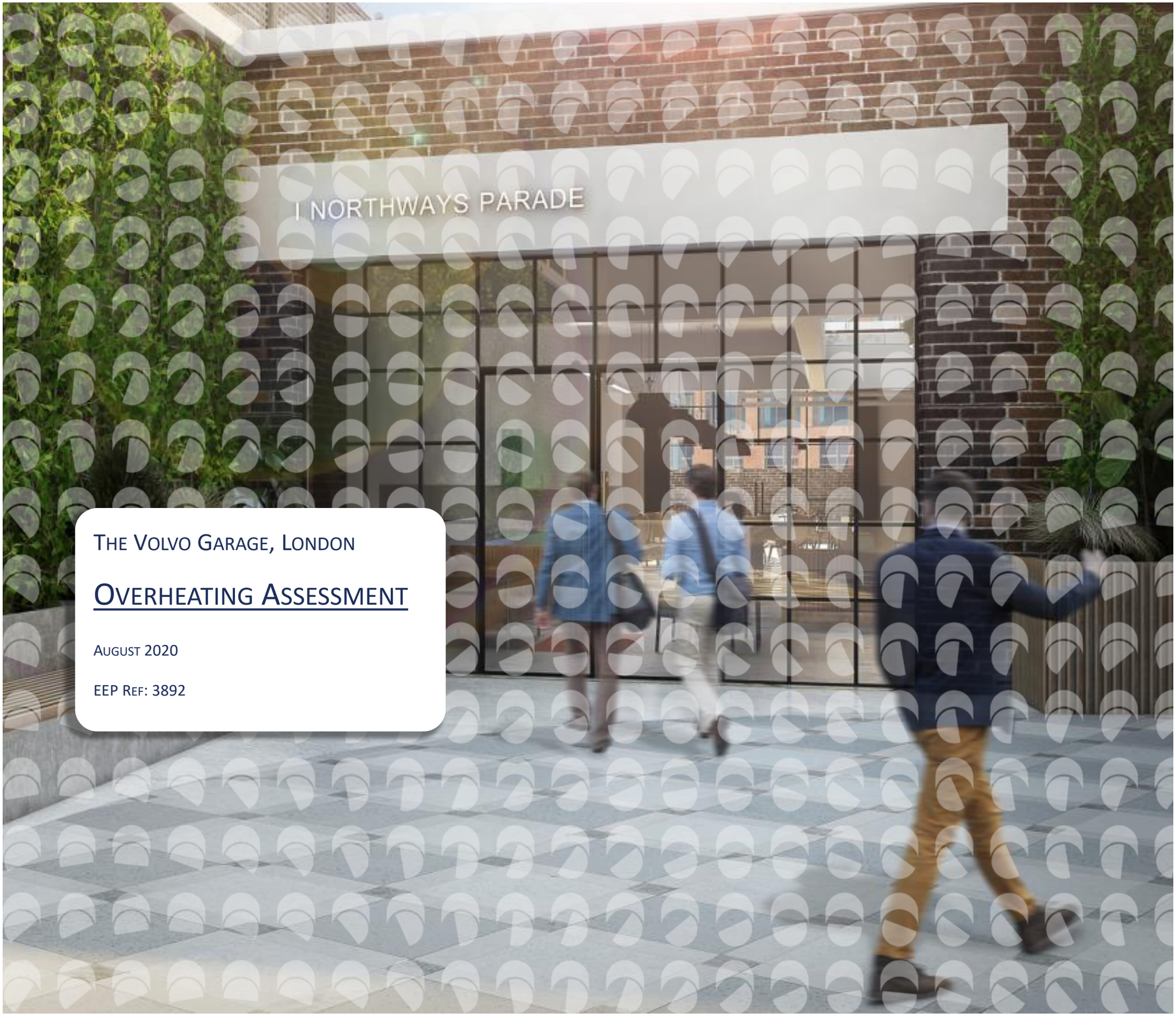


THE VOLVO GARAGE, LONDON

OVERHEATING ASSESSMENT

AUGUST 2020

EEP REF: 3892

ENVIRONMENTAL ENGINEERING PARTNERSHIP

CONSULTING ENGINEERS

The Chapel House,
High Street, West Wycombe,
Buckinghamshire.
HP14 3AG
Telephone: 01494 464544
Facsimile: 01494 464282
e-mail: consulting@eep.co.uk
Website: eep.co.uk

EEP Project Services Ltd trading as
Environmental Engineering Partnership

Directors:
Nigel V Bowater IEng MASHRAE MIHEEM
Dr Tygue S Doyle BEng EngD
Neil Reynolds MSc BEng CEng MCIBSE

Associate Directors:
Ashley Barrett EngTech LCIBSE
Isabelle Phillips BEng MIET

Consultants:
Martin R Clark MSc BSc CEng MCIBSE
David Gadsdon BSc CEng MIMechE MCIBSE

Company Registration No. 02584221
Registered in England
VAT Number GB 314 0971 80

BSRIA Member

Contents

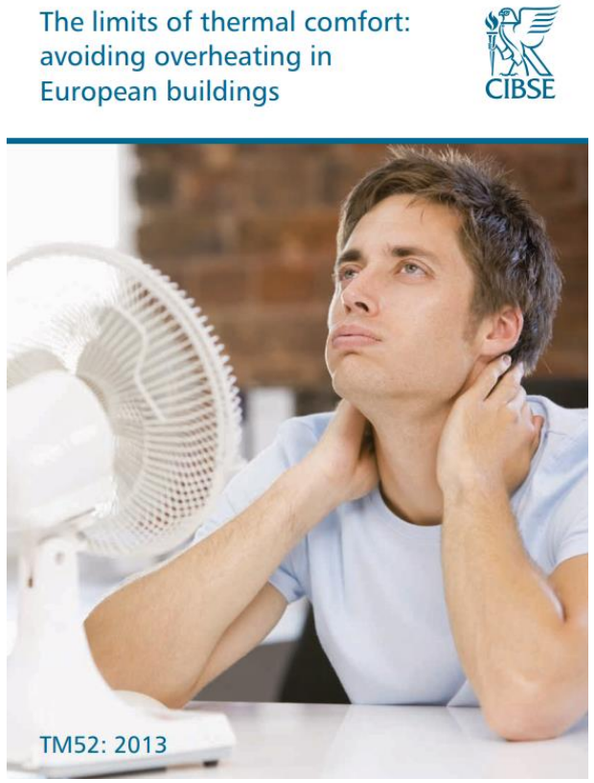
INTRODUCTION

Overheating is a widely used term but is not precisely defined or understood. It implies that building occupants feel uncomfortably hot and that this discomfort is caused by the indoor environment.

Thermal comfort is a complex topic quantified by a subjective response of an occupant's interaction with the environment around them and it is difficult to predict one occupants experience from another, and it is common for personal comfort to vary between occupants with varying degrees.

It is proposed for the ground floor area to change its usage from a car workshop/garage to an office. There is to be a small extension to allow for pedestrian access from College Crescent. Air source heat pumps VRF systems will provide space heating and cooling, an air handling unit with heat recovery capability will provide fresh air to the offices.

This report assesses the likelihood that the building is going to overheat via the methodology set out in CIBSE Guide A: Environmental Design and TM52: The Limits of Thermal Comfort.



CIBSE Guide A – Environmental Design

CIBSE Guide A states that the indoor environment should be designed and controlled so that occupants' comfort and health are assured. There are individual difference in perception and subjective evaluation, resulting in a base level of dissatisfaction within the building population. This dissatisfaction may be with a specific aspect of the environment or may be general and non-specific. The aim of design should be to minimise the dissatisfaction as far as is reasonably practicable.

TM52: The limits of Thermal Comfort, Avoiding Overheating in European Buildings

The CIBSE "TM52 – The limits of thermal comfort: avoiding overheating in European buildings" provides a methodology for predicting overheating in buildings and is intended to ensure comfort conditions can be maintained for the given building design.

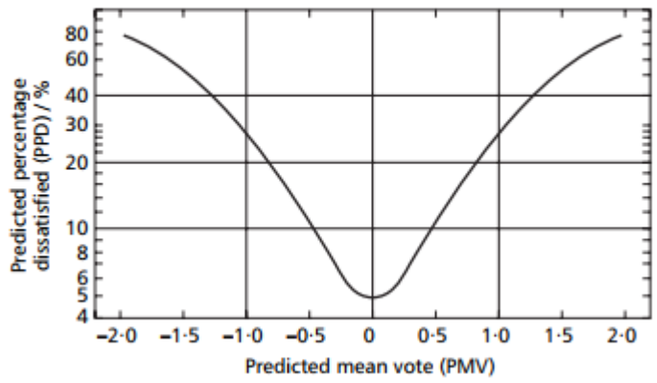
In an attempt to measure/predict thermal comfort metrics called PMV (Predicted mean vote) and PPD (Predicted percentage dissatisfied) have been created and assume that the sensation experienced by an occupant is a function of heat production (metabolism) and heat loss (clothing, sweat, environment etc.).

The 'predicted mean vote' (PMV) combines the influence of air temperature, mean radiant temperature, air movement and humidity with that of clothing and activity level into one value on a thermal sensation, see table 1.1. The PMV is the predicted mean value of 'votes' of a large group of persons, exposed to the same environment with identical clothing and activity.

Individual thermal sensation votes will be scattered around the PMV, it is useful also to predict the percentage of people who would be dissatisfied. The predicted percentage dissatisfied (PPD) attempts to do this and is a function of the PMV. The PPD is the notional probability that a randomly chosen person, having that clothing and activity, would experience discomfort in that thermal environment.

Table 1.1 Thermal sensation scale[1]

Index value	Thermal sensation
+3	Hot
+2	Warm
+1	Slightly warm
0	Neutral
–1	Slightly cool
–2	Cool
–3	Cold



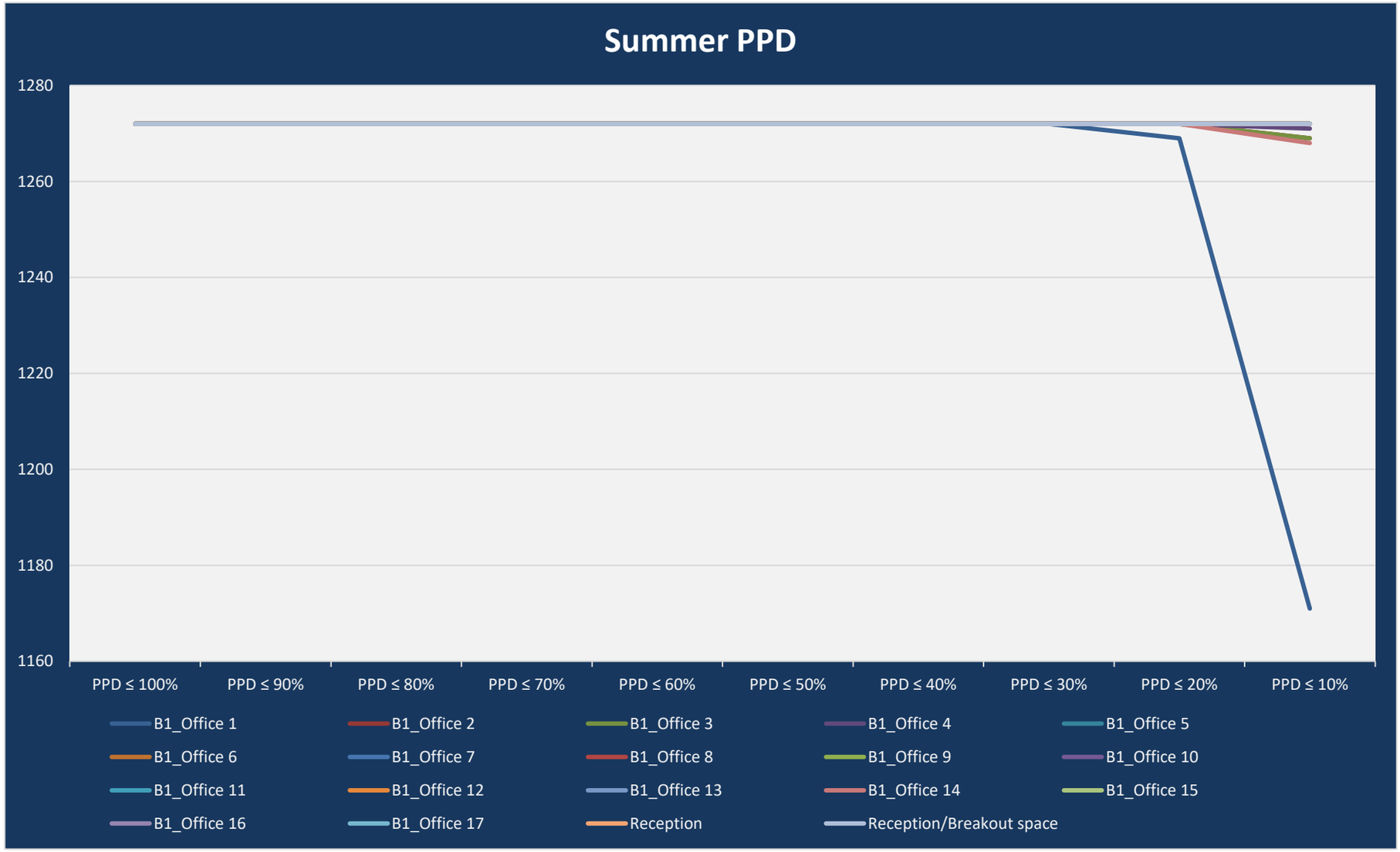
Overheating Analysis

The TM52 guidance can therefore also be used as a design tool that can bring about changes to the building form to introduce/maximise passive cooling measures (such as external shading, building orientation, glazing ratios, thermal properties of building elements etc.).

The publication focusses on overheating that occurs in free-running buildings (i.e. buildings that do not include mechanical cooling), although overheating can still occur in mechanically cooled buildings, so further guidance is provided to test these scenarios.

For the purposes of TM52 and predicting overheating a building is considered to be overheating if the PMV index is above 0.5 (PPD ≥ 10%).

Assumptions		
Metabolic Rate	1.20	Met
Air Speed		
Min	0.15	m/s
Max	0.30	
Clothing value		
Summer	0.50	Clo
Winter	1.00	



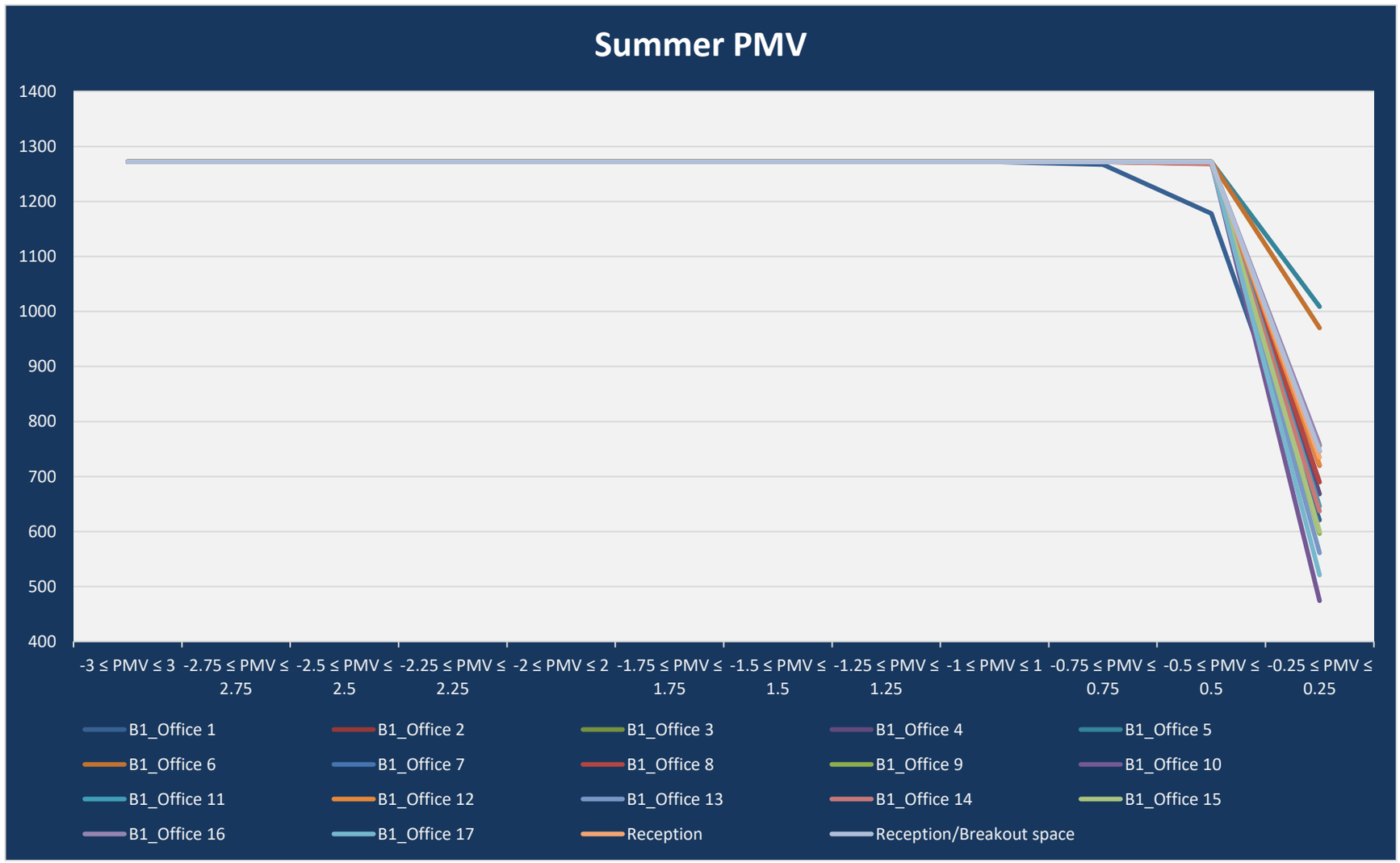
CONCLUSION

The results show, for this mechanically cooled building, that there is very little overheating shown with the small ground floor office, located near the new pedestrian entrance, having the slightly lower results compared with the rest of the building, this is due to the high glazing ratio, caused by the two rooflights, in the office area.

The cumulative results show that the PMV range for the building will be at ± 0.5 PMV or ± 0.25 PMV for most of the year and never exceeding ± 1.0 PMV. There are a small number of hours for a small office where the hours exceed ± 0.75 PMV.

The PMV results show that in terms of PPD the building achieves a 10% PPD value all year for all areas except for the small office with two roof lights. This office space does not exceed 20% PPD.

The results indicated that the small office located near the new pedestrian entrance has a higher chance of overheating than other office spaces. The fan coil unit will be sized to ensure that the additional gains attributed to the high glazing ratios do not cause occupant discomfort.



ENVIRONMENTAL
ENGINEERING
PARTNERSHIP

CONSULTING ENGINEERS