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One North Parade

Manchester

BREEAM Hea 04 – Thermal Comfort

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1.0 Executive Summary

This report has been prepared to show the proposed One North Parade development, located in central Manchester, achieves compliance with BREEAM UK New Construction – Hea 04: Thermal Comfort. The proposed development will include open plan offices, a restaurant, bicycle storage, and shower and changing facilities. Therefore, the development falls under Use Class E(g) (*Offices*) and E(b) (*Food and Drinks*) in accordance with the Town and Country Planning (Use Classes) Order 2020. For the purposes of the dynamic thermal modelling within IES:VE, the building has been modelled under the ‘B1 Offices’ classification, as this remains the relevant category within the compliance software.

To achieve compliance with the thermal comfort targets, the following design features have been included:

- Enhanced fabric performance to reduce the initial energy demand
- Efficient VRF for space heating and cooling
- Appropriate clothing and metabolic values to achieve thermal comfort

Table 1 and 2 below summarises the result demonstrating the proposed One North Parade development satisfies BREEAM Hea 04 thermal comfort criteria, for both the current and future climate scenarios, and therefore achieves the targeted credits.

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L00_Kitchen	-0.37 / 0.37	5.08 / 7.80	Pass
L00_Security Room	-0.46 / 0.42	5.00 / 9.35	Pass
L00_RF Room	-0.39 / 0.44	5.00 / 8.98	Pass
L00_Reception	-0.43 / 0.44	5.82 / 8.95	Pass
L00_Restaurant/Bar/Lounge	0.06 / 0.27	5.08 / 6.56	Pass
L0M_Restaurant	-0.38 / 0.39	5.09 / 8.09	Pass
L02_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L03_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L04_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L05_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L06_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L07_Office	-0.16 / 0.16	5.00 / 5.53	Pass

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L08_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L12_Office	-0.16 / 0.16	5.00 / 5.51	Pass
L09_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L01_Office	-0.16 / 0.16	5.00 / 5.51	Pass
L0M_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L11_Office	-0.16 / 0.16	5.00 / 5.51	Pass
L10_Office	-0.16 / 0.16	5.00 / 5.53	Pass

Table 1. Current Climate Scenario Results

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L00_Kitchen	-0.37 / 0.37	5.07 / 7.80	Pass
L00_Security Room	-0.50 / 0.36	5.00 / 9.88	Pass
L00_RF Room	-0.47 / 0.40	5.00 / 9.66	Pass
L00_Reception	-0.43 / 0.43	5.82 / 8.90	Pass
L00_Restaurant/Bar/Lounge	0.06 / 0.27	5.08 / 6.56	Pass
L0M_Restaurant	-0.38 / 0.38	5.08 / 7.99	Pass
L02_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L03_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L04_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L05_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L06_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L07_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L08_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L12_Office	-0.17 / 0.16	5.00 / 5.57	Pass
L09_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L01_Office	-0.16 / 0.16	5.00 / 5.54	Pass

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L0M_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L11_Office	-0.16 / 0.16	5.00 / 5.54	Pass
L10_Office	-0.16 / 0.16	5.00 / 5.54	Pass

Table 2. Future Climatic Conditions Results

2.0 Introduction

Crookes Walker Consulting Limited (CWC) have been commissioned to undertake a thermal comfort study aligned with the requirements of BREEAM Hea 04 credits. The proposed building is located in Manchester city centre.

2.1 Site Location

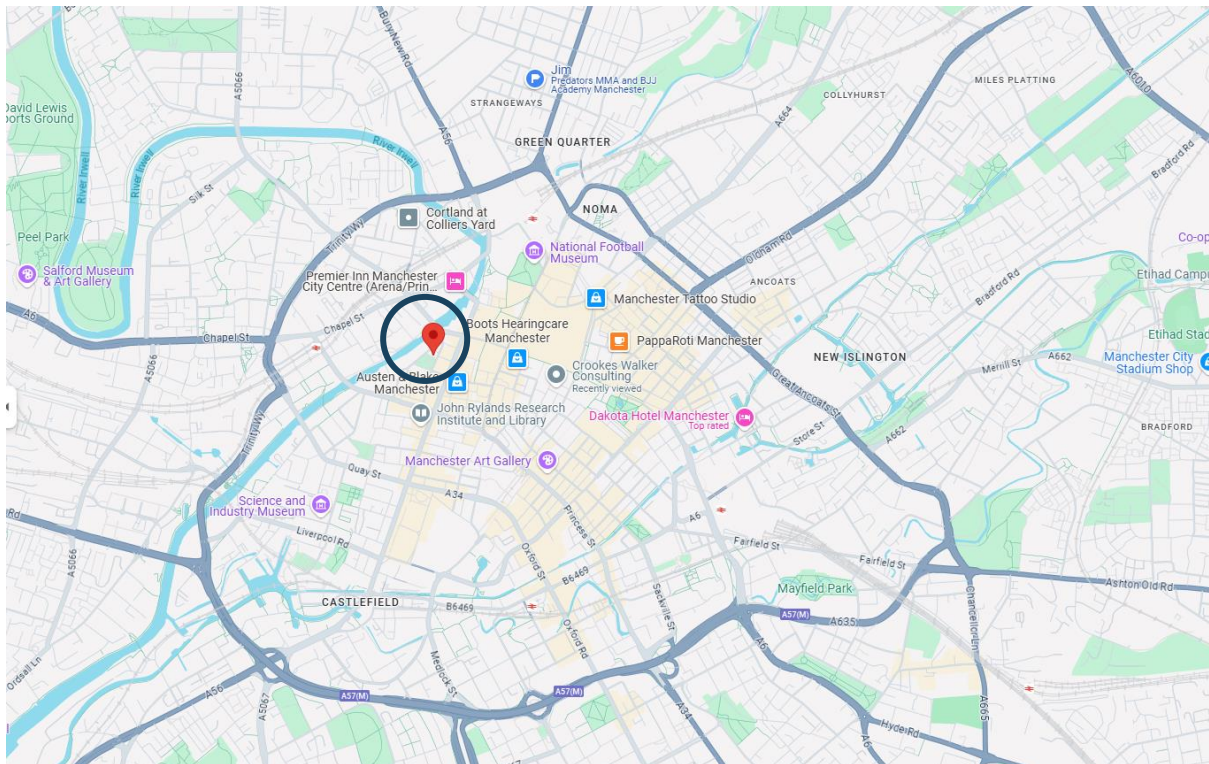


Figure 1. Site Location

The site is located in Manchester city centre, therefore the Manchester DSY1 2020 High 50th percentile has been used for the assessment. To consider the future climate scenario, Manchester DSY1 2050 High 50th percentile weather was used.

2.2 Modelling Disclaimer

The building has been modelled with accredited software package IESVE accredited software version 2024.0.1.0 which is approved for the purpose of demonstrating compliance with the energy efficiency and carbon emission requirements of the building regulations.

These assessments were undertaken by an Energy Specialist; an individual who has acquired substantial expertise or a recognised qualification for undertaking assessments within the residential sector and is not professionally connected to a single technology or manufacturer.

It should be noted that the data generated by this work is obtained using computer calculations. These calculations are the best means of predicting the performance of the building at this stage. Full certainty can only be achieved by measuring the performance of the building and associated systems after a period of use.

Whilst the calculations have been undertaken in good faith using reasonable skill and care, Crookes Walker Consulting Limited can take no responsibility for differences between the computer calculations and the actual performance of the completed building due to the inherent complexity and variability of the physics in a building and its environment.

2.3 View of Thermal Model

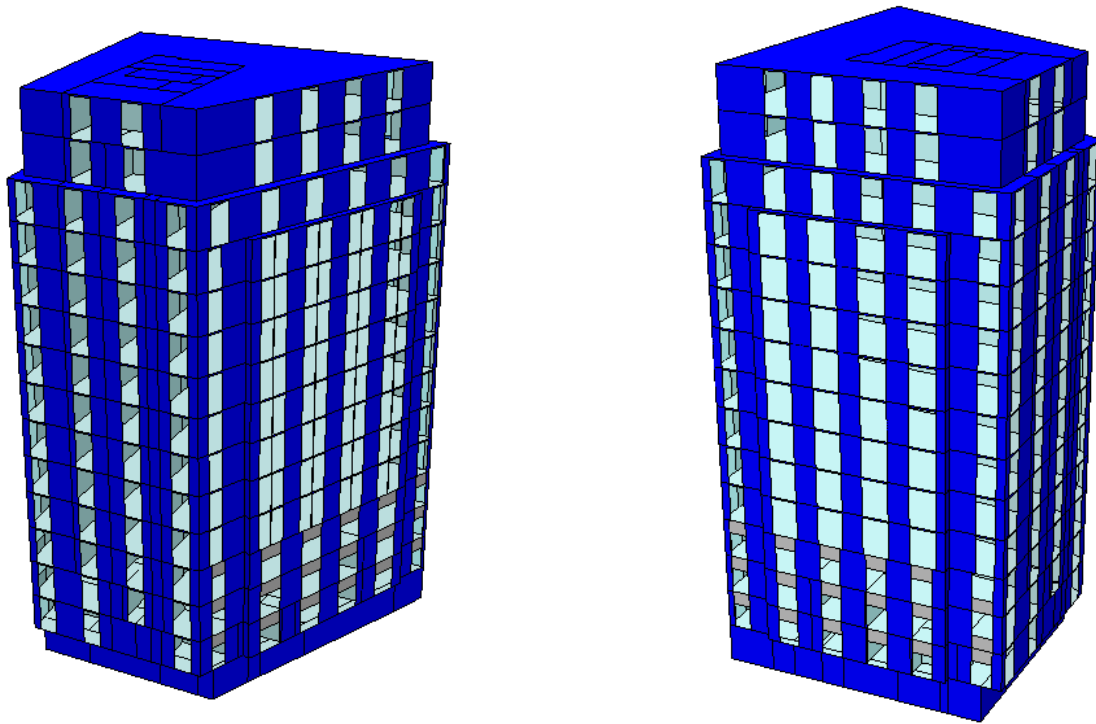


Figure 2. Thermal Model North view (left) and East view (right)

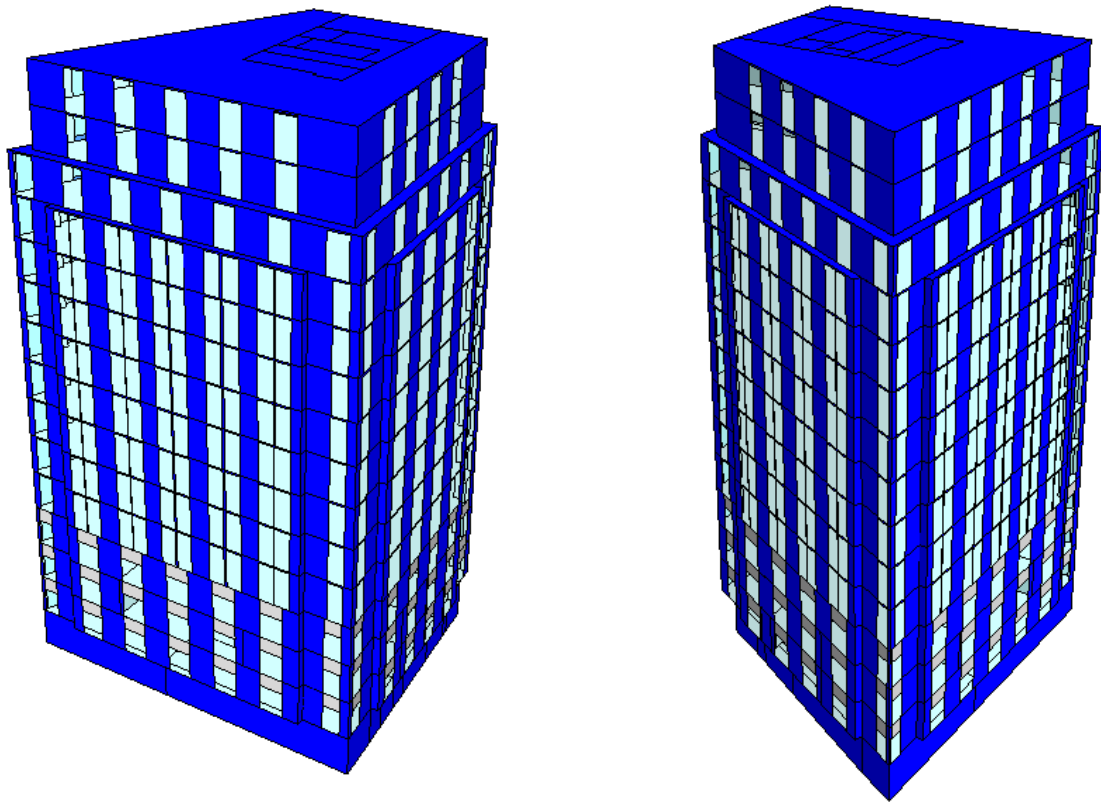


Figure 3. Thermal Model South view (left) and West view (right)

3.0 Assessment Targets

3.1 BREEAM Hea 04: Thermal Comfort

Hea 04 aims to ensure the development is capable of providing an appropriate level of thermal comfort, to reduce risk to occupier health and well-being, provide future proofing to the building in terms of projected climate change and to reduce the impact on costs and the environment.

For developments that are mechanically cooled, the Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD) standardised approach is used. The PMV combines the influence of air temperature, mean radiant temperature, air movement and humidity with that of clothing and activity levels into one value on a thermal sensation scale, as shown in Figure 3.

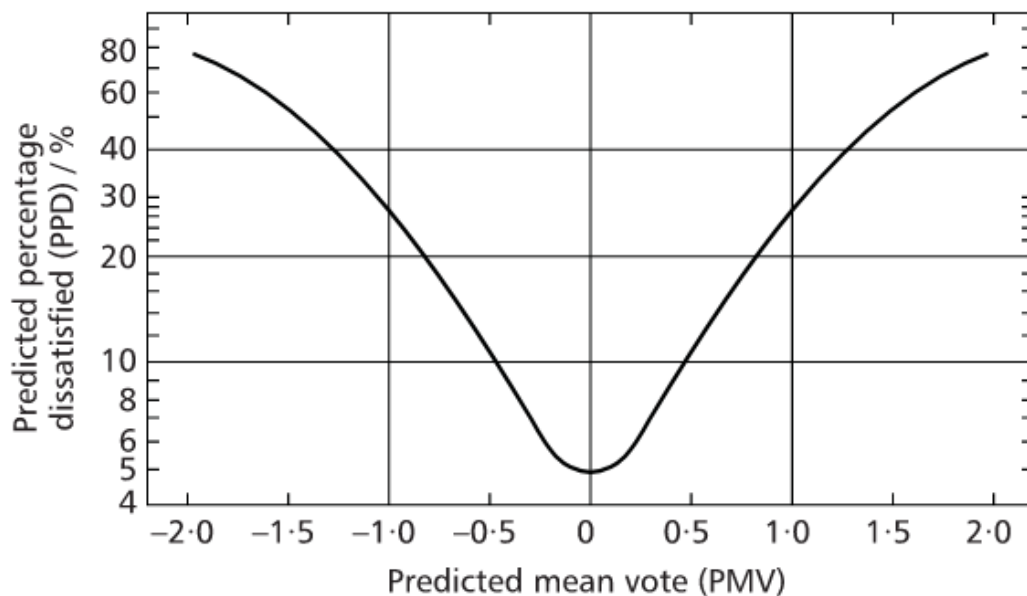


Figure 3. CIBSE PMV / PPD Requirements

Figure 3 outlines the guidelines for maintaining a comfortable indoor environment in mechanically cooled buildings. The aim is to keep the PMV index near zero. If the PMV exceeds 0.5 (equivalent to a 10% likelihood of dissatisfaction), the space is considered overheated.

The PMV / PPD methodology includes four categories, shown in Figure 4 below. The One North Parade development is a new build site, therefore it should be assessed under Category 2 for normal expectations in new buildings and renovations, with PMV limits between -0.5 and 0.5, and the PPD limited to less than 10%.

Category	Explanation	Suggested acceptable range / K	Suggested acceptable PMV limits
I	High level of expectation (only used for spaces occupied by very sensitive and fragile persons)	$\pm 2 \text{ K}$	± 0.2
II	Normal expectation (for new buildings and renovations)	$\pm 3 \text{ K}$	± 0.5
III	A moderate expectation (used for existing buildings)	$\pm 4 \text{ K}$	± 0.7
IV	Values outside the criteria for the above categories (only acceptable for a limited periods)	$> 4 \text{ K}$	> 0.7

Figure 4. CIBSE PMV / PPD Categories

All assumptions and mitigations made within this report must form part of the construction contract, or the model will need to be re-simulated to prove compliance. Inclusion of pipework insulation, blinds and openable windows etc must not be ignored.

4.0 Input Parameters

4.1 Fabric Parameters

A 'fabric first' approach has been taken for the One North Parade development, u-values that are better than the minimum required for compliance with Building Regulations. Table 3 below confirms the fabric parameters assigned:

	Fabric Parameters
External Wall	0.17 W/m ² K
Glazing	1.40 W/m ² K 0.40
Roof	0.10 W/m ² K
Ground Floor	0.10 W/m ² K
Air permeability	5.00 m ³ /(h.m ²)@50Pa

Table 3. Fabric Parameters

4.2 System Parameters

Tables 4 to 6 give the systems, and their performance figures, that have used to assess the building.

	System Parameters - Offices
HVAC Type	Air source heat pumps, VRF system with ventilation via local MVHRs
Heating Efficiency	4.50
Cooling Efficiency	6.50
Ventilation SFP	1.00 W/l/s
Heat Recovery Efficiency	85%

Table 4. System Parameters – Offices

	System Parameters – Reception/Security
HVAC Type	Air source heat pumps, VRF system with ventilation via local MVHRs
Heating Efficiency	4.50

	System Parameters – Reception/Security
Cooling Efficiency	6.50
Ventilation SFP	1.00 W/l/s
Heat Recovery Efficiency	85%

Table 5. System Parameters – Reception / Security

	System Parameters – Restaurant
HVAC Type	Air source heat pumps, VRF system with ventilation via local MVHRs
Heating Efficiency	4.50
Cooling Efficiency	6.50
Ventilation SFP	1.00 W/l/s
Heat Recovery Efficiency	85%

Table 6. System Parameters – Restaurant

4.3 Thermal Parameters

Tables 7 highlight the variables used to assess the Predicted Mean Vote (PMV) and the Predicted People Dissatisfied (PPD).

Variant	Value
Metabolic Rate	1.20
Nominal Air Sped	0.10
Elevated Air Speed	0.30
Design Temperature	Winter 22°C Summer 23°C
Clothing Levels	Min 0.70 Max 1.20

Table 7. PMV / PPD Inputs

All the assessed spaces within the building are assumed to have a design setpoint that would fall within the recommended temperature ranges given by CIBSE, as required by Criterion 3.a. of Hea 04.

5.0 Results

Thermal comfort analysis has been undertaken to ensure that all occupied areas within the One North Parade development achieves compliance with the requirements of Hea 04 for a comfort cooled building.

Detailed results for the assessment can be found in Appendix A for the current climate scenario. Appendix B comprises detailed results for the assessment considering a future climate scenario (2050s).

6.0 Appendix A – Detailed Results for the Current Climate Scenario

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L00_Kitchen	-0.37 / 0.37	5.08 / 7.80	Pass
L00_Security Room	-0.46 / 0.42	5.00 / 9.35	Pass
L00_RF Room	-0.39 / 0.44	5.00 / 8.98	Pass
L00_Reception	-0.43 / 0.44	5.82 / 8.95	Pass
L00_Restaurant/Bar/Lounge	0.06 / 0.27	5.08 / 6.56	Pass
L0M_Restaurant	-0.38 / 0.39	5.09 / 8.09	Pass
L02_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L03_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L04_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L05_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L06_Office	-0.16 / 0.16	5.00 / 5.53	Pass

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L07_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L08_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L12_Office	-0.16 / 0.16	5.00 / 5.51	Pass
L09_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L01_Office	-0.16 / 0.16	5.00 / 5.51	Pass
L0M_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L11_Office	-0.16 / 0.16	5.00 / 5.51	Pass
L10_Office	-0.16 / 0.16	5.00 / 5.53	Pass

Zone	Predicted mean vote - hours in range						
	<= -0.50	>-0.50 to <=-0.30	>-0.30 to <=-0.10	>-0.10 to <=0.10	>0.10 to <=0.30	>0.30 to <=0.50	> 0.50
L00_Kitchen	0	491	365	367	2860	297	0
L00_Security Room	0	33	659	897	1268	14	0
L00_RF Room	0	22	752	808	1276	13	0
L00_Reception	0	379	351	0	1069	289	0
L00_Restaurant/Bar/Lounge	0	0	0	2432	1583	0	0
L0M_Restaurant	0	249	228	2320	1014	204	0
L02_Office	0	0	665	971	1235	0	0
L03_Office	0	0	665	977	1229	0	0
L04_Office	0	0	666	976	1229	0	0
L05_Office	0	0	666	977	1228	0	0
L06_Office	0	0	663	970	1238	0	0
L07_Office	0	0	663	976	1232	0	0
L08_Office	0	0	663	970	1238	0	0
L12_Office	0	0	617	965	1289	0	0

Zone	Predicted mean vote - hours in range						
	≤ -0.50	> -0.50 to ≤ -0.30	> -0.30 to ≤ -0.10	> -0.10 to ≤ 0.10	> 0.10 to ≤ 0.30	> 0.30 to ≤ 0.50	> 0.50
L09_Office	0	0	661	974	1236	0	0
L01_Office	0	0	666	953	1252	0	0
L0M_Office	0	0	579	1306	986	0	0
L11_Office	0	0	627	888	1356	0	0
L10_Office	0	0	660	950	1261	0	0

All zones show no PMV below -0.5 and above 0.5 the requirements of Hea 04. The comfort cooled zone criteria are satisfied.

7.0 Appendix B – Detailed Results for the Future Climate Scenario

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L00_Kitchen	-0.37 / 0.37	5.07 / 7.80	Pass
L00_Security Room	-0.50 / 0.36	5.00 / 9.88	Pass
L00_RF Room	-0.47 / 0.40	5.00 / 9.66	Pass
L00_Reception	-0.43 / 0.43	5.82 / 8.90	Pass
L00_Restaurant/Bar/Lounge	0.06 / 0.27	5.08 / 6.56	Pass
L0M_Restaurant	-0.38 / 0.38	5.08 / 7.99	Pass
L02_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L03_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L04_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L05_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L06_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L07_Office	-0.16 / 0.16	5.00 / 5.52	Pass

Zone	Predicted Mean Vote Min/Max	Predicted Percentage Dissatisfied Min/Max	Result
L08_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L12_Office	-0.17 / 0.16	5.00 / 5.57	Pass
L09_Office	-0.16 / 0.16	5.00 / 5.53	Pass
L01_Office	-0.16 / 0.16	5.00 / 5.54	Pass
L0M_Office	-0.16 / 0.16	5.00 / 5.52	Pass
L11_Office	-0.16 / 0.16	5.00 / 5.54	Pass
L10_Office	-0.16 / 0.16	5.00 / 5.54	Pass

Zone	Predicted mean vote - hours in range						
	<= -0.50	>-0.50 to <=-0.30	>-0.30 to <=-0.10	>-0.10 to <=0.10	>0.10 to <=0.30	>0.30 to <=0.50	> 0.50
L00_Kitchen	0	563	469	290	2718	340	0
L00_Security Room	0	68	694	661	1442	6	0
L00_RF Room	0	71	576	679	1539	6	0
L00_Reception	0	401	438	0	958	291	0
L00_Restaurant/Bar/Lounge	0	0	0	2229	1786	0	0
L0M_Restaurant	0	328	323	2117	1026	221	0
L02_Office	0	0	700	1077	1094	0	0
L03_Office	0	0	699	1084	1088	0	0
L04_Office	0	0	699	1083	1089	0	0
L05_Office	0	0	697	1085	1089	0	0
L06_Office	0	0	699	1078	1094	0	0
L07_Office	0	0	697	1083	1091	0	0
L08_Office	0	0	699	1078	1094	0	0
L12_Office	0	0	643	1054	1174	0	0
L09_Office	0	0	696	1081	1094	0	0
L01_Office	0	0	706	1057	1108	0	0

Zone	Predicted mean vote - hours in range						
	<= -0.50	>-0.50 to <=-0.30	>-0.30 to <=-0.10	>-0.10 to <=0.10	>0.10 to <=0.30	>0.30 to <=0.50	> 0.50
L0M_Office	0	0	571	1321	979	0	0
L11_Office	0	0	654	1010	1207	0	0
L10_Office	0	0	689	1046	1136	0	0

All zones show no PMV below -0.5 and above 0.5 the requirements of Hea 04. The comfort cooled zone criteria are satisfied.