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Mayfield Phase 1b – Plot J & K - TM59 & AVO

Considerations – Rev 00

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DATE	22 November 2024	CONFIDENTIALITY	Confidential
SUBJECT	TM59 Initial Overheating Assessment – Residential Apartments		

EXECUTIVE SUMMARY

This Design Development Note (DDN) has been produced to assess the overheating risk for a sample of apartments within the development of Mayfield Phase 1b – Plot J & K.

CIBSE TM59 methodology has been utilised to assess the overheating risk within a relevant selection of units. Compliance with TM59 minimum criteria has been analysed using the Manchester weather Centre data. Current scenario weather files were considered with the possibility of considering future weather files at further stages. Apartments were selected based on engineering judgement for worst case and include a selection of apartment typologies, elevation and heights to ensure a wide coverage with impetus to likely worst case scenarios due to location and form.

Due acoustic constraints, the analysis assumes that window or purge ventilation openings cannot be used for overheating and remain closed at all time, therefore overheating shall be mitigated by passive and mechanical means only.

Mayfield Phase 1b – Plot J & K High-rise apartments pass CIBSE TM59. Typical apartments are highlighted below:

For Plot K: (Shown below in Figures 1 to 3)

K1-Level 7 & 27

K2-Level 9 & 19

For Plot J: (Shown below in Figures 4 to 6)

J1-Level 13 & 16

J2-Level 13 & 22

Plot K Images



Figure 1: Plot K1 Level 7 and K2 Level 9

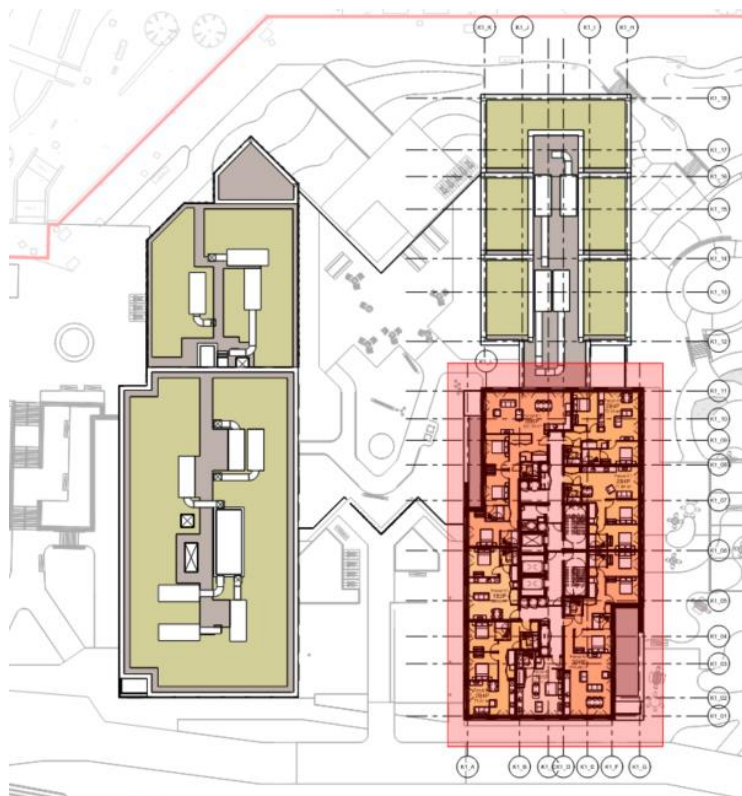


Figure 2: Plot K1 Level 27



Figure 3: Plot K2 Level 19

Plot J Images

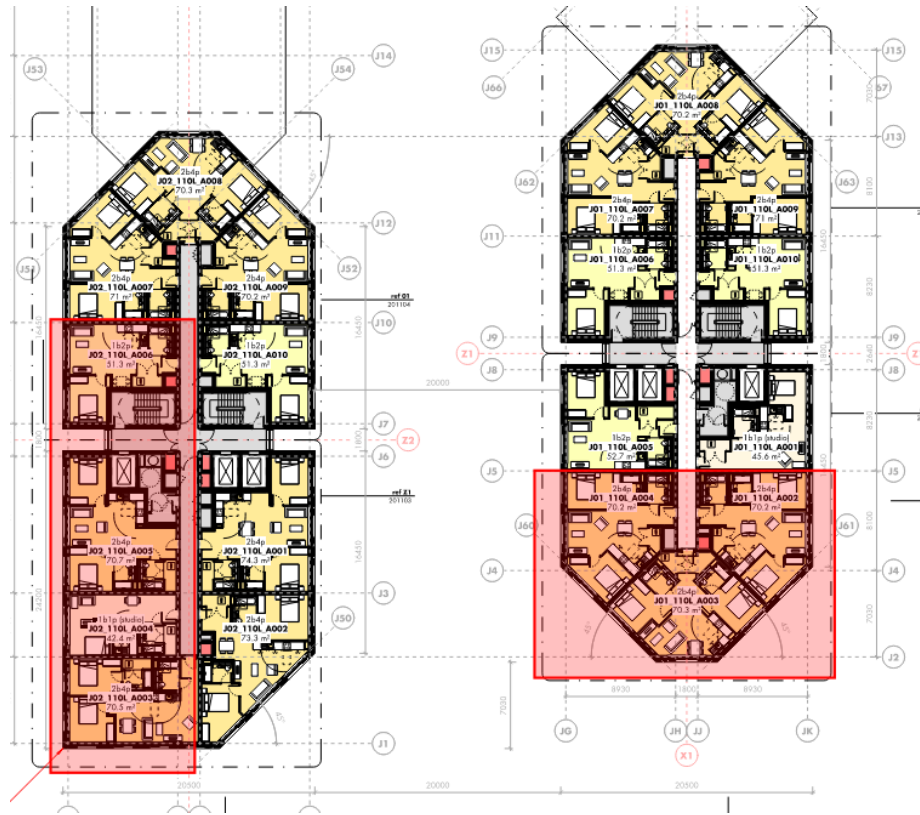


Figure 4: Plot J1 and J2 - Level 13

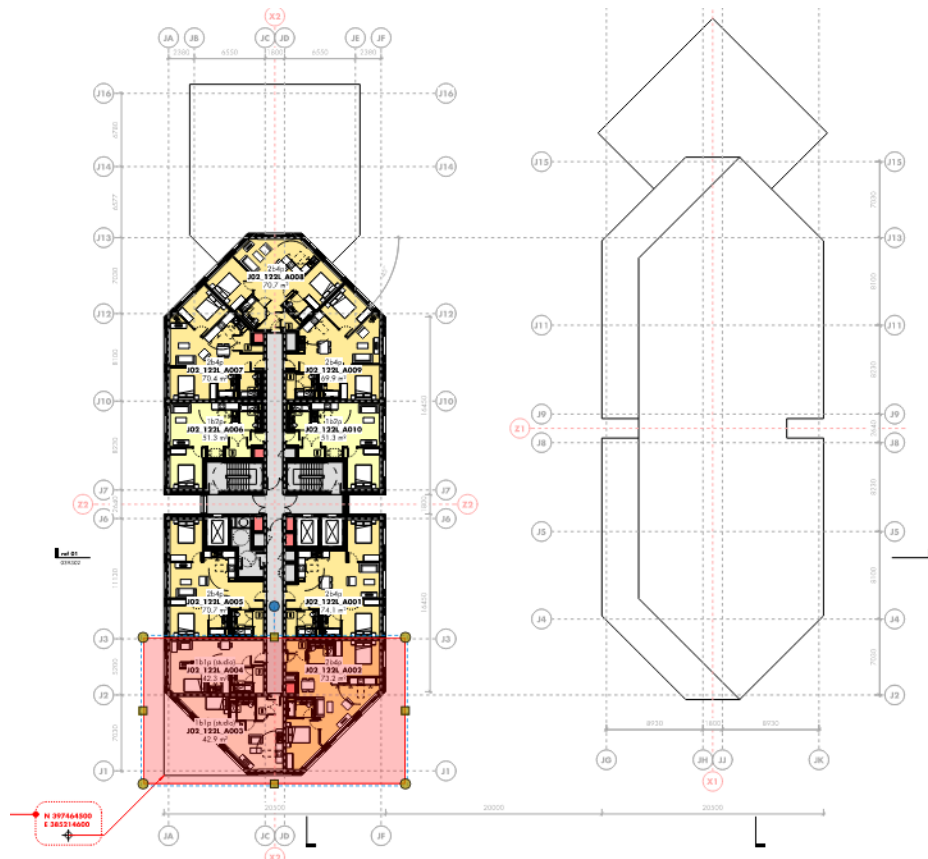


Figure 5: Plot J2 level 22



Figure 6: Plot J1 Floor 16 & 17- (Due to Duplex apartment)

METHODOLOGY

The overheating study has been carried out in line with the recommendations made by the CIBSE documents 'TM52: 2013: The Limits of Thermal Comfort: Avoiding Overheating', and 'TM59 2017: Design Methodology for the Assessment of Overheating Risk in Homes'.

Compliance with TM59 is based on passing both of the following two criteria, as the homes are 'predominantly naturally ventilated, including homes that have mechanical ventilation with heat recovery (MVHR), with good opportunities for natural ventilation in the summer'. We shall be using the following:

- Criteria (a): For living rooms, kitchens and bedrooms: The number of hours during which the operative temperature of the space is above the adaptive temperature of the space by one-degree Kelvin during the period May to September inclusive shall not be more than 3% of occupied hours.
- Criteria (b): For bedrooms only: The operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours (i.e. 33 or more hours is a fail).

WSP utilised a dynamic simulation software package, the Virtual Environment (VE) suite from Integrated Environmental Solutions (IES) to perform overheating assessments according to CIBSE TM52 (2013) and TM59 (2017) guidance.

The sample size has been selected based on the guidance from the CIBSE TM59 document.

“Sample Size: Guidance – The assessment should try to identify all the dwellings that are at risk of overheating. These are likely to be those (a) with large glazing areas, (b) on the topmost floor, (c) having less shading, (d) having large, sun-facing windows, (e) having a single aspect, or (c) having limited optioning windows.”

The IES models were developed based on the design received by architects SEW (Plot K) and ShedKM (Plot J) architects on the 31st October. The samples apartments were modelled in IES-VE software and tested for overheating according to TM59 methodology (sample floor/ apartment) shown in Figures 7 to 11, (views taken from IES model). These floor levels were assessed as considered “worst case” based on the façade detailing and massing of the site taking into account the adjacent buildings which have been modelled as shown below.

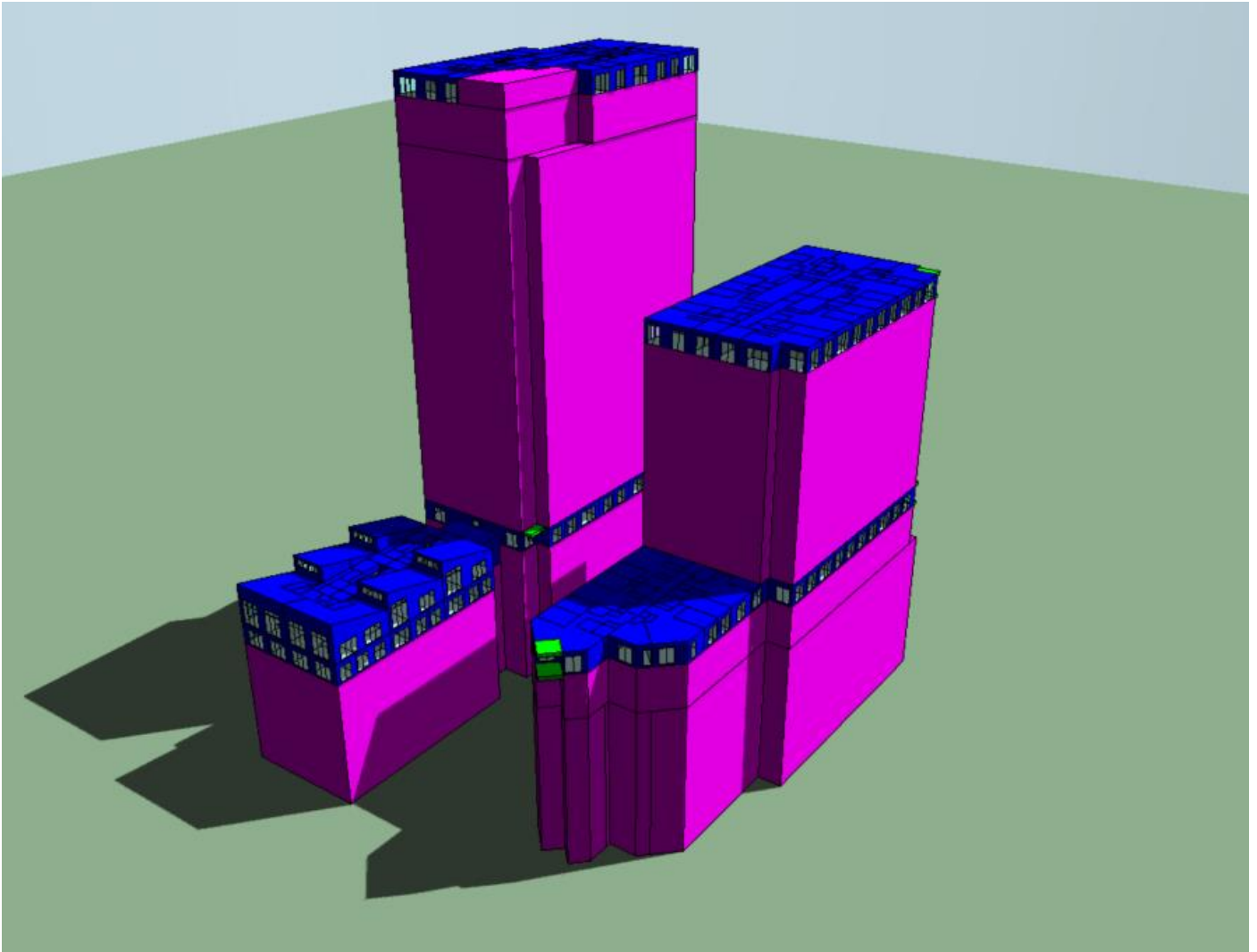


Figure 7: Plot K1 and K2, IES model- K1 on the left side of the picture, K2 on the right side

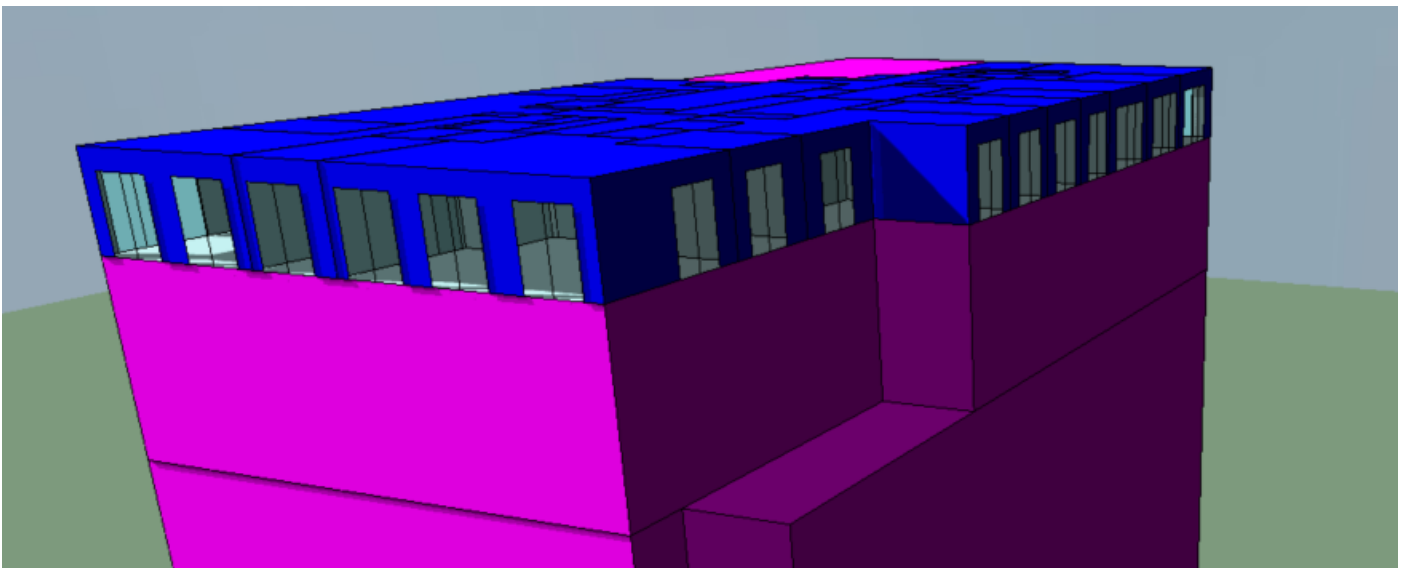


Figure 8: Plot K1 Level 27

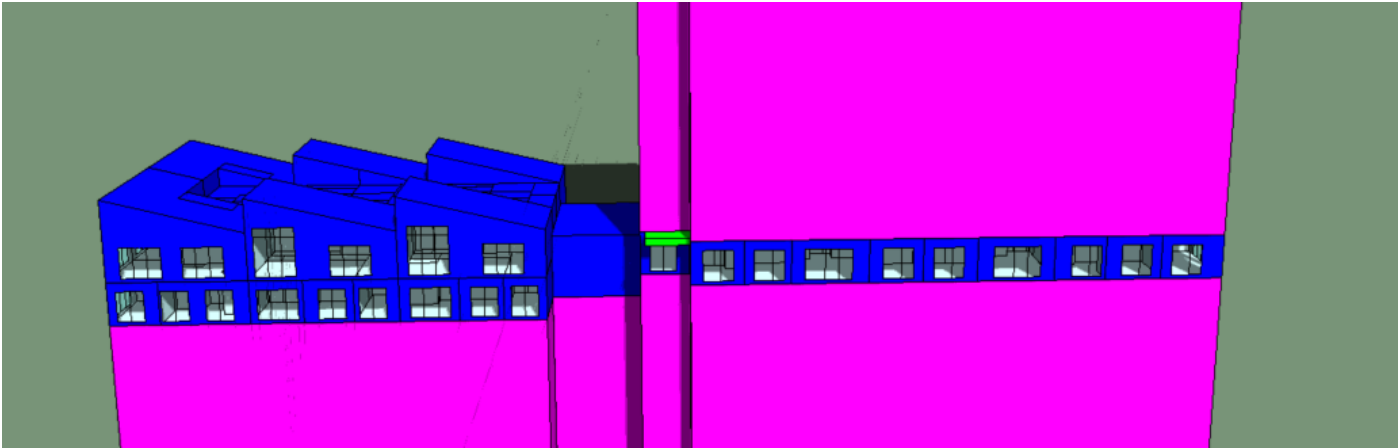


Figure 9: Plot K1 Level 7

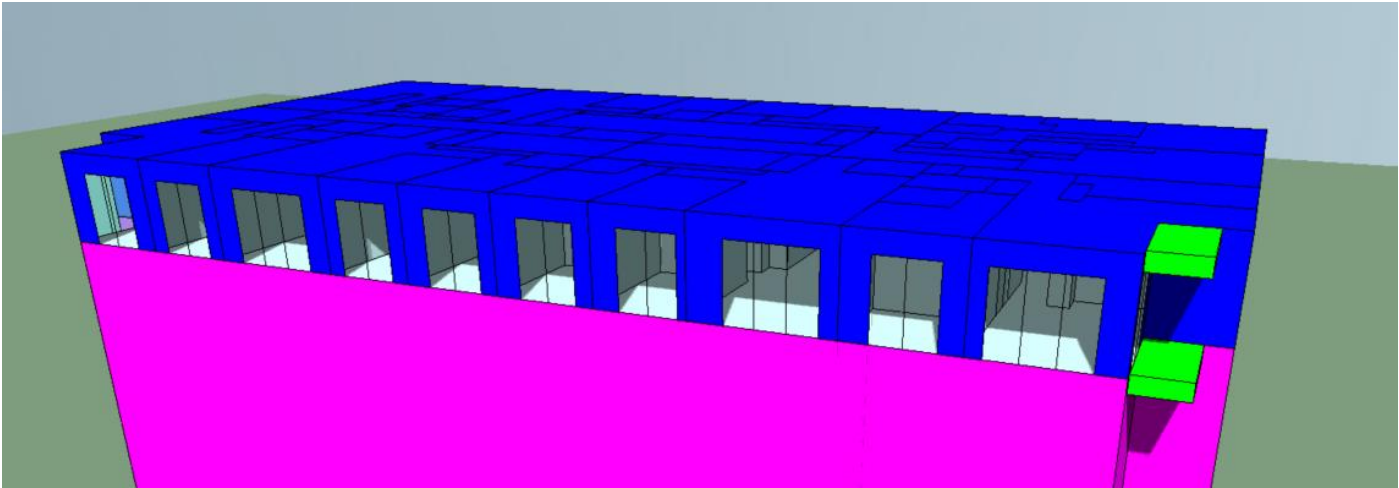


Figure 10: Plot K2 Level 19

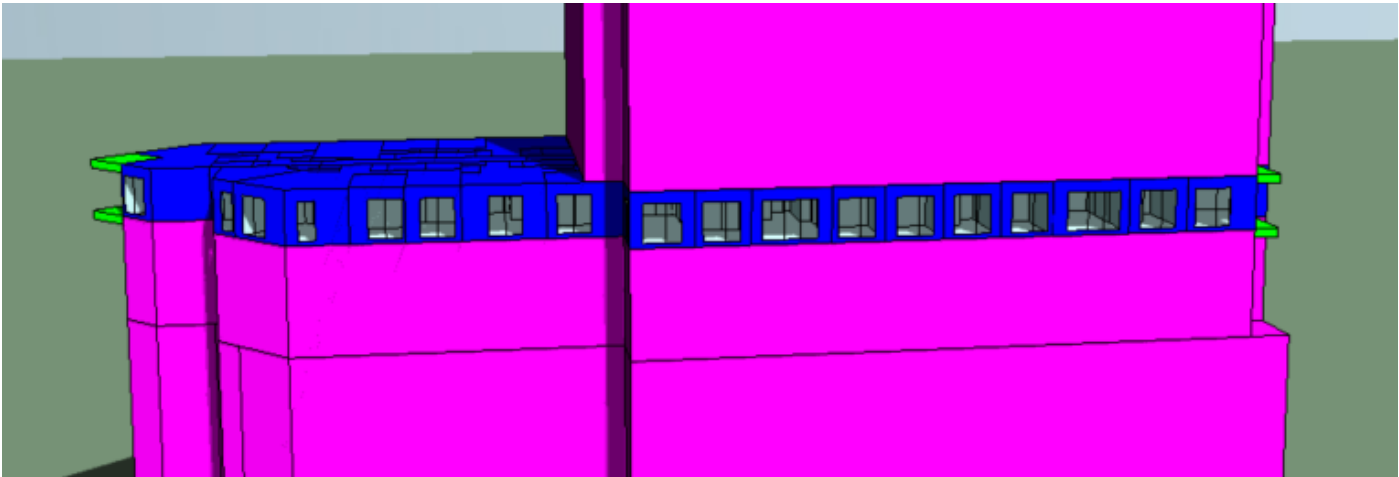


Figure 11: Plot K2 Level 9

MODELLING ASSUMPTIONS

Occupancy and equipment gains are specified by the TM59 guidance. For clarity, the following assumptions have been used and the proposals for purge vent openings are also detailed below:

Table 1 – Model assumptions – Residential

Assumptions	Target performance
Wall (W/m ² . K) (including frame and thermal bridging)	0.18 W/m ² K
Glazing G-value (all glazing areas excluding purge vents)	0.4
Glazing U-value (all glazing areas excluding purge vents)	0.9
Glazing G-value, including perforated walls within the purge panel.	0.2
Glazing U-value, including perforated walls within the purge panel.	0.9
Floor plan & Façade layout	As per architecture layouts from SEW & ShedKM
Angle of north	0
Weather data	Manchester_DSY1_2020High50.epw
Bedroom ventilation (l/s)	29 (boost mode)
Bathroom ventilation (l/s)	29 (boost mode)
Open Plan Livingroom and Kitchen Cooling ventilation (l/s)	29 (boost mode)
Air Infiltration (ACH)	0.15
Purge vent panel design	None are openable
Open Plan Livingroom and Kitchen Cooling (W)	Maximum cooling capacity of the unit is 1.5 kW, and this will be distributed between the living areas and the bedrooms based on the airflow rates that are being supplied into each of the spaces as follows: - Living rooms : 500W (provided by ASHP in Free Cooling Mode) when internal temperature is above 24 °C - Bedrooms : 250W / per bedroom (provided by ASHP in Free Cooling Mode) when internal temperature is above 24 °C
Bedroom Cooling (W)	
Air Permeability (m ³ /h/m ² @ 50 Pa)	3
Internal gains for Bedrooms	Occupancy Maximum Sensible gain - 75 W/Person Maximum Latent gain - 55 W/Person

	Occupant Density – 2 people Lighting Maximum Sensible gain – 2 W/m ² Maximum Power Consumption - 2 W/m ² Equipment Gain Maximum Sensible gain - 80 W Maximum Latent gain - 0 W
Internal gains for Open Plan Livingroom and Kitchen	Occupancy Maximum Sensible gain - 75 W/Person Maximum Latent gain - 55 W/Person Occupant Density – 3 people Lighting Maximum Sensible gain – 2 W/m ² Maximum Power Consumption - 2 W/m ² Equipment Gain Maximum Sensible gain - 450 W Maximum Latent gain - 0 W

MEP Strategy and KERS System Overview:

The eco-friendly KERS Weatherby indoor heat pump is a combined heat recovery and hot water system with storage cylinder. Using energy in the outdoor air to provide low cost, low carbon renewable hot water. KERS's heater less design produces hot water temperatures up to 65 deg C solely using heat pump technology, resulting in greater energy savings.

The KERS Cool Boost System offers all the benefits of an MVHR with the added bonus of a cooling module for the extreme summer months, meaning homes can have a constant source of clean, fresh air and remain habitable - set to an optimal comfort temperature all year round.

The KERS cooling system works in conjunction with an MVHR Systems. Both systems work independently when no cooling is required. Once the temperature within the apartment exceeds 24 Degrees, the MVHR System will first use the cooler external air to reduce the internal temperature. If the external temperature is equal or higher than the internal temperature, the MVHR System then sends a signal to the Coolboost Module to activate the cooling controls and provides free cooling to the apartment via the MVHR ducting. Air will be taken from the room, absorbing the energy and the resultant cool air will be diverted into the room to supply free cooling. Specialist software and internal dampers will allow the control strategy to work.

The maximum cooling capacity of the unit is 1.5 kW, and this will be distributed between the living areas and the bedrooms based on the airflow rates that are being supplied into each of the spaces.

RESULTS

The following section sets out the results from the TM59 overheating study with acoustic considerations applied. Note that there is no TM59 criteria for closing windows at any time but windows in each room should be controlled separately and modelled as open when both the internal dry bulb temperature exceeds 22 °C and the room is occupied.

Plot K

Table 2

Space	Criterion 01 % Hours Top Tmax >= 1°C		Criterion 02 Bedroom only Hours between 10pm – 7am > 26°C (per annum)	
K1_L07_07_2B4P_Bed-room01	0	Pass	0	Pass
K1_L07_07_2B4P_Bed-room02	0	Pass	0	Pass
K1_L07_08_1B2P_Bed-room01	0	Pass	0	Pass
K1_L07_08_1B2P_LKD	0	Pass	#N/A	#N/A
K1_L07_09_1B2P_Bed-room01	0	Pass	0	Pass
K1_L07_09_1B2P_LKD	0	Pass	#N/A	#N/A
K1_L07_01_2B4P_Bed-room01	0	Pass	0	Pass
K1_L07_01_2B4P_Bed-room02	0	Pass	0	Pass
K1_L07_02_1B1P_LKD	0	Pass	0	Pass
K1_L07_03_2B4P_Bed-room01	0	Pass	0	Pass
K1_L07_03_2B4P_Bed-room02	0	Pass	0	Pass
K1_L07_04_2B4P_Bed-room02	0	Pass	0	Pass
K1_L07_04_2B4P_Bed-room01	0	Pass	0	Pass
K1_L07_04_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L07_05_2B4P_Bed-room01	0	Pass	0	Pass
K1_L07_05_2B4P_Bed-room02	0	Pass	0	Pass



K1_L07_05_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L07_06_2B4P_Bedroom01	0	Pass	0	Pass
K1_L07_06_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L07_06_2B4P_Bedroom02	0	Pass	0	Pass
K2_L09_01_2B4P_Bedroom1	0.1	Pass	0	Pass
K2_L09_01_2B4P_Bedroom2	0	Pass	0	Pass
K2_L09_01_2B4P_LKD	0	Pass	#N/A	#N/A
K2_L09_02_1B1P_LKD	0	Pass	0	Pass
K2_L09_03_2B4P_Bedroom2	0	Pass	0	Pass
K2_L09_03_2B4P_Bedroom1	0	Pass	0	Pass
K2_L09_03_2B4P_LKD	0	Pass	#N/A	#N/A
K2_L09_04_1B2P_Bedroom	0	Pass	0	Pass
K2_L09_04_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L09_05_2B4P_Bedroom1	0	Pass	0	Pass
K2_L09_06_1B2P_Bedroom	0	Pass	0	Pass
K2_L09_06_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L09_11_1B2P_Bedroom	0	Pass	0	Pass
K2_L09_11_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L09_12_1B2P_Bedroom	0	Pass	0	Pass
K2_L09_13_3B6P_Bedroom1	0	Pass	0	Pass
K2_L09_13_3B6P_Bedroom2	0	Pass	0	Pass
K2_L09_13_3B6P_LKD	0	Pass	#N/A	#N/A
K2_L09_13_3B6P_Bedroom3	0	Pass	0	Pass
K2_L09_14_2B4P_Bedroom2	0	Pass	0	Pass
K2_L09_14_2B4P_LKD	0	Pass	#N/A	#N/A
K2_L09_14_2B4P_Bedroom1	0	Pass	0	Pass
K2_L09_10_1B2P_Bedroom	0	Pass	0	Pass
K2_L09_10_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L09_07_1B2P_Bedroom	0.2	Pass	0	Pass
K2_L09_07_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L09_08_2B4P_Bedroom1	0.6	Pass	0	Pass

K2_L09_08_2B4P_LKD	0.1	Pass	#N/A	#N/A
K2_L09_08_2B4P_Bedroom2	0.2	Pass	0	Pass
K2_L09_09_2B4P_Bedroom1	0.2	Pass	0	Pass
K2_L09_09_2B4P_Bedroom2	0.6	Pass	0	Pass
K2_L09_09_2B4P_LKD	0.1	Pass	#N/A	#N/A
K1_L07_01_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L07_07_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L07_10_3B6P_Bedroom02	0	Pass	0	Pass
K1_L07_10_3B6P_Bedroom03	0	Pass	0	Pass
K1_L07_10_3B6P_Bedroom01	0	Pass	0	Pass
K1_L07_11_3B6P_Bedroom01	0	Pass	0	Pass
K1_L07_11_3B6P_Bedroom02	0	Pass	0	Pass
K1_L07_11_3B6P_Bedroom03	0	Pass	0	Pass
K1_L07_12_3B6P_Bedroom01	0.1	Pass	0	Pass
K1_L07_12_3B6P_Bedroom02	0	Pass	0	Pass
K1_L07_12_3B6P_Bedroom03	0	Pass	0	Pass
K1_L07_15_3B6P_Bedroom03	0	Pass	0	Pass
K1_L07_03_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L07_15_3B6P_Bedroom02	0	Pass	0	Pass
K1_L07_15_3B6P_Bedroom01	0.4	Pass	0	Pass
K1_L07_13_3B6P_Bedroom02	0	Pass	0	Pass
K1_L07_13_3B6P_Bedroom01	0	Pass	0	Pass
K1_L07_14_3B6P_Bedroom03	0	Pass	0	Pass

K1_L07_14_3B6P_Bed-room01	1.2	Pass	0	Pass
K1_L07_13_3B6P_Bed-room03	0.7	Pass	0	Pass
K2_L09_05_2B4P_Bedroom2	0	Pass	0	Pass
K2_L09_05_2B4P_LKD	0	Pass	#N/A	#N/A
K2_L09_12_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L19_01_2B4P_Bedroom1	0.8	Pass	0	Pass
K2_L19_01_2B4P_Bedroom2	0.1	Pass	0	Pass
K2_L19_02_1B1P_LKD	0	Pass	0	Pass
K2_L19_03_2B4P_Bedroom2	0	Pass	0	Pass
K2_L19_03_2B4P_Bedroom1	0	Pass	0	Pass
K2_L19_03_2B4P_LKD	0	Pass	#N/A	#N/A
K2_L19_04_1B2P_Bedroom	0	Pass	0	Pass
K2_L19_04_1B2P_LKD	0	Pass	#N/A	#N/A
K2_L19_05_2B4P_Bedroom1	0	Pass	0	Pass
K2_L19_08_2B4P_Bedroom1	1.2	Pass	0	Pass
K2_L19_08_2B4P_LKD	0.3	Pass	#N/A	#N/A
K2_L19_08_2B4P_Bedroom2	0.8	Pass	0	Pass
K2_L19_09_2B4P_Bedroom1	0.8	Pass	0	Pass
K2_L19_09_2B4P_Bedroom2	1.3	Pass	0	Pass
K2_L19_09_2B4P_LKD	0.3	Pass	#N/A	#N/A
K2_L19_05_2B4P_Bedroom2	0	Pass	0	Pass
K2_L19_05_2B4P_LKD	0	Pass	#N/A	#N/A
K2_L19_07_2B4P_Bedroom2	0.6	Pass	0	Pass
K2_L19_07_2B4P_Bedroom1	0	Pass	0	Pass
K2_L19_07_2B4P_LKD	0.1	Pass	#N/A	#N/A
K2_L19_06_2B4P_Bedroom2	0	Pass	0	Pass
K2_L19_06_2B4P_Bedroom1	0	Pass	0	Pass
K2_L19_06_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L27_04_2B4P_Bedroom2	0	Pass	0	Pass
K1_L27_04_2B4P_Bedroom1	0	Pass	0	Pass
K1_L27_04_2B4P_LKD	0	Pass	#N/A	#N/A

K1_L27_02_2B4P_Bedroom2	0	Pass	0	Pass
K1_L27_02_2B4P_Bedroom1	0.2	Pass	0	Pass
K1_L27_03_1B2P_LKD	0	Pass	#N/A	#N/A
K1_L27_03_1B2P_Bedroom	0	Pass	0	Pass
K1_L27_05_2B4P_Bedroom1	0.6	Pass	0	Pass
K1_L27_05_2B4P_LKD	0	Pass	#N/A	#N/A
K1_L27_05_2B4P_Bedroom2	0	Pass	0	Pass
K1_L27_06_2B4P_Bedroom2	1.3	Pass	0	Pass
K1_L07_12_3B6P_LKD	0.1	Pass	#N/A	#N/A
K1_L07_11_3B6P_LKD	0	Pass	#N/A	#N/A
K1_L07_10_3B6P_LKD	0	Pass	#N/A	#N/A
K1_L07_14_3B6P_Bedroom02	1.8	Pass	0	Pass
K2_L19_01_2B4P_LKD	1.3	Pass	#N/A	#N/A
K1_L27_01_1B2P_Bedroom	0.6	Pass	0	Pass
K1_L27_01_1B2P_LKD	1.1	Pass	#N/A	#N/A
K1_L27_06_2B4P_Bedroom1	0.7	Pass	0	Pass
K1_L27_02_2B4P_LKD	0.6	Pass	#N/A	#N/A
K1_L27_06_2B4P_LKD	1.5	Pass	#N/A	#N/A
K1_L07_14_3B6P_LKD	2.5	Pass	#N/A	#N/A
K1_L07_13_3B6P_LKD	0	Pass	#N/A	#N/A
K1_L07_15_3B6P_LKD	1.1	Pass	#N/A	#N/A

Plot J

Table 3

Space	Criterion 01 % Hours Top Tmax >= 1°C		Criterion 02 Bedroom only Hours between 10pm – 7am > 26°C (per annum)	
J01_113L_A002_2B4P_Bedroom1	0	Pass	0	Pass
J01_113L_A002_2B4P_Bedroom2	0	Pass	0	Pass
J01_113L_A002_2B4P_LKD	0	Pass	#N/A	#N/A
J01_113L_A003_2B4P_Bedroom2	0	Pass	0	Pass



J01_113L_A003_2B4P_LKD	0	Pass	#N/A	#N/A
J01_113L_A003_2B4P_Bedroom1	0.1	Pass	0	Pass
J01_113L_A004_2B4P_Bedroom2	0	Pass	0	Pass
J01_113L_A004_2B4P_Bedroom1	0	Pass	0	Pass
J01_113L_A004_2B4P_LKD	0	Pass	#N/A	#N/A
J01_113L_A005_1B2P_Bedroom1	0	Pass	0	Pass
J01_113L_A005_1B2P_LKD	0	Pass	#N/A	#N/A
J01_113L_A006_1B2P_Bedroom1	0	Pass	0	Pass
J01_113L_A006_1B2P_LKD	0	Pass	#N/A	#N/A
J01_113L_A010_1B2P_Bedroom1	0	Pass	0	Pass
J01_113L_A010_1B2P_LKD	0	Pass	#N/A	#N/A
J01_113L_A009_2B4P_Bedroom1	0	Pass	0	Pass
J01_113L_A009_2B4P_Bedroom2	0	Pass	0	Pass
J01_113L_A009_2B4P_LKD	0	Pass	#N/A	#N/A
J01_113L_A007_2B4P_Bedroom1	0	Pass	0	Pass
J01_113L_A007_2B4P_Bedroom2	0	Pass	0	Pass
J01_113L_A007_2B4P_LKD	0	Pass	#N/A	#N/A
J01_113L_A008_2B4P_Bedroom2	0	Pass	0	Pass
J01_113L_A008_2B4P_Bedroom1	0	Pass	0	Pass
J01_113L_A008_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A003_2B4P_Bedroom2	0.6	Pass	0	Pass
J02_113L_A003_2B4P_Bedroom1	0	Pass	0	Pass
J02_113L_A003_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A002_2B4P_Bedroom1	0	Pass	0	Pass
J02_113L_A002_2B4P_Bedroom1	0	Pass	0	Pass
J02_113L_A002_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A001_2B4P_Bedroom1	0	Pass	0	Pass
J02_113L_A001_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A001_2B4P_Bedroom2	0	Pass	0	Pass
J02_113L_A004_1B1P(Studio)	0	Pass	0	Pass



J02_113L_A005_2B4P_Bedroom2	0.7	Pass	0	Pass
J02_113L_A005_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A005_2B4P_Bedroom1	0.5	Pass	0	Pass
J02_113L_A006_1B2P_Bedroom1	0.6	Pass	0	Pass
J02_113L_A006_1B2P_LKD	0	Pass	#N/A	#N/A
J02_113L_A010_1B2P_Bedroom1	0	Pass	0	Pass
J02_113L_A010_1B2P_LKD	0	Pass	#N/A	#N/A
J02_113L_A009_2B4P_Bedroom1	0	Pass	0	Pass
J02_113L_A009_2B4P_Bedroom2	0	Pass	0	Pass
J02_113L_A009_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A007_2B4P_Bedroom2	0.4	Pass	0	Pass
J02_113L_A007_2B4P_Bedroom1	0.1	Pass	0	Pass
J02_113L_A007_2B4P_LKD	0	Pass	#N/A	#N/A
J02_113L_A008_2B4P_Bedroom1	0	Pass	0	Pass
J02_113L_A008_2B4P_Bedroom2	0	Pass	0	Pass
J02_113L_A008_2B4P_LKD	0	Pass	#N/A	#N/A
J02_122L_A002_2B4P_Bedroom1	0	Pass	0	Pass
J02_122L_A002_2B4P_Bedroom1	0	Pass	0	Pass
J02_122L_A002_2B4P_LKD	0	Pass	#N/A	#N/A
J02_122L_A004_1B1P(Studio)	0	Pass	0	Pass
J02_122L_Studio	1.9	Pass	0	Pass
L15_J01_A003_LKD	2.7	Pass	#N/A	#N/A
L15_J01_A003_Bedroom 01	0.2	Pass	0	Pass
L15_J01_A002_Lounge	0	Pass	#N/A	#N/A
L15_J01_A002_Bedroom 01	0	Pass	0	Pass
L16_J01_A003_Bedroom 02	0	Pass	0	Pass
L16_J01_A003_Bedroom 03	0.2	Pass	0	Pass
L16_J01_A002_LKD	0	Pass	#N/A	#N/A
L16_J01_A002_Bedroom 02	0	Pass	0	Pass
L16_J01_A002_Bedroom 03	0	Pass	0	Pass

CONCLUSION

Plot K and Plot J successfully meet the TM59 overheating criteria, as detailed in Tables 2 and 3 above. This achievement is particularly significant given the stringent requirements for acoustic and air quality compliance, and the analysis assumes that window or purge ventilation openings cannot be used for overheating and remain closed at all times, therefore overheating shall be mitigated by passive and mechanical means only.

The results indicate that both plots can provide a thermally comfortable living environment without compromising on essential environmental standards. This compliance ensures that future residents will benefit from thermal comfort, while also being protected from external noise and air pollution.