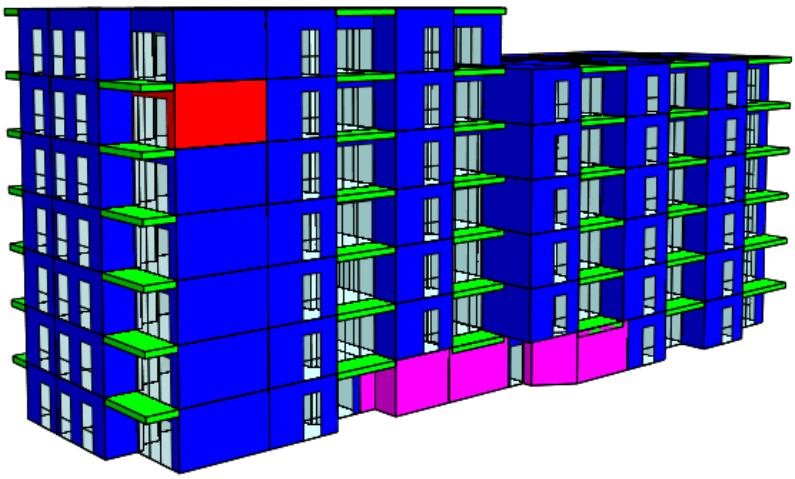


Figure 8. Example K/D/L in Block T (5.08_K/D/L-1bed)

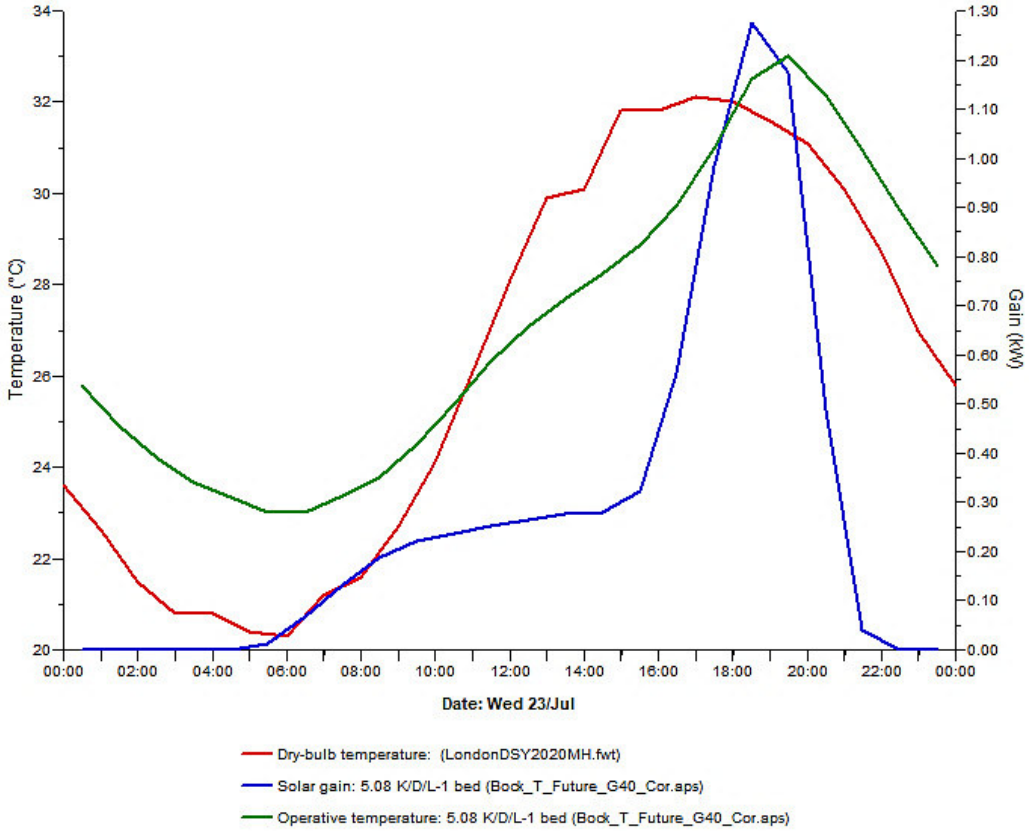


Figure 9. Future weather data chart of dry-bulb and operative temperature and solar gains for Plot 5.08_K/D/L-1bed on the 22nd of July

6.2.2 Typical Bedroom

Block I:

An example double bedroom located on the 3rd floor of Block I (3.07_Double Bedroom) is reviewed in detail. The room features one window opening facing south. The room is highlighted in red in Figure 10 within the context of the IES model.

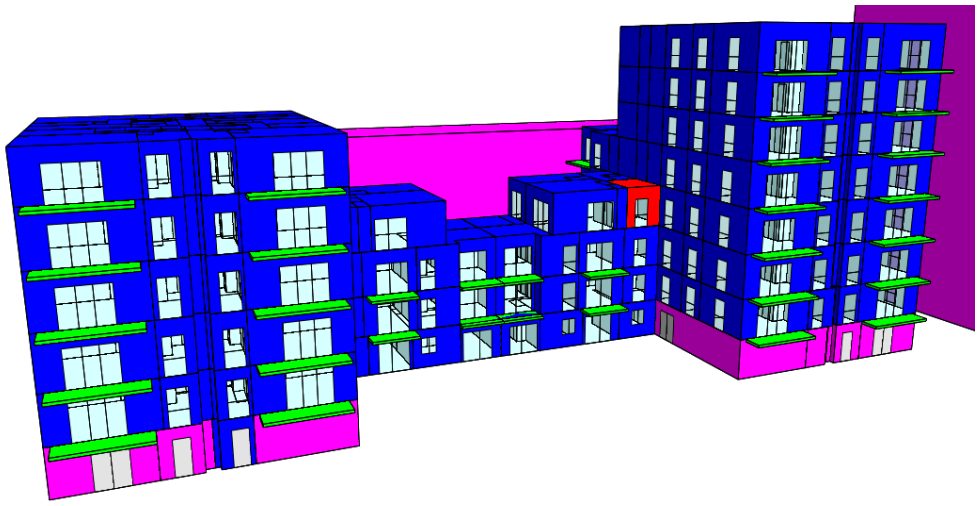


Figure 10. Example double bedroom in Block I (3.07_Double Bedroom)

In the analysed room on the hottest summer day (22nd of July), the solar gains appear to reach a peak of 0.43 kWh at 14.30. As illustrated in Figure 11, the operative temperature can be seen to rise throughout the day with a peak of 32oC at late afternoon times. During sleeping hours, the windows are opened to allow temperature drop during night time. However, during day time and when the external temperature is higher than the internal one, the windows remain close to prevent additional heat gains due to the incoming hot air to the room.

To comply with Criterion B and guarantee comfort during sleeping hours, sleeping hours must not exceed 26°C for more than 1 % of annual hours (or 32 hours) between 22.00 and 07.00. As shown in Figure 12, the room is predicted to exceed 26°C between 22.00 and 07.00 for 15 hours per year, which complies with the requirements of Criterion B (full results in Appendix 3).

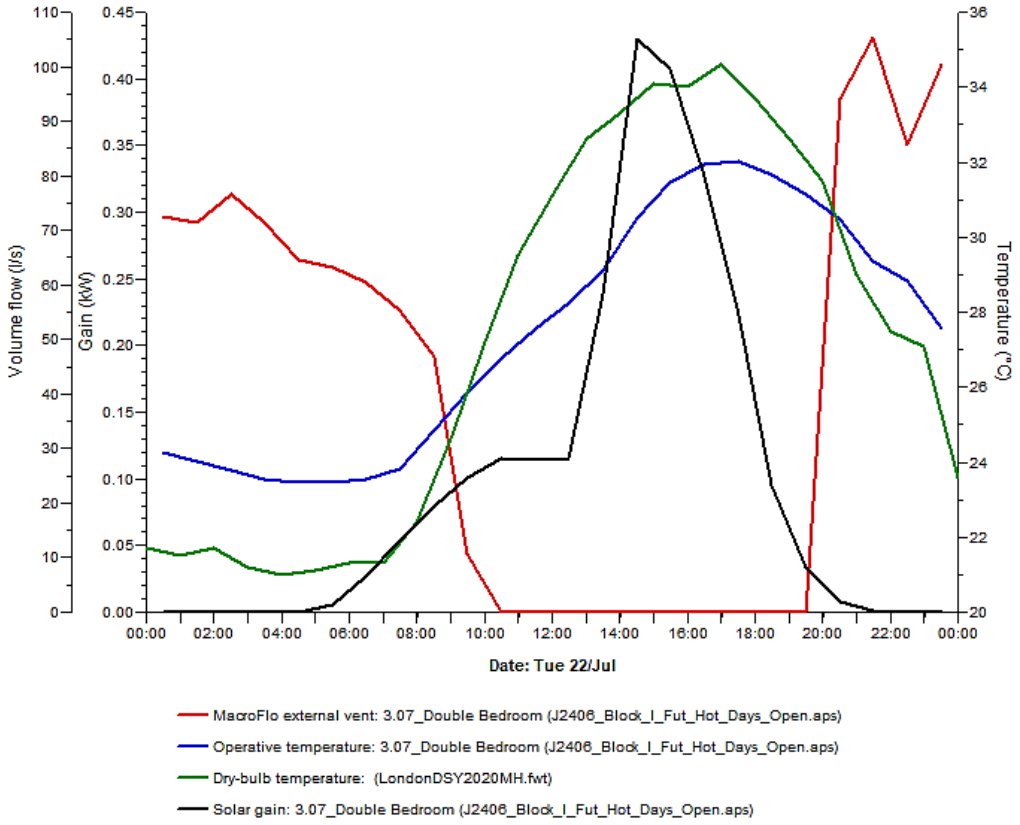


Figure 11. Future weather data chart of operative and dry-bulb temperature, solar gains and airflow volume through the openable window for 3.07_Double Bedroom on the 22nd of July

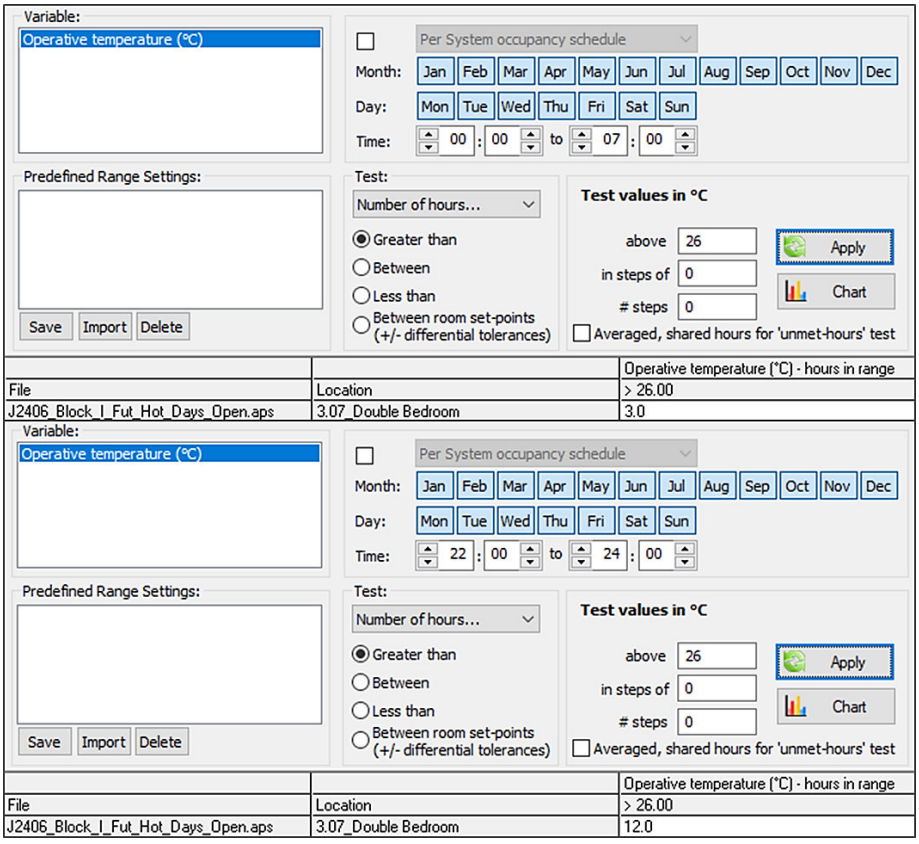


Figure 12. Future weather data of annual overheating hours for 3.07_Double Bedroom

Block T:

An example double bedroom located on the 4th floor of Block T (4.02_Double Bedroom) is reviewed in detail. The room features one window opening facing north. The room is highlighted in red in Figure 13 within the context of the IES model.

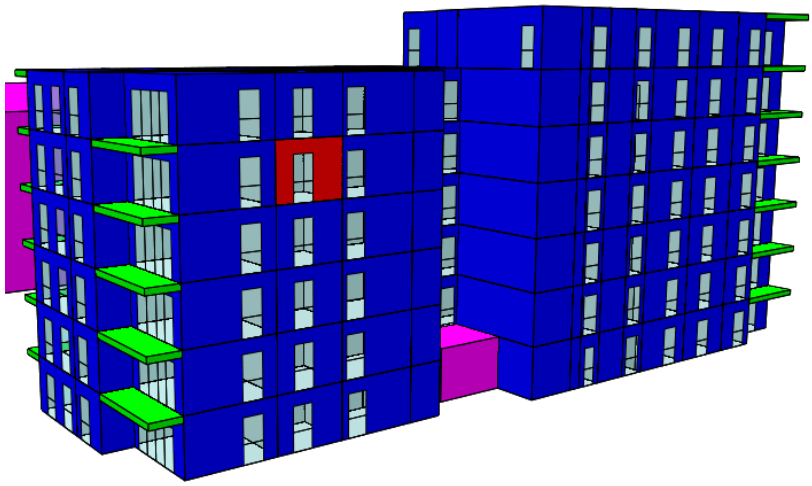


Figure 13. Example double bedroom in Block T (4.02_Double Bedroom)

On the 22nd of July, as shown in Figure 14, the bedroom reaches the maximum temperature of 29.8°C at 20:00, while the outdoor temperature's maximum temperature of the year reaches 34.5°C at 17:00 . During the occupied period 22:00 to 07:00, the peak temperature is less than 29°C when the purge ventilation starts to cool down the room.

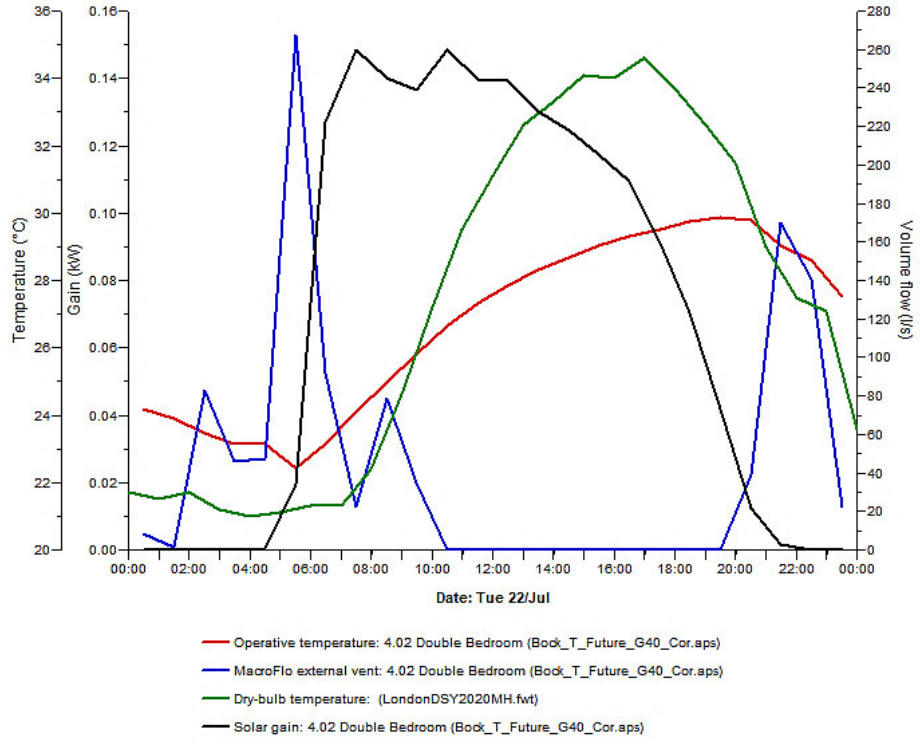


Figure 14. Future weather data chart of operative and dry-bulb temperature, solar gains and airflow volume through the openable window for 4.02_Double Bedroom on the 22nd of July

Between 22:00-07:00 occupied period, as required by CIBSE TM 59, the number of hours of the temperature above 26°C in this bedroom is 11 hours, less than 33 hours of the requirement, as shown in Figure 15.

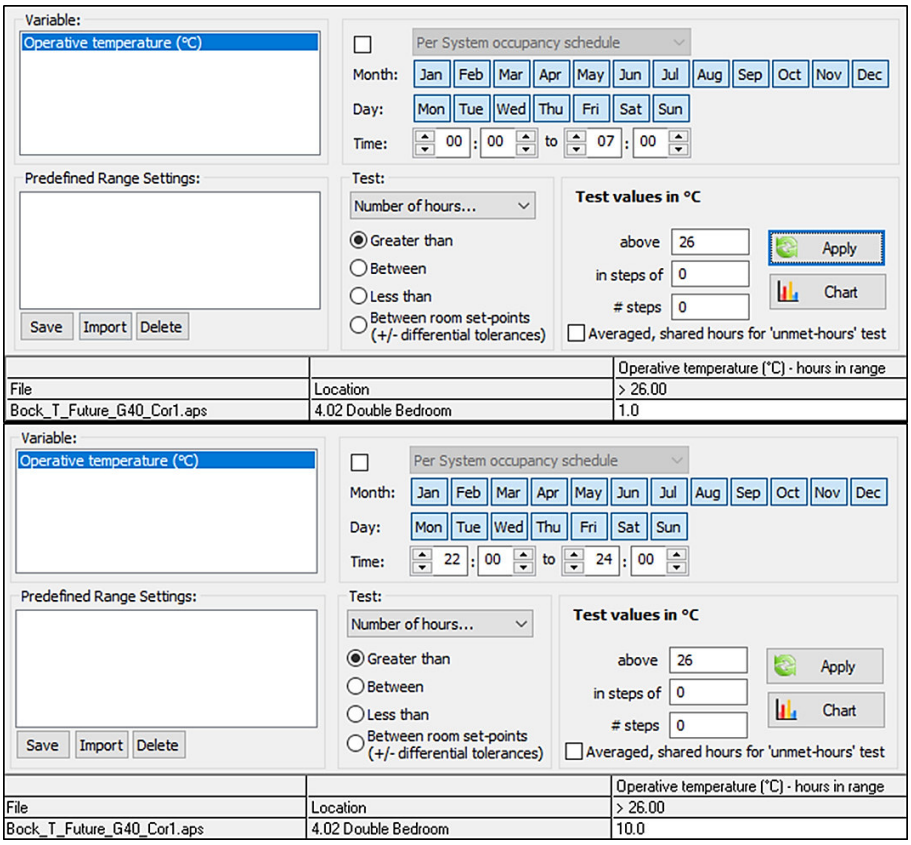


Figure 15. Future weather data of annual overheating hours for 4.02_Double Bedroom

6.2.3 Typical Communal Corridor

Block I:

An example communal corridor located on the 5th floor of Block I (5F_Communal Corridor W) is reviewed in detail. The room features one window opening facing east. A riser with Automatic Opening Vent (AOV) adjacent to the room is to provide ventilation to the corridor to prevent overheating. The room is highlighted in red in Figure 16.

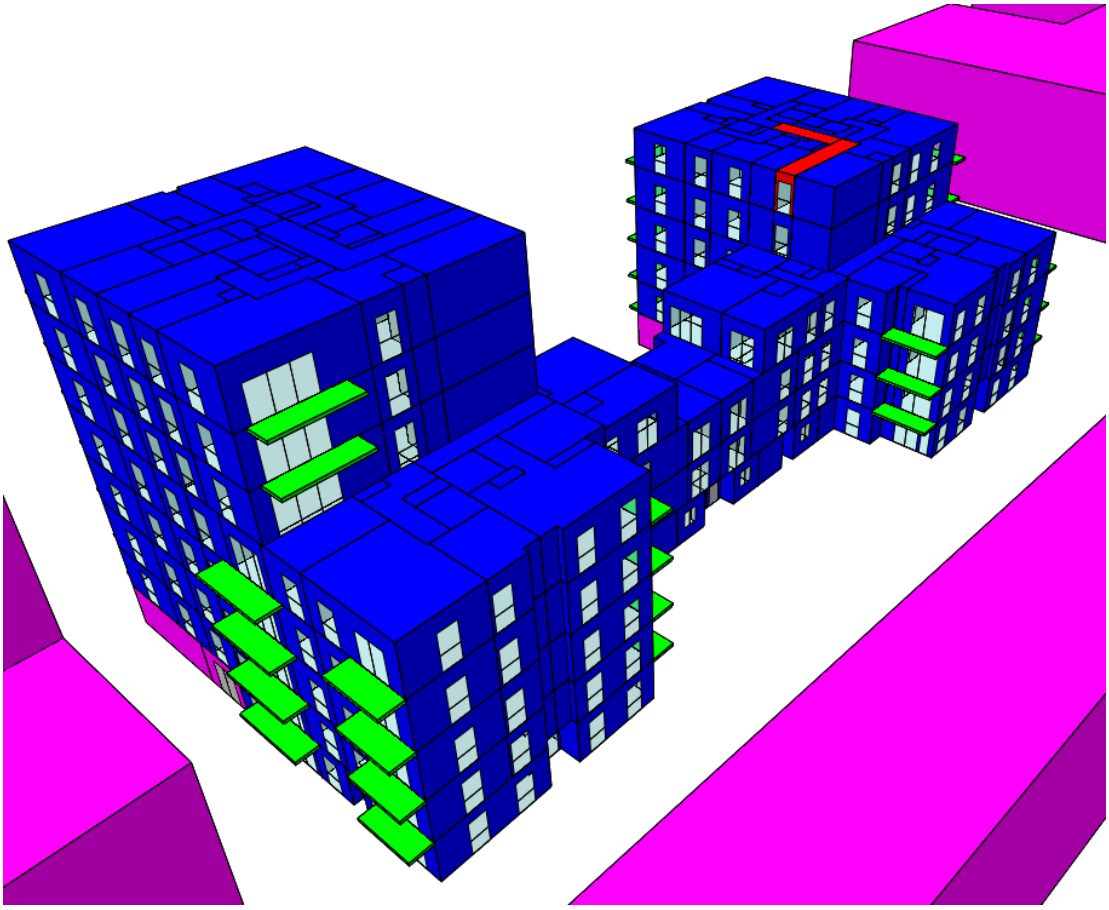


Figure 16. Example communal corridor on the fifth floor of Block I (5F_Communal Corridor W)

Figure 17 shows the corridor's annual temperature range that can be maintained throughout the whole year, even in hot months, such as June and July. This has been beneficial from the low solar gain received through the small glazing area.

The number of annual hours that the temperature is above 28°C in the communal corridor is 61 hours, which is less than the CIBSE TM 59 requirement of 262 hours, equivalent to 3% of annual hours (Figure 18).

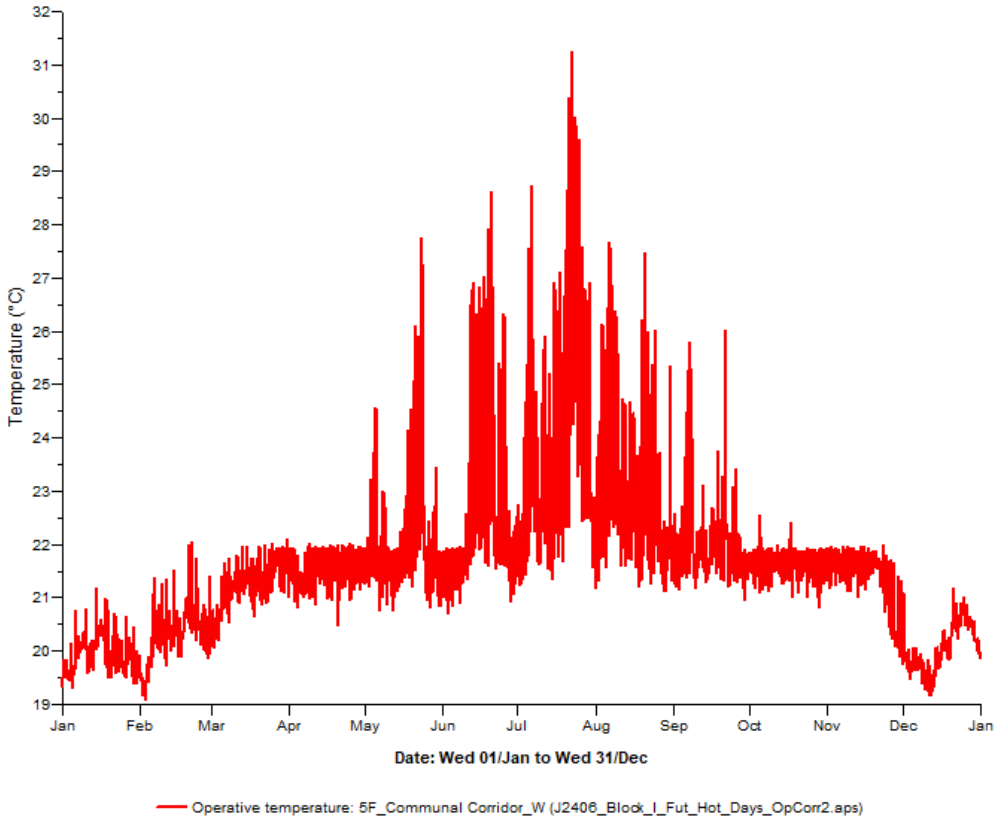


Figure 17. Future weather data of annual temperature range for 5F_Communal Corridor W

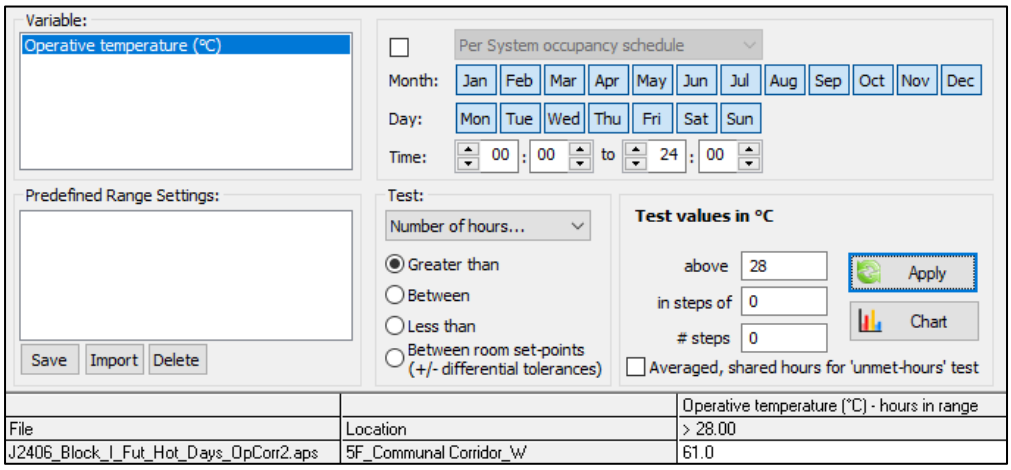


Figure 18. Future weather data of annual overheating hours for 5F_Communal Corridor W

Block T:

An example communal corridor located on the 6th floor of Block T (Communal Corridor_6F) is reviewed in detail. The room features one window opening facing north. A riser with Automatic Opening Vent (AOV) adjacent to the room is to provide ventilation to the corridor to prevent overheating. The room is highlighted in red in Figure 19.

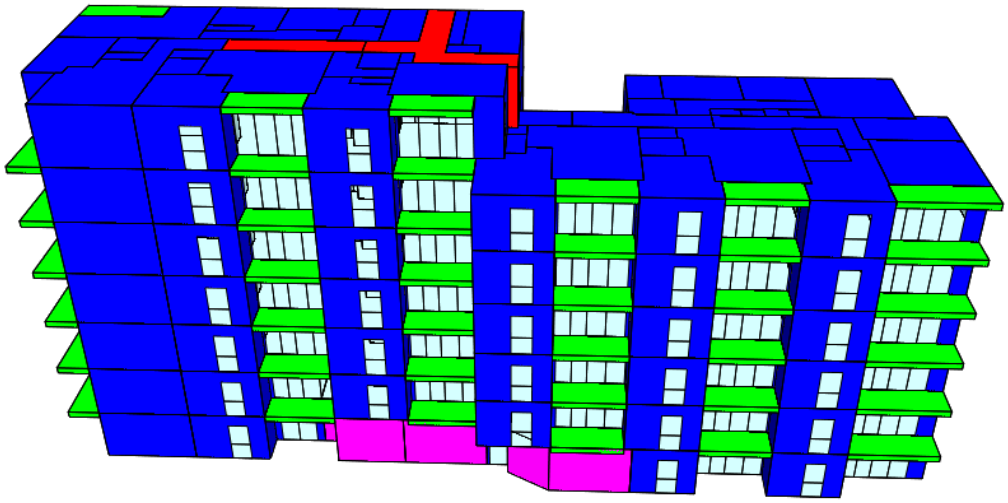


Figure 19. Example communal corridor on the sixth floor of Block T (Communal Corridor_6F)

Figure 20 demonstrates the operative temperature through the whole year. The peak temperature could reach 29.2oC on the 22nd of July. The number of hours of the temperature above 28°C in communal corridor is 36 hours as shown in Figure 21.

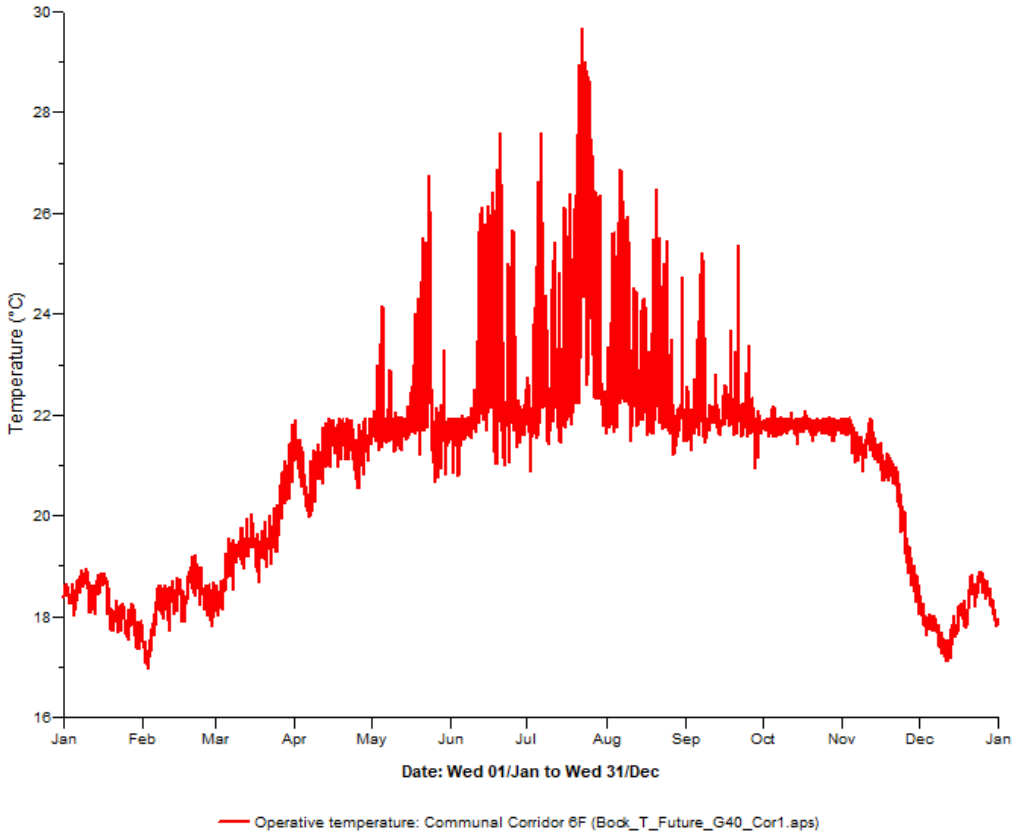


Figure 20. weather data 2020s of annual temperature range for Communal Corridor_6F

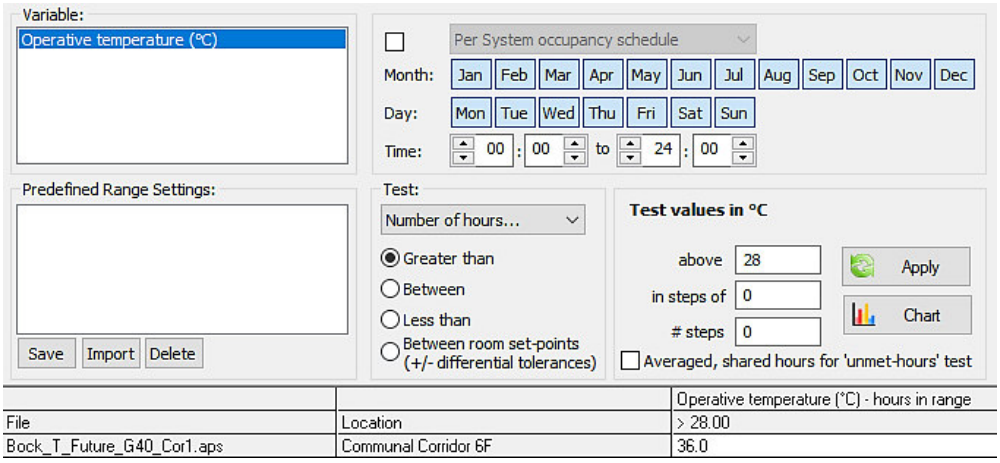


Figure 21. Future weather data of annual overheating hours for Communal Corridor_6F

7.0 Conclusion

This report provides a detailed analysis, including the methodology of the overheating assessment and the results, of all the residential units and communal corridors within increased mass/height of the revised scheme. The thermal performances of the occupied areas of the proposed development have been assessed in accordance with the overheating requirements set out in CIBSE TM 59:2017 and TM 52:2013.

The results indicate that:

- For the weather file DSY1 2020s Scenario: the weather projection shows higher outdoor temperature and higher solar gain in summer period, comparing to weather file London DSY05, that results in negative impact on potential overheating issue in all habitable rooms. The mitigation measures are included:
    - Reduce G value to 0.40.
    - Night cooling through purge ventilation.
    - Natural ventilation for some rooms that experience high solar gain and insufficient ventilation.
    - Internal blinds to a few rooms failed from above.

The overheating study has also found out that internal doors kept open in the flat could play important part for the air flow to ease the room temperature in hot days.

Thermal comfort level varied from person to person, associated with age, gender, clothes level and other factors.

CIBSE weather file London DSY1 of 2020s, high emission and 50% percentile is used as reference for comfort study only. However, some other weather files including the more extreme DSY2 and DSY3, as well future files i.e. 2050s and 2080s could be used to further test design of particular concern such as the presence of vulnerable occupants and/or where required in the client's brief.

CIBSE TM59:2017 provides a baseline for all domestic overheating risk assessment and methodology to influence building design for the better, although there is no mandatory target to meet. The overheating risk must be considered in the project and the decision should be taken jointly with all relevant parties.

Appendix 1 Thermal Comfort and Operative Temperature

Thermal Comfort and Operative Temperatures

The provision of thermal comfort for building occupants involves designing the internal conditions so that the heat loss and heat gain from occupants lie within the bounds that are generally accepted as comfortable. Thermal comfort is defined in the ISO 7730 as *"That condition of mind which expresses satisfaction with the thermal environment".* This is a definition most people can agree on but also a definition that is not easily converted into physical parameters.

The human body can be crudely regarded as a heat engine that converts fuel (food) into energy for its function and creates waste heat that must be dissipated by the body to ensure proper "thermoregulation". The greater the amount of activity, the greater the amount of heat to be dissipated. Typical office work generates up to 110-130W of heat. Heat dissipation from the body takes place by several modes of heat transfer — radiation and convection from the outer surface, evaporation from both the surface and inner parts of the body and respiration involving both sensible and latent heat transfer. To maintain thermal equilibrium, the amount of heat produced or absorbed must equal the heat dissipated. The perception of thermal comfort is based on a range of variables:

Dry bulb air temperature

Is the most commonly quoted factor in relation to thermal comfort. In a 'traditional" building, if the air temperature is within reasonable limits, it is likely that there is a reasonable degree of thermal comfort. This simple relationship between air temperature and comfort is less reliable in lighter weight modern buildings.

Moisture content

Humans will experience discomfort if the moisture content of the air in the room is either too dry, causing drying of the respiratory tract and eyes or too moist so that the body is unable to lose heat through evaporation (sweating) from the skin.

Air movement

The movement of air across the surface of the body affects the convective heat transfer from both the bare and clothed parts; over the exposed skin surfaces the flow of air is a factor in

determining the transmission rate of moisture from the surface. If the combined effect of temperature and movement is too great then too much heat is removed and a subjective feeling of chill or draught results. Conversely, a high air temperature with little air movement will produce a subjective sensation of warmth that, although acceptable locally near a heating unit, is not tolerable throughout the general area of a room.

Surface temperatures

Experiments with test subjects in rooms with different air and surface temperatures have shown that, for optimum thermal comfort occupants prefer that the perceived surface temperatures (the mean radiant temperature) should be close to the air temperature. In real buildings, the inside surface temperatures can vary widely between surfaces. The human body is directionally sensitive to the radiation pattern — it cannot average multiple adverse effects to reach an acceptable condition therefore an imbalance can be conceived as uncomfortable.

Direct solar radiation -

If the occupants find themselves in the direct path of solar radiation transmitted through a glazed area, they may experience serious thermal discomfort. This will occur no matter how adequately the environmental systems are designed to cope with the solar and other loads.

PMV & PPD

The PMV represents the predicted mean vote of a large population of people exposed to a certain environment. It predicts the mean value of the votes of a large group of people on a seven-point scale from hot (+3) to cold (-3). PMV takes into account the environmental parameters (air temperature, mean radiant temperature, air velocity and relative humidity) together with heat production due to activity level and thermal resistance due to clothing.

PPD is the predicted percentage of dissatisfied people at each PMV. As PMV changes away from zero in either the positive or the negative direction, PPD increases. Unlike PMV, which gives the average response of a large group of people, PPD is indicative of the range of individual responses.

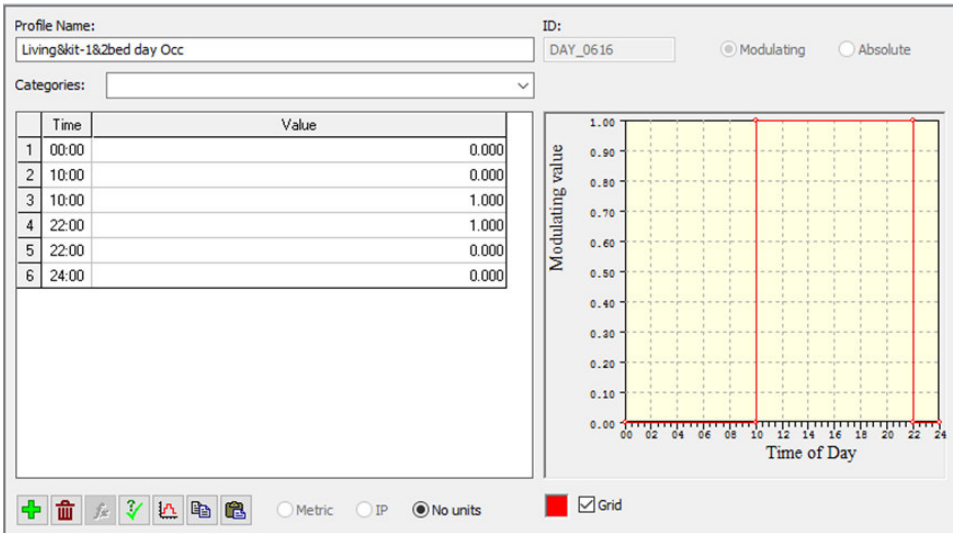
Operative Temperatures

The CIBSE standard adopted in the UK for the assessment of comfort in an internal space is known as operative temperature (formerly known as dry resultant temperature);

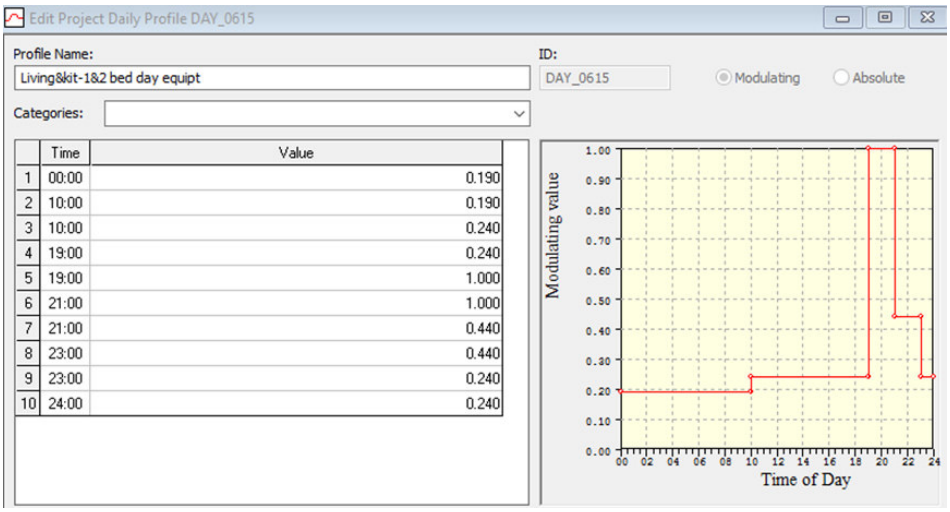
$T_{operative} = (0.5xT_{air}) + (0.5x\ T_{radiant})$

This is in effect a simple average and so an increasing air temperature requires a corresponding reduction in radiant temperature if comfort is to be maintained. This can be achieved through reduced areas of glass, external shading, exposed concrete soffits and radiant cooling systems.

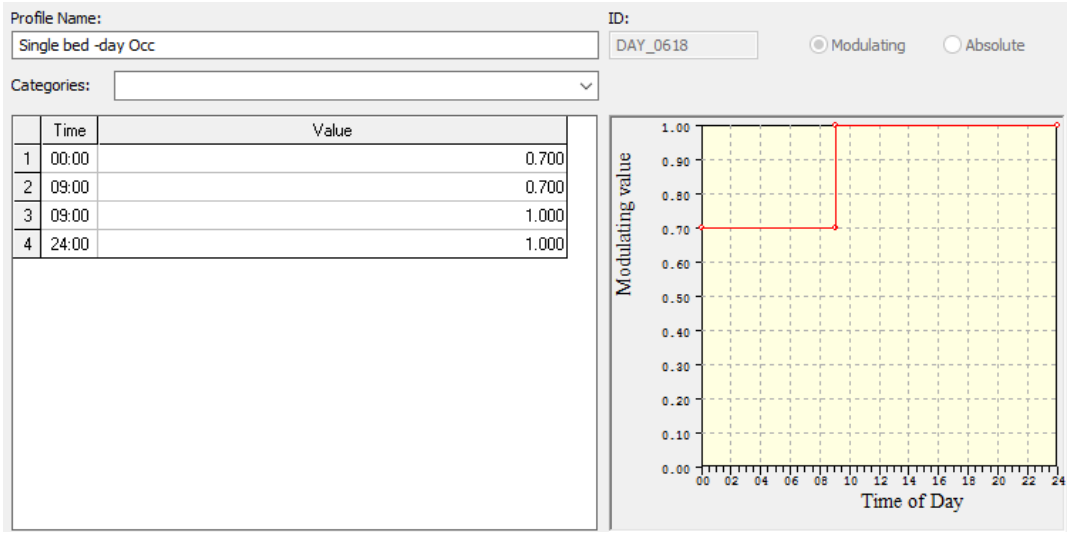
Appendix 2 **Occupancy and other usage profiles**



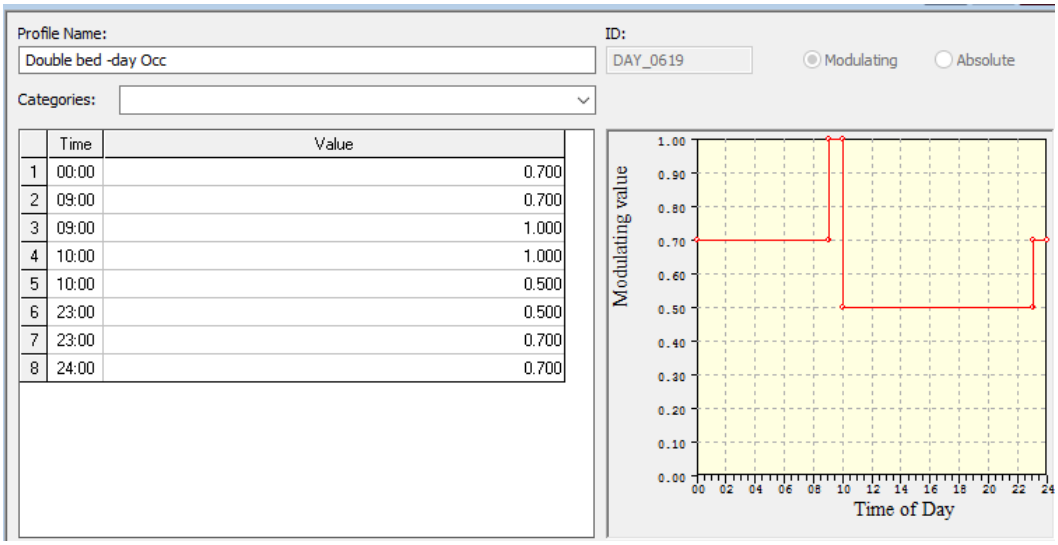
Living & kit – 1 & 2 beds Occupancy profile



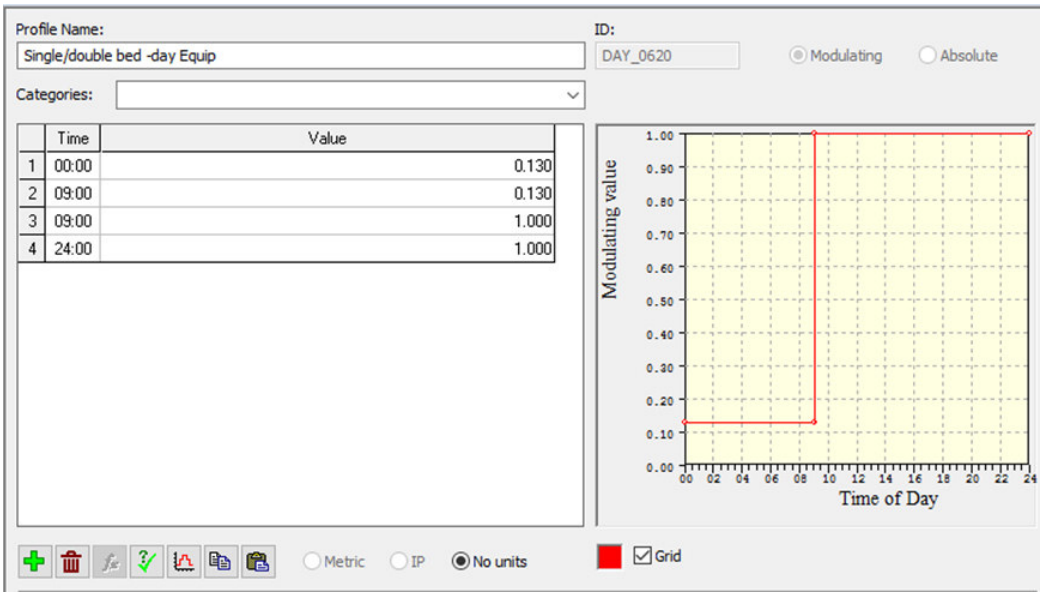
Living & kit – 1 & 2 beds Equipment profile



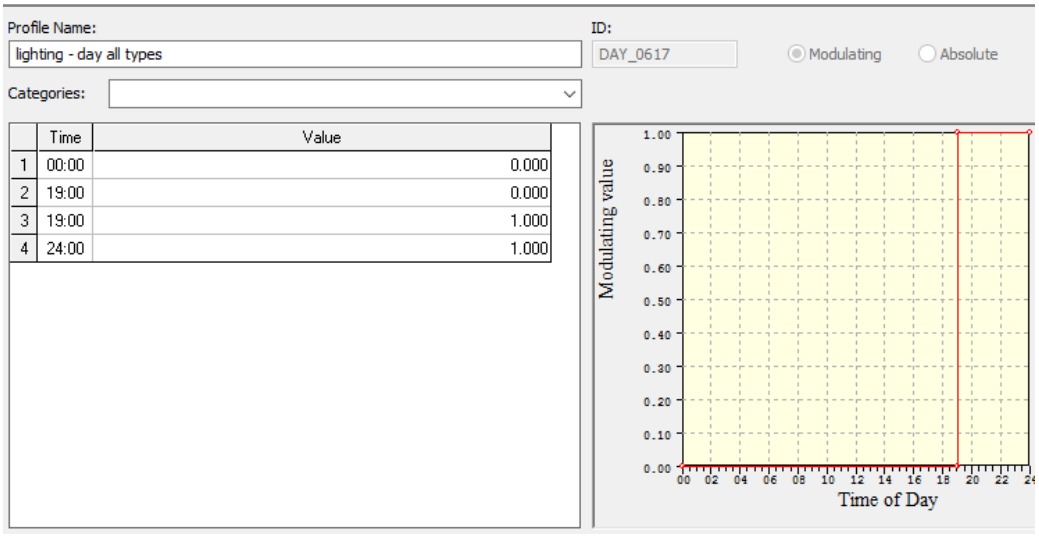
Bedrooms – single bed occupancy profile



Bedrooms – double bed occupancy profile



Bedrooms – single/double bed equipment profile



Lighting profile

Appendix 3 **IES Results Outputs**

Criteria A - DSY 2020s results – G Value 55%

Block I:

CRITERIA 1 FAIL		CRITERIA 1 FAIL	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
1.01_Double Bedroom Ensuite	5.9	3.07_K/D/L -2bed	6
1.01_K/D/L -2bed	29.6	3.11_Double Bedroom	10
1.01_Single Bedroom	16	3.11_K/D/L - 3bed	10.2
1.02_Double Bedroom	10.5	3.11_Single Bedroom	10.1
1.02_Double Bedroom Ensuite	3.2	3.12_Double Bedroom Ensuite	6.3
1.02_K/D/L - 3bed	12.2	3.12_K/D/L - 2bed	43
1.02_Single Bedroom	11.7	3.12_Single Bedroom	11.4
1.04_K/D/L - 2bed	3.2	4.01_Double Bedroom Ensuite	17.3
1.06_Double Bedroom	4.7	4.01_K/D/L -2bed	43
1.06_K/D/L -1bed	7.2	4.01_Single Bedroom	27.2
1.07_K/D/L -1bed	6.7	4.02_Double Bedroom	10.1
1.08_K/D/L -1bed	8.2	4.02_Double Bedroom Ensuite	3.3
1.09_Double Bedroom	7.5	4.02_K/D/L - 3bed	13.3
1.09_K/D/L -1bed	11.2	4.02_Single Bedroom	11.4
1.13_Double Bedroom	10	4.03_K/D/L -3bed	3.9
1.13_K/D/L - 3bed	10	4.07_Double Bedroom	9.9
1.14_Double Bedroom	9	4.07_K/D/L - 3bed	10.1
1.14_Double Bedroom Ensuite	8.4	4.07_Single Bedroom	10
1.14_K/D/L - 2bed	29.7	4.08_Double Bedroom Ensuite	9.4
1.14_Single Bedroom	15.8	4.08_K/D/L - 2bed	43.9
2.01_Double Bedroom Ensuite	6	4.08_Single Bedroom	15
2.01_K/D/L -2bed	31.9	5.01_Double Bedroom Ensuite	20.9
2.01_Single Bedroom	17.3	5.01_K/D/L -2bed	55.7
2.02_Double Bedroom	9.7	5.01_Single Bedroom	32.3
2.02_K/D/L - 3bed	12.4	5.02_Double Bedroom	10.2
2.02_Single Bedroom	10.9	5.02_Double Bedroom Ensuite	3.3
2.06_Double Bedroom	7.9	5.02_K/D/L - 3bed	15.3
2.06_K/D/L -1bed	17.5	5.02_Single Bedroom	12.1
2.07_K/D/L -1bed	11.2	5.03_K/D/L -3bed	4.2
2.08_K/D/L -1bed	12.8	5.05_Double Bedroom	10.7
2.09_Double Bedroom	10.3	5.05_K/D/L - 3bed	10
2.09_K/D/L -1bed	20	5.05_Single Bedroom	10.8
2.13_Double Bedroom	10.7	5.06_Double Bedroom Ensuite	12.8
2.13_K/D/L - 3bed	10.1	5.06_K/D/L - 2bed	46.5
2.13_Single Bedroom	10.7	5.06_Single Bedroom	18.9
2.14_Double Bedroom Ensuite	4.7	6.02_Double Bedroom	10.7
2.14_K/D/L - 2bed	41.6	6.02_K/D/L - 3bed	10
2.14_Single Bedroom	9.6	6.02_Single Bedroom	10.9
3.01_Double Bedroom Ensuite	9.2	6.03_Double Bedroom Ensuite	13.5
3.01_K/D/L -2bed	37	6.03_K/D/L - 2bed	46.9
3.01_Single Bedroom	21.3	6.03_Single Bedroom	19.4
3.02_Double Bedroom	9.9	7.02_Double Bedroom	8.7
3.02_Double Bedroom Ensuite	3.2	7.02_K/D/L - 3bed	10.6
3.02_K/D/L - 3bed	13	7.02_Single Bedroom	9.1
3.02_Single Bedroom	11.2	7.03_Double Bedroom Ensuite	10
3.06_Double Bedroom	6	7.03_K/D/L - 2bed	54.3
3.06_K/D/L -2bed	4.9	7.03_Single Bedroom	15.9
3.07_Double Bedroom	8.6		

CRITERIA 1 PASS		CRITERIA 1 PASS	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
0.01_Single Bedroom	2.2	2.11_K/D/L - 2bed	0.3
0.01_Double Bedroom	1	2.12_Double Bedroom	0
0.01_K/D/L - 2bed	1.7	2.12_Double Bedroom Ensuite	0
0.02_Double Bedroom	0.1	2.12_K/D/L - 2bed	0.1
0.02_K/D/L - 1bed	0.4	2.13_Double Bedroom Ensuite	1.1
0.03_Double Bedroom	0.6	3.03_Double Bedroom	2
0.03_K/D/L - 1bed	1	3.03_Double Bedroom Ensuite	1.8
0.04_Double Bedroom	1.4	3.03_K/D/L - 2bed	2.9
0.04_K/D/L - 1bed	2.7	3.04_Double Bedroom	0.1
0.05_Double Bedroom	1.4	3.04_Double Bedroom	1
0.05_K/D/L - 1bed	2.7	3.04_K/D/L - 2bed	2.7
0.06_Double Bedroom	0.8	3.05_Double Bedroom	0.5
0.06_K/D/L - 1bed	1.3	3.05_K/D/L -1bed	0.8
0.07_Double Bedroom	0	3.06_Double Bedroom Ensuite	1.9
0.07_K/D/L - 1bed	0.4	3.07_Double Bedroom Ensuite	1.8
0.08_Double Bedroom	0	3.08_Double Bedroom	1.2
0.08_K/D/L - 2bed	0.3	3.08_K/D/L -1bed	1.4
0.08_Single Bedroom	0.1	3.09_Double Bedroom	0.1
0.09_Double Bedroom	0	3.09_Double Bedroom	0.1
0.09_K/D/L - 1bed	0	3.09_K/D/L - 2bed	0.7
0.10_Double Bedroom	1.3	3.10_Double Bedroom	0
0.10_K/D/L - 1bed	0.9	3.10_Double Bedroom Ensuite	0
1.03_Double Bedroom	1.7	3.10_K/D/L - 2bed	0.2
1.03_Double Bedroom Ensuite	1.5	3.11_Double Bedroom Ensuite	1.1
1.03_K/D/L - 2bed	2.2	4.03_Double Bedroom	1.6
1.04_Double Bedroom	0.4	4.03_Single Bedroom	2.9
1.04_Double Bedroom	1.2	4.03_Single Bedroom	0.9
1.05_Double Bedroom	0.3	4.04_Double Bedroom	1.4
1.05_K/D/L -1bed	0.6	4.04_K/D/L -1bed	1.9
1.07_Double Bedroom	1.5	4.05_Double Bedroom	0
1.08_Double Bedroom	1.5	4.05_Double Bedroom	0
1.10_Double Bedroom	0.2	4.05_K/D/L - 2bed	0.9
1.10_K/D/L -1bed	0.7	4.06_Double Bedroom	0
1.11_Double Bedroom	0	4.06_Double Bedroom Ensuite	0
1.11_Double Bedroom	0	4.06_K/D/L - 2bed	0.3
1.11_K/D/L - 2bed	0.4	4.07_Double Bedroom Ensuite	1
1.12_Double Bedroom	0	5.03_Double Bedroom	1.4
1.12_Double Bedroom Ensuite	0	5.03_Single Bedroom	2.8
1.12_K/D/L - 2bed	0.3	5.03_Single Bedroom	0.7
1.13_Double Bedroom Ensuite	1.4	5.04_Double Bedroom Ensuite	0.1
2.02_Double Bedroom Ensuite	2.9	5.04_K/D/L -3bed	2.7
2.03_Double Bedroom	1.7	5.04_Single Bedroom	1.1
2.03_Double Bedroom Ensuite	1.4	5.04_Single Bedroom	0.7
2.03_K/D/L - 2bed	2.3	5.05_Double Bedroom Ensuite	1.2
2.04_Double Bedroom	0.2	6.01_Double Bedroom Ensuite	0.1
2.04_Double Bedroom	1.1	6.01_K/D/L -3bed	2.9
2.04_K/D/L - 2bed	2.7	6.01_Single Bedroom	1.2
2.05_Double Bedroom	0.4	6.01_Single Bedroom	0.7
2.05_K/D/L -1bed	0.6	6.02_Double Bedroom Ensuite	1.2
2.07_Double Bedroom	1.6	7.01_Double Bedroom Ensuite	0
2.08_Double Bedroom	1.5	7.01_K/D/L -3bed	1.4
2.10_Double Bedroom	0.3	7.01_Single Bedroom	0.1
2.10_K/D/L -1bed	1	7.01_Single Bedroom	0.4
2.11_Double Bedroom	0	7.02_Double Bedroom Ensuite	0.6
2.11_Double Bedroom	0		

Block T:

CRITERIA 1 FAIL	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
0.01 K/D/L-2 bed	4
0.03 K/D/L-2 bed	5.1
0.06 Double Bedroom	4.5
0.06 K/D/L-1 bed	3.7
1.01 K/D/L-2 bed	3.7
1.02 K/D/L-2 bed	3.3
1.03 K/D/L-2 bed	5.1
1.06 K/D/L-1 bed	3.2
1.08 Double Bedroom	4.5
1.08 K/D/L-1 bed	3.4
2.01 K/D/L-2 bed	3.7
2.02 K/D/L-2 bed	3.4
2.03 K/D/L-2 bed	5.3
2.06 Double Bedroom	3.8
2.06 K/D/L-1 bed	3.1
2.08 Double Bedroom	4.7
2.08 K/D/L-1 bed	3.3
3.01 K/D/L-2 bed	4.4
3.02 K/D/L-2 bed	3.4
3.03 K/D/L-2 bed	5.3
3.06 K/D/L-1 bed	3.3
3.08 Double Bedroom	3.9
3.08 K/D/L-1 bed	3.2
4.01 K/D/L-2 bed	3.7
4.02 K/D/L-2 bed	3.4
4.03 K/D/L-2 bed	5.4
4.06 K/D/L-1 bed	3.5
4.07 Double Bedroom	3.1
4.07 K/D/L-1 bed	3.3
4.08 Double Bedroom	4.7
4.08 K/D/L-1 bed	3.3
5.01 K/D/L-2 bed	3.6
5.02 K/D/L-2 bed	4.1
5.03 K/D/L-2 bed	6.7
5.04 K/D/L-1 bed	6.8
5.05 K/D/L-1 bed	7.1
5.06 K/D/L-1 bed	3.5
5.07 K/D/L-1 bed	3.2
5.08 Double Bedroom	4.4
5.08 K/D/L-1 bed	3.1
6.02 K/D/L-1 bed	3.1
6.04 Double Bedroom	3.8
6.04 K/D/L-1 bed	3.7

CRITERIA 1 PASS		CRITERIA 1 PASS	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
0.01 Double Bedroom	2.1	3.02 Double Bedroom	0.6
0.01 Double Ensuite Bedroom	1.1	3.02 Double Ensuite Bedroom	0
0.02 Double Bedroom	0	3.03 Double Bedroom	1.3
0.02 Double Ensuite Bedroom	0	3.03 Double Ensuite Bedroom	0.9
0.02 K/D/L-2 bed	2.1	3.04 Double Bedroom	2.3
0.03 Double Bedroom	1.1	3.04 K/D/L-1 bed	2.5
0.03 Double Ensuite Bedroom	0.6	3.05 Double Bedroom	1.6
0.04 Double Bedroom	2.7	3.05 K/D/L-1 bed	2.3
0.04 K/D/L-1 bed	2.9	3.06 Double Bedroom	1.5
0.05 Double Bedroom	1.7	3.07 Double Bedroom	2.7
0.05 K/D/L-1 bed	1.6	3.07 K/D/L-1 bed	2.8
1.01 Double Bedroom	1.2	4.01 Double Bedroom	1.1
1.01 Double Ensuite Bedroom	1.1	4.01 Double Ensuite Bedroom	1.1
1.02 Double Bedroom	0.6	4.02 Double Bedroom	0.6
1.02 Double Ensuite Bedroom	0.1	4.02 Double Ensuite Bedroom	0
1.03 Double Bedroom	1.1	4.03 Double Bedroom	1.3
1.03 Double Ensuite Bedroom	0.8	4.03 Double Ensuite Bedroom	1
1.04 Double Bedroom	2.1	4.04 Double Bedroom	2.5
1.04 K/D/L-1 bed	2.4	4.04 K/D/L-1 bed	3
1.05 Double Bedroom	1.6	4.05 Double Bedroom	1.7
1.05 K/D/L-1 bed	2	4.05 K/D/L-1 bed	2.6
1.06 Double Bedroom	1.4	4.06 Double Bedroom	1.6
1.07 Double Bedroom	2.5	5.01 Double Bedroom	1.1
1.07 K/D/L-1 bed	2.6	5.01 Double Ensuite Bedroom	1.1
2.01 Double Bedroom	1.1	5.02 Double Bedroom	0.4
2.01 Double Ensuite Bedroom	1.2	5.02 Double Ensuite Bedroom	0
2.02 Double Bedroom	0.6	5.03 Double Bedroom	0.8
2.02 Double Ensuite Bedroom	0	5.03 Double Ensuite Bedroom	0.6
2.03 Double Bedroom	1.2	5.04 Double Bedroom	2.9
2.03 Double Ensuite Bedroom	0.8	5.05 Double Bedroom	2.1
2.04 Double Bedroom	2	5.06 Double Bedroom	1.6
2.04 K/D/L-1 bed	2.3	5.07 Double Bedroom	3
2.05 Double Bedroom	1.5	6.01 Double Bedroom	0.4
2.05 K/D/L-1 bed	1.9	6.01 Double Ensuite Bedroom	0.3
2.07 Double Bedroom	1.7	6.01 K/D/L-2 bed	2.9
2.07 K/D/L-1 bed	1.8	6.02 Double Bedroom	1.1
3.01 Double Bedroom	2.3	6.03 Double Bedroom	1.9
3.01 Double Ensuite Bedroom	2	6.03 K/D/L-1 bed	1.9

Criteria B - DSY 2020s results – G Value 55%

Block I:

Room	Hours >26 degrees		Room	Hours >26 degrees	
0.01_Double Bedroom	10	pass	3.04_Double Bedroom	8	pass
0.01_Single Bedroom	11	pass	3.04_Double Bedroom	12	pass
0.02_Double Bedroom	9	pass	3.05_Double Bedroom	10	pass
0.03_Double Bedroom	64	fail	3.06_Double Bedroom	80	fail
0.04_Double Bedroom	78	fail	3.06_Double Bedroom Ensuite	6	pass
0.05_Double Bedroom	78	fail	3.07_Double Bedroom	90	fail
0.06_Double Bedroom	66	fail	3.07_Double Bedroom Ensuite	5	pass
0.07_Double Bedroom	6	pass	3.08_Double Bedroom	12	pass
0.08_Double Bedroom	9	pass	3.09_Double Bedroom	10	pass
0.08_Single Bedroom	9	pass	3.09_Double Bedroom	12	pass
0.09_Double Bedroom	15	pass	3.10_Double Bedroom	16	pass
0.10_Double Bedroom	21	pass	3.10_Double Bedroom Ensuite	16	pass
1.01_Double Bedroom Ensuite	96	fail	3.11_Double Bedroom	69	fail
1.01_Single Bedroom	101	fail	3.11_Double Bedroom Ensuite	23	pass
1.02_Double Bedroom	72	fail	3.11_Single Bedroom	66	fail
1.02_Double Bedroom Ensuite	20	pass	3.12_Double Bedroom Ensuite	110	fail
1.02_Single Bedroom	68	fail	3.12_Single Bedroom	109	fail
1.03_Double Bedroom	24	pass	4.01_Double Bedroom Ensuite	118	fail
1.03_Double Bedroom Ensuite	25	pass	4.01_Single Bedroom	127	fail
1.04_Double Bedroom	9	pass	4.02_Double Bedroom	76	fail
1.04_Double Bedroom	14	pass	4.02_Double Bedroom Ensuite	23	pass
1.05_Double Bedroom	10	pass	4.02_Single Bedroom	72	fail
1.06_Double Bedroom	91	fail	4.03_Double Bedroom	15	pass
1.07_Double Bedroom	9	pass	4.03_Single Bedroom	14	pass
1.08_Double Bedroom	9	pass	4.03_Single Bedroom	9	pass
1.09_Double Bedroom	98	fail	4.04_Double Bedroom	9	pass
1.10_Double Bedroom	8	pass	4.05_Double Bedroom	8	pass
1.11_Double Bedroom	10	pass	4.05_Double Bedroom	8	pass
1.11_Double Bedroom	10	pass	4.06_Double Bedroom	16	pass
1.12_Double Bedroom	16	pass	4.06_Double Bedroom Ensuite	16	pass
1.12_Double Bedroom Ensuite	16	pass	4.07_Double Bedroom	66	fail
1.13_Double Bedroom	62	fail	4.07_Double Bedroom Ensuite	22	pass
1.13_Double Bedroom Ensuite	21	pass	4.07_Single Bedroom	66	fail
1.14_Double Bedroom	62	fail	4.08_Double Bedroom Ensuite	124	fail
1.14_Double Bedroom Ensuite	100	fail	4.08_Single Bedroom	125	fail
1.14_Single Bedroom	109	fail	5.01_Double Bedroom Ensuite	112	fail
2.01_Double Bedroom Ensuite	97	fail	5.01_Single Bedroom	122	fail
2.01_Single Bedroom	105	fail	5.02_Double Bedroom	63	fail
2.02_Double Bedroom	74	fail	5.02_Double Bedroom Ensuite	16	pass
2.02_Double Bedroom Ensuite	21	pass	5.02_Single Bedroom	62	fail
2.02_Single Bedroom	70	fail	5.03_Double Bedroom	12	pass
2.03_Double Bedroom	27	pass	5.03_Single Bedroom	8	pass
2.03_Double Bedroom Ensuite	27	pass	5.03_Single Bedroom	9	pass
2.04_Double Bedroom	9	pass	5.04_Double Bedroom Ensuite	9	pass
2.04_Double Bedroom	16	pass	5.04_Single Bedroom	9	pass
2.05_Double Bedroom	11	pass	5.04_Single Bedroom	10	pass
2.06_Double Bedroom	105	fail	5.05_Double Bedroom	66	fail
2.07_Double Bedroom	8	pass	5.05_Double Bedroom Ensuite	21	pass
2.08_Double Bedroom	8	pass	5.05_Single Bedroom	65	fail
2.09_Double Bedroom	115	fail	5.06_Double Bedroom Ensuite	146	fail
2.10_Double Bedroom	8	pass	5.06_Single Bedroom	136	fail
2.11_Double Bedroom	9	pass	6.01_Double Bedroom Ensuite	9	pass
2.11_Double Bedroom	10	pass	6.01_Single Bedroom	9	pass
2.12_Double Bedroom	16	pass	6.01_Single Bedroom	10	pass
2.12_Double Bedroom Ensuite	15	pass	6.02_Double Bedroom	66	fail
2.13_Double Bedroom	73	fail	6.02_Double Bedroom Ensuite	21	pass
2.13_Double Bedroom Ensuite	22	pass	6.02_Single Bedroom	64	fail
2.13_Single Bedroom	66	fail	6.03_Double Bedroom Ensuite	150	fail
2.14_Double Bedroom Ensuite	100	fail	6.03_Single Bedroom	138	fail
2.14_Single Bedroom	100	fail	7.01_Double Bedroom Ensuite	8	pass
3.01_Double Bedroom Ensuite	100	fail	7.01_Single Bedroom	7	pass
3.01_Single Bedroom	115	fail	7.01_Single Bedroom	8	pass
3.02_Double Bedroom	76	fail	7.02_Double Bedroom	57	fail
3.02_Double Bedroom Ensuite	22	pass	7.02_Double Bedroom Ensuite	16	pass
3.02_Single Bedroom	71	fail	7.02_Single Bedroom	54	fail
3.03_Double Bedroom	28	pass	7.03_Double Bedroom Ensuite	114	fail
3.03_Double Bedroom Ensuite	29	pass	7.03_Single Bedroom	110	fail

Block T:

Room	Hours >26 degrees	
0.01 Double Bedroom	26	pass
0.01 Double Ensuite Bedroom	25	pass
0.02 Double Bedroom	19	pass
0.02 Double Ensuite Bedroom	19	pass
0.03 Double Bedroom	22	pass
0.03 Double Ensuite Bedroom	13	pass
0.04 Double Bedroom	35	fail
0.05 Double Bedroom	34	fail
0.06 Double Bedroom	32	pass
1.01 Double Bedroom	25	pass
1.01 Double Ensuite Bedroom	19	pass
1.02 Double Bedroom	12	pass
1.02 Double Ensuite Bedroom	12	pass
1.03 Double Bedroom	14	pass
1.03 Double Ensuite Bedroom	14	pass
1.04 Double Bedroom	25	pass
1.05 Double Bedroom	25	pass
1.06 Double Bedroom	17	pass
1.07 Double Bedroom	25	pass
1.08 Double Bedroom	25	pass
2.01 Double Bedroom	25	pass
2.01 Double Ensuite Bedroom	19	pass
2.02 Double Bedroom	12	pass
2.02 Double Ensuite Bedroom	12	pass
2.03 Double Bedroom	16	pass
2.03 Double Ensuite Bedroom	14	pass
2.04 Double Bedroom	25	pass
2.05 Double Bedroom	25	pass
2.06 Double Bedroom	34	fail
2.07 Double Bedroom	19	pass
2.08 Double Bedroom	25	pass
3.01 Double Bedroom	26	pass
3.01 Double Ensuite Bedroom	26	pass
3.02 Double Bedroom	12	pass
3.02 Double Ensuite Bedroom	12	pass
3.03 Double Bedroom	16	pass
3.03 Double Ensuite Bedroom	15	pass
3.04 Double Bedroom	25	pass
3.05 Double Bedroom	26	pass
3.06 Double Bedroom	17	pass
3.07 Double Bedroom	25	pass
3.08 Double Bedroom	27	pass
4.01 Double Bedroom	24	pass
4.01 Double Ensuite Bedroom	17	pass
4.02 Double Bedroom	12	pass
4.02 Double Ensuite Bedroom	12	pass
4.03 Double Bedroom	15	pass
4.03 Double Ensuite Bedroom	15	pass
4.04 Double Bedroom	25	pass
4.05 Double Bedroom	26	pass
4.06 Double Bedroom	17	pass
4.07 Double Bedroom	25	pass
4.08 Double Bedroom	23	pass
5.01 Double Bedroom	23	pass
5.01 Double Ensuite Bedroom	16	pass
5.02 Double Bedroom	11	pass
5.02 Double Ensuite Bedroom	9	pass
5.03 Double Bedroom	13	pass
5.03 Double Ensuite Bedroom	12	pass
5.04 Double Bedroom	23	pass
5.05 Double Bedroom	24	pass
5.06 Double Bedroom	17	pass
5.07 Double Bedroom	25	pass
5.08 Double Bedroom	23	pass
6.01 Double Bedroom	15	pass
6.01 Double Ensuite Bedroom	13	pass
6.02 Double Bedroom	13	pass
6.03 Double Bedroom	21	pass
6.04 Double Bedroom	18	pass

Criteria A - DSY 2020s results – Mitigation "G Value 40%+Blinds"

Block I:

CRITERIA 1 PASS		CRITERIA 1 PASS	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
0.01_Double Bedroom	0.4	1.12_K/D/L - 2bed	0.1
0.01_K/D/L - 2bed	0.9	1.13_Double Bedroom	2
0.01_Single Bedroom	1.3	1.13_Double Bedroom Ensuite	0.3
0.02_Double Bedroom	0	1.13_K/D/L - 3bed	2.1
0.02_K/D/L - 1bed	0.1	1.14_Double Bedroom	1.7
0.03_Double Bedroom	0.4	1.14_Double Bedroom Ensuite	0.6
0.03_K/D/L - 1bed	0.4	1.14_K/D/L - 2bed	2
0.04_Double Bedroom	0.7	1.14_Single Bedroom	1.3
0.04_K/D/L - 1bed	1.3	2.01_Double Bedroom Ensuite	0.2
0.05_Double Bedroom	0.8	2.01_K/D/L -2bed	1.4
0.05_K/D/L - 1bed	1.3	2.01_Single Bedroom	0.7
0.06_Double Bedroom	0.5	2.02_Double Bedroom	1.6
0.06_K/D/L - 1bed	0.7	2.02_Double Bedroom Ensuite	1
0.07_Double Bedroom	0	2.02_K/D/L - 3bed	2.7
0.07_K/D/L - 1bed	0.1	2.02_Single Bedroom	1.8
0.08_Double Bedroom	0	2.03_Double Bedroom	0.8
0.08_K/D/L - 2bed	0.1	2.03_Double Bedroom Ensuite	0.7
0.08_Single Bedroom	0	2.03_K/D/L - 2bed	1.6
0.09_Double Bedroom	0	2.04_Double Bedroom	0.1
0.09_K/D/L - 1bed	0	2.04_Double Bedroom	0.5
0.10_Double Bedroom	0.5	2.04_K/D/L - 2bed	1.7
0.10_K/D/L - 1bed	0.6	2.05_Double Bedroom	0
1.01_Double Bedroom Ensuite	0.2	2.05_K/D/L -1bed	0.1
1.01_K/D/L -2bed	1.4	2.06_Double Bedroom	0.6
1.01_Single Bedroom	0.8	2.06_K/D/L -1bed	1.4
1.02_Double Bedroom	2	2.07_Double Bedroom	0.3
1.02_Double Bedroom Ensuite	1	2.07_K/D/L -1bed	2.1
1.02_K/D/L - 3bed	2.9	2.08_Double Bedroom	0.3
1.02_Single Bedroom	2.1	2.08_K/D/L -1bed	2.6
1.03_Double Bedroom	0.9	2.09_Double Bedroom	1.2
1.03_Double Bedroom Ensuite	0.7	2.09_K/D/L -1bed	2.2
1.03_K/D/L - 2bed	1.4	2.10_Double Bedroom	0.1
1.04_Double Bedroom	0.1	2.10_K/D/L -1bed	0.6
1.04_Double Bedroom	0.6	2.11_Double Bedroom	0
1.04_K/D/L - 2bed	2	2.11_Double Bedroom	0
1.05_Double Bedroom	0.1	2.11_K/D/L - 2bed	0.1
1.05_K/D/L -1bed	0.2	2.12_Double Bedroom	0
1.06_Double Bedroom	0.3	2.12_Double Bedroom Ensuite	0
1.06_K/D/L -1bed	0.5	2.12_K/D/L - 2bed	0
1.07_Double Bedroom	0.4	2.13_Double Bedroom	1.8
1.07_K/D/L -1bed	0.7	2.13_Double Bedroom Ensuite	0.2
1.08_Double Bedroom	0.4	2.13_K/D/L - 3bed	1.9
1.08_K/D/L -1bed	1.2	2.13_Single Bedroom	1.7
1.09_Double Bedroom	0.8	2.14_Double Bedroom Ensuite	0.4
1.09_K/D/L -1bed	0.8	2.14_K/D/L - 2bed	2.8
1.10_Double Bedroom	0.1	2.14_Single Bedroom	1
1.10_K/D/L -1bed	0.5	3.01_Double Bedroom Ensuite	0.2
1.11_Double Bedroom	0	3.01_K/D/L -2bed	1.5
1.11_Double Bedroom	0	3.01_Single Bedroom	0.8
1.11_K/D/L - 2bed	0.1	3.02_Double Bedroom	1.6
1.12_Double Bedroom	0	3.02_Double Bedroom Ensuite	1
1.12_Double Bedroom Ensuite	0	3.02_K/D/L - 3bed	3

CRITERIA 1 PASS		CRITERIA 1 PASS	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
3.02_Single Bedroom	1.8	4.07_Single Bedroom	1.4
3.03_Double Bedroom	1.1	4.08_Double Bedroom Ensuite	0.7
3.03_Double Bedroom Ensuite	0.8	4.08_K/D/L - 2bed	3
3.03_K/D/L - 2bed	1.7	4.08_Single Bedroom	1.5
3.04_Double Bedroom	0	5.01_Double Bedroom Ensuite	0.3
3.04_Double Bedroom	0.4	5.01_K/D/L -2bed	2.8
3.04_K/D/L - 2bed	1.5	5.01_Single Bedroom	1.1
3.05_Double Bedroom	0	5.02_Double Bedroom	1.7
3.05_K/D/L -1bed	0	5.02_Double Bedroom Ensuite	1
3.06_Double Bedroom	0.5	5.02_Single Bedroom	1.9
3.06_Double Bedroom Ensuite	0.7	5.02_K/D/L - 3bed	2.7
3.06_K/D/L -2bed	2.7	5.03_Double Bedroom	0.7
3.07_Double Bedroom	1.2	5.03_K/D/L -3bed	2.8
3.07_Double Bedroom Ensuite	1.1	5.03_Single Bedroom	0.2
3.07_K/D/L -2bed	3	5.03_Single Bedroom	1.6
3.08_Double Bedroom	0.5	5.04_Double Bedroom Ensuite	0
3.08_K/D/L -1bed	0.8	5.04_K/D/L -3bed	1.3
3.09_Double Bedroom	0	5.04_Single Bedroom	0.4
3.09_Double Bedroom	0	5.04_Single Bedroom	0.2
3.09_K/D/L - 2bed	0.2	5.05_Double Bedroom	1.9
3.10_Double Bedroom	0	5.05_Double Bedroom Ensuite	0.3
3.10_Double Bedroom Ensuite	0	5.05_K/D/L - 3bed	2
3.10_K/D/L - 2bed	0.1	5.05_Single Bedroom	1.8
3.11_Double Bedroom	1.7	5.06_Double Bedroom Ensuite	1.1
3.11_Double Bedroom Ensuite	0.2	5.06_Single Bedroom	1.9
3.11_K/D/L - 3bed	1.9	5.06_K/D/L - 2bed	2.2
3.11_Single Bedroom	1.4	6.01_Double Bedroom Ensuite	0
3.12_Double Bedroom Ensuite	0.6	6.01_K/D/L -3bed	1.3
3.12_Single Bedroom	1.2	6.01_Single Bedroom	0.4
3.12_K/D/L - 2bed	3	6.01_Single Bedroom	0.2
4.01_Double Bedroom Ensuite	0.4	6.02_Double Bedroom	1.9
4.01_K/D/L -2bed	1.8	6.02_Double Bedroom Ensuite	0.3
4.01_Single Bedroom	1.1	6.02_K/D/L - 3bed	2
4.02_Double Bedroom	1.7	6.02_Single Bedroom	1.8
4.02_Double Bedroom Ensuite	1	6.03_Double Bedroom Ensuite	1.1
4.02_K/D/L - 3bed	2.9	6.03_Single Bedroom	1.9
4.02_Single Bedroom	1.8	6.03_K/D/L - 2bed	2.1
4.03_Double Bedroom	0.8	7.01_Double Bedroom Ensuite	0
4.03_K/D/L -3bed	2.5	7.01_K/D/L -3bed	0.3
4.03_Single Bedroom	1.7	7.01_Single Bedroom	0
4.03_Single Bedroom	0.3	7.01_Single Bedroom	0
4.04_Double Bedroom	0.6	7.02_Double Bedroom	1.5
4.04_K/D/L -1bed	0.9	7.02_Double Bedroom Ensuite	0.1
4.05_Double Bedroom	0	7.02_K/D/L - 3bed	2.6
4.05_Double Bedroom	0	7.02_Single Bedroom	1.4
4.05_K/D/L - 2bed	0.1	7.03_Double Bedroom Ensuite	0.5
4.06_Double Bedroom	0	7.03_Single Bedroom	1.3
4.06_Double Bedroom Ensuite	0	7.03_K/D/L - 2bed	2.8
4.06_K/D/L - 2bed	0.1		
4.07_Double Bedroom	1.6		
4.07_Double Bedroom Ensuite	0.2		
4.07_K/D/L - 3bed	1.9		

Block T:

CRITERIA 1 PASS		CRITERIA 1 PASS	
Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)
0.01 Double Bedroom	1.1	3.03 Double Ensuite Bedroom	0.3
0.01 Double Ensuite Bedroom	0.4	3.03 K/D/L-2 bed	2.5
0.01 K/D/L-2 bed	2.3	3.04 Double Bedroom	0.8
0.02 Double Bedroom	0.2	3.04 K/D/L-1 bed	1.1
0.02 Double Ensuite Bedroom	0.1	3.05 Double Bedroom	0.5
0.02 K/D/L-2 bed	1.6	3.05 K/D/L-1 bed	0.9
0.03 Double Bedroom	0.5	3.06 Double Bedroom	0.9
0.03 Double Ensuite Bedroom	0.2	3.06 K/D/L-1 bed	2.8
0.03 K/D/L-2 bed	2.3	3.07 Double Bedroom	1.3
0.04 Double Bedroom	1.4	3.07 K/D/L-1 bed	1.3
0.04 K/D/L-1 bed	1.6	3.08 Double Bedroom	2.1
0.05 Double Bedroom	0.8	3.08 K/D/L-1 bed	2.1
0.05 K/D/L-1 bed	0.9	4.01 Double Bedroom	0.4
0.06 Double Bedroom	2.6	4.01 Double Ensuite Bedroom	0.3
0.06 K/D/L-1 bed	2.3	4.01 K/D/L-2 bed	1.9
1.01 Double Bedroom	0.4	4.02 Double Bedroom	0.2
1.01 Double Ensuite Bedroom	0.3	4.02 Double Ensuite Bedroom	0
1.01 K/D/L-2 bed	1.9	4.02 K/D/L-2 bed	1.5
1.02 Double Bedroom	0.2	4.03 Double Bedroom	0.5
1.02 Double Ensuite Bedroom	0	4.03 Double Ensuite Bedroom	0.3
1.02 K/D/L-2 bed	1.5	4.03 K/D/L-2 bed	2.6
1.03 Double Bedroom	0.4	4.04 Double Bedroom	1
1.03 Double Ensuite Bedroom	0.2	4.04 K/D/L-1 bed	1.3
1.03 K/D/L-2 bed	2.3	4.05 Double Bedroom	0.5
1.04 Double Bedroom	0.8	4.05 K/D/L-1 bed	1.1
1.04 K/D/L-1 bed	1.1	4.06 Double Bedroom	1
1.05 Double Bedroom	0.5	4.06 K/D/L-1 bed	2.8
1.05 K/D/L-1 bed	0.8	4.07 Double Bedroom	1.4
1.06 Double Bedroom	0.8	4.07 K/D/L-1 bed	1.3
1.06 K/D/L-1 bed	2.7	4.08 Double Bedroom	2.7
1.07 Double Bedroom	1.1	4.08 K/D/L-1 bed	2
1.07 K/D/L-1 bed	1.2	5.01 Double Bedroom	0.3
1.08 Double Bedroom	2.6	5.01 Double Ensuite Bedroom	0.3
1.08 K/D/L-1 bed	2.1	5.01 K/D/L-2 bed	1.9
2.01 Double Bedroom	0.4	5.02 Double Bedroom	0
2.01 Double Ensuite Bedroom	0.3	5.02 Double Ensuite Bedroom	0
2.01 K/D/L-2 bed	2	5.02 K/D/L-2 bed	1.6
2.02 Double Bedroom	0.2	5.03 Double Bedroom	0.3
2.02 Double Ensuite Bedroom	0	5.03 Double Ensuite Bedroom	0.1
2.02 K/D/L-2 bed	1.5	5.03 K/D/L-2 bed	3
2.03 Double Bedroom	0.4	5.04 Double Bedroom	1.5
2.03 Double Ensuite Bedroom	0.2	5.04 K/D/L-1 bed	2.5
2.03 K/D/L-2 bed	2.4	5.05 Double Bedroom	1.1
2.04 Double Bedroom	0.7	5.05 K/D/L-1 bed	2.7
2.04 K/D/L-1 bed	0.9	5.06 Double Bedroom	1
2.05 Double Bedroom	0.4	5.06 K/D/L-1 bed	2.9
2.05 K/D/L-1 bed	0.8	5.07 Double Bedroom	1.4
2.06 Double Bedroom	1.9	5.07 K/D/L-1 bed	1.3
2.06 K/D/L-1 bed	2.7	5.08 Double Bedroom	2.5
2.07 Double Bedroom	0.9	5.08 K/D/L-1 bed	2
2.07 K/D/L-1 bed	0.8	6.01 Double Bedroom	0
2.08 Double Bedroom	2.7	6.01 Double Ensuite Bedroom	0
2.08 K/D/L-1 bed	2	6.01 K/D/L-2 bed	1.2
3.01 Double Bedroom	1.3	6.02 Double Bedroom	0.5
3.01 Double Ensuite Bedroom	0.9	6.02 K/D/L-1 bed	2
3.01 K/D/L-2 bed	2.9	6.03 Double Bedroom	0.5
3.02 Double Bedroom	0.2	6.03 K/D/L-1 bed	0.6
3.02 Double Ensuite Bedroom	0	6.04 Double Bedroom	2.1
3.02 K/D/L-2 bed	1.5	3.02 Corridor	0
3.03 Double Bedroom	0.4	6.04 K/D/L-1 bed	2.1

Criteria B - DSY 2020s results – Mitigation "G Value 40%+Blinds"

Block I:

Room	Hours >26 degrees		Room	Hours >26 degrees	
0.01_Double Bedroom	10	pass	3.04_Double Bedroom	6	pass
0.01_Single Bedroom	8	pass	3.04_Double Bedroom	8	pass
0.02_Double Bedroom	8	pass	3.05_Double Bedroom	8	pass
0.03_Double Bedroom	8	pass	3.06_Double Bedroom	13	pass
0.04_Double Bedroom	10	pass	3.06_Double Bedroom Ensuite	5	pass
0.05_Double Bedroom	10	pass	3.07_Double Bedroom	15	pass
0.06_Double Bedroom	8	pass	3.07_Double Bedroom Ensuite	5	pass
0.07_Double Bedroom	6	pass	3.08_Double Bedroom	8	pass
0.08_Double Bedroom	8	pass	3.09_Double Bedroom	9	pass
0.08_Single Bedroom	8	pass	3.09_Double Bedroom	12	pass
0.09_Double Bedroom	13	pass	3.10_Double Bedroom	15	pass
0.10_Double Bedroom	18	pass	3.10_Double Bedroom Ensuite	15	pass
1.01_Double Bedroom Ensuite	11	pass	3.11_Double Bedroom	12	pass
1.01_Single Bedroom	10	pass	3.11_Double Bedroom Ensuite	13	pass
1.02_Double Bedroom	16	pass	3.11_Single Bedroom	10	pass
1.02_Double Bedroom Ensuite	9	pass	3.12_Double Bedroom Ensuite	17	pass
1.02_Single Bedroom	13	pass	3.12_Single Bedroom	16	pass
1.03_Double Bedroom	21	pass	4.01_Double Bedroom Ensuite	11	pass
1.03_Double Bedroom Ensuite	22	pass	4.01_Single Bedroom	12	pass
1.04_Double Bedroom	8	pass	4.02_Double Bedroom	16	pass
1.04_Double Bedroom	12	pass	4.02_Double Bedroom Ensuite	10	pass
1.05_Double Bedroom	9	pass	4.02_Single Bedroom	13	pass
1.06_Double Bedroom	16	pass	4.03_Double Bedroom	14	pass
1.07_Double Bedroom	6	pass	4.03_Single Bedroom	11	pass
1.08_Double Bedroom	6	pass	4.03_Single Bedroom	9	pass
1.09_Double Bedroom	17	pass	4.04_Double Bedroom	7	pass
1.10_Double Bedroom	8	pass	4.05_Double Bedroom	7	pass
1.11_Double Bedroom	8	pass	4.05_Double Bedroom	7	pass
1.11_Double Bedroom	9	pass	4.06_Double Bedroom	15	pass
1.12_Double Bedroom	16	pass	4.06_Double Bedroom Ensuite	15	pass
1.12_Double Bedroom Ensuite	15	pass	4.07_Double Bedroom	12	pass
1.13_Double Bedroom	10	pass	4.07_Double Bedroom Ensuite	13	pass
1.13_Double Bedroom Ensuite	13	pass	4.07_Single Bedroom	10	pass
1.14_Double Bedroom	10	pass	4.08_Double Bedroom Ensuite	17	pass
1.14_Double Bedroom Ensuite	12	pass	4.08_Single Bedroom	16	pass
1.14_Single Bedroom	8	pass	5.01_Double Bedroom Ensuite	9	pass
2.01_Double Bedroom Ensuite	11	pass	5.01_Single Bedroom	9	pass
2.01_Single Bedroom	11	pass	5.02_Double Bedroom	10	pass
2.02_Double Bedroom	16	pass	5.02_Double Bedroom Ensuite	6	pass
2.02_Double Bedroom Ensuite	9	pass	5.02_Single Bedroom	10	pass
2.02_Single Bedroom	13	pass	5.03_Double Bedroom	8	pass
2.03_Double Bedroom	22	pass	5.03_Single Bedroom	6	pass
2.03_Double Bedroom Ensuite	21	pass	5.03_Single Bedroom	8	pass
2.04_Double Bedroom	8	pass	5.04_Double Bedroom Ensuite	9	pass
2.04_Double Bedroom	12	pass	5.04_Single Bedroom	9	pass
2.05_Double Bedroom	10	pass	5.04_Single Bedroom	10	pass
2.06_Double Bedroom	17	pass	5.05_Double Bedroom	10	pass
2.07_Double Bedroom	6	pass	5.05_Double Bedroom Ensuite	13	pass
2.08_Double Bedroom	6	pass	5.05_Single Bedroom	10	pass
2.09_Double Bedroom	17	pass	5.06_Double Bedroom Ensuite	17	pass
2.10_Double Bedroom	8	pass	5.06_Single Bedroom	16	pass
2.11_Double Bedroom	8	pass	6.01_Double Bedroom Ensuite	9	pass
2.11_Double Bedroom	8	pass	6.01_Single Bedroom	9	pass
2.12_Double Bedroom	15	pass	6.01_Single Bedroom	9	pass
2.12_Double Bedroom Ensuite	14	pass	6.02_Double Bedroom	10	pass
2.13_Double Bedroom	12	pass	6.02_Double Bedroom Ensuite	12	pass
2.13_Double Bedroom Ensuite	13	pass	6.02_Single Bedroom	9	pass
2.13_Single Bedroom	10	pass	6.03_Double Bedroom Ensuite	17	pass
2.14_Double Bedroom Ensuite	17	pass	6.03_Single Bedroom	15	pass
2.14_Single Bedroom	15	pass	7.01_Double Bedroom Ensuite	7	pass
3.01_Double Bedroom Ensuite	11	pass	7.01_Single Bedroom	7	pass
3.01_Single Bedroom	11	pass	7.01_Single Bedroom	7	pass
3.02_Double Bedroom	16	pass	7.02_Double Bedroom	7	pass
3.02_Double Bedroom Ensuite	10	pass	7.02_Double Bedroom Ensuite	10	pass
3.02_Single Bedroom	13	pass	7.02_Single Bedroom	7	pass
3.03_Double Bedroom	23	pass	7.03_Double Bedroom Ensuite	15	pass
3.03_Double Bedroom Ensuite	24	pass	7.03_Single Bedroom	13	pass

Block T:

Room	Hours >26 degrees	
0.01 Double Bedroom	25	pass
0.01 Double Ensuite Bedroom	19	pass
0.02 Double Bedroom	25	pass
0.02 Double Ensuite Bedroom	24	pass
0.03 Double Bedroom	20	pass
0.03 Double Ensuite Bedroom	13	pass
0.04 Double Bedroom	28	pass
0.05 Double Bedroom	28	pass
0.06 Double Bedroom	24	pass
1.01 Double Bedroom	20	pass
1.01 Double Ensuite Bedroom	16	pass
1.02 Double Bedroom	11	pass
1.02 Double Ensuite Bedroom	10	pass
1.03 Double Bedroom	14	pass
1.03 Double Ensuite Bedroom	12	pass
1.04 Double Bedroom	23	pass
1.05 Double Bedroom	23	pass
1.06 Double Bedroom	14	pass
1.07 Double Bedroom	22	pass
1.08 Double Bedroom	18	pass
2.01 Double Bedroom	21	pass
2.01 Double Ensuite Bedroom	16	pass
2.02 Double Bedroom	11	pass
2.02 Double Ensuite Bedroom	10	pass
2.03 Double Bedroom	14	pass
2.03 Double Ensuite Bedroom	12	pass
2.04 Double Bedroom	23	pass
2.05 Double Bedroom	23	pass
2.06 Double Bedroom	28	pass
2.07 Double Bedroom	17	pass
2.08 Double Bedroom	18	pass
3.01 Double Bedroom	25	pass
3.01 Double Ensuite Bedroom	24	pass
3.02 Double Bedroom	11	pass
3.02 Double Ensuite Bedroom	10	pass
3.03 Double Bedroom	14	pass
3.03 Double Ensuite Bedroom	12	pass
3.04 Double Bedroom	24	pass
3.05 Double Bedroom	23	pass
3.06 Double Bedroom	14	pass
3.07 Double Bedroom	23	pass
3.08 Double Bedroom	20	pass
4.01 Double Bedroom	20	pass
4.01 Double Ensuite Bedroom	16	pass
4.02 Double Bedroom	11	pass
4.02 Double Ensuite Bedroom	10	pass
4.03 Double Bedroom	14	pass
4.03 Double Ensuite Bedroom	12	pass
4.04 Double Bedroom	24	pass
4.05 Double Bedroom	24	pass
4.06 Double Bedroom	14	pass
4.07 Double Bedroom	23	pass
4.08 Double Bedroom	18	pass
5.01 Double Bedroom	19	pass
5.01 Double Ensuite Bedroom	15	pass
5.02 Double Bedroom	8	pass
5.02 Double Ensuite Bedroom	7	pass
5.03 Double Bedroom	11	pass
5.03 Double Ensuite Bedroom	9	pass
5.04 Double Bedroom	18	pass
5.05 Double Bedroom	19	pass
5.06 Double Bedroom	14	pass
5.07 Double Bedroom	22	pass
5.08 Double Bedroom	18	pass
6.01 Double Bedroom	14	pass
6.01 Double Ensuite Bedroom	12	pass
6.02 Double Bedroom	10	pass
6.03 Double Bedroom	17	pass
6.04 Double Bedroom	15	pass

Communal Corridors – DSY1 2020s results – G Value 40%+Blinds

Block I:

Room	Operative temperature (°C) - hours > 28.00
1F_Communal Corridor_E	58
1F_Communal Corridor_W	60
2F_Communal Corridor_E	58
2F_Communal Corridor_W	59
3F_Communal Corridor_E	38
3F_Communal Corridor_W	37
4F_Communal Corridor_E	55
4F_Communal Corridor_W	66
5F_Communal Corridor_E	78
5F_Communal Corridor_W	61
6F_Communal Corridor_E	77
7F_Communal Corridor_E	64

Block T:

Room	Operative temperature (°C) - hours > 28.00
Communal Corridor GF	63
Communal Corridor 1F	75
Communal Corridor 2F	69
Communal Corridor 3F	86
Communal Corridor 4F	71
Communal Corridor 5F	69
Communal Corridor 6F	36