



Planning Application
For Development
at
Stone Close
West Drayton

Overheating Risk Analysis

Planning Submission

Issue 1

Stone Close, West Drayton Overheating Risk Analysis



Client Name: Orchard Street Investment
Management LLP

Client Address: 16 New Burlington Place
London
W1S 2HX

Property: Stone Close
West Drayton

Project Reference: 4316

Issue: Planning Submission, Issue 1

Date: April 2018

Prepared by: SH

Checked by: MDC

Validated by: MDC



CONTENTS

	<u>Page</u>
1.00 Introduction	1
2.00 Overheating Risk Analysis Principles	2
3.00 Overheating Risk Analysis	6
4.00 Overheating / Thermal Comfort Strategy	25
5.00 Conclusion	26



1.00 INTRODUCTION

1.01 Purpose

This report has been prepared for Orchard Street Investment Management LLP for the proposed redevelopment of the site at Stone Close, West Drayton. This document assesses the overheating risk to the office accommodation of the industrial units and demonstrates how it complies with London Plan Policy 5.9.

The office accommodation of the industrial unit has been subjected to an overheating analysis as set out in the GLA document “Energy Planning Greater London Authority guidance on preparing energy assessments (March 2016)” to assess the risk of the building overheating. The weather data used for the assessment has been taken from the CIBSE TM49 suite of data as recommended by the GLA energy strategy guidance. The assessment of the overheating criteria is based on the recommendations of the CIBSE Technical Memorandum document TM52 and the 2015 edition of the CIBSE Guide A that was published after TM52.

The warehouse area of the industrial unit is not included in this assessment as the opportunities to reduce the cooling demand by passive means is limited. However as stated in the accompanying Energy Strategy report the warehouse area roof lights have been provided with good ‘U’ values, ‘g’ values and light transmittance.

1.02 Proposed Building

Full planning permission for the demolition of existing buildings, associated structures, and redevelopment comprising the construction of a single industrial unit with ancillary offices, means of access, car and cycle parking facilities, drainage, landscaping, plant and ancillary works.

The industrial unit is to be built as a shell warehouse with the associated office space being provided with comfort cooling and heating and fitted out to a Category A standard.

By their speculative nature the final use of the industrial units cannot be defined at this early stage. In terms of energy usage, it is assumed for estimating energy usage that the shell warehouse areas will be heated although this will ultimately be dependent on the future tenants’ bespoke needs.

The fitting out of the industrial area for a specific process would require bespoke systems to suit the tenants’ individual needs arising at the time of letting, which would all require assessment under ADL2B.

The servicing strategy for the industrial unit will be as follows:

- Warehouse Heating No heating, see the note below.
- Office Area Heating and Cooling Air source heat pumps serving refrigerant based variable refrigerant flow (VRF) comfort cooling and heating systems.
- Office Area Ventilation A combination of natural ventilation via openable windows and mechanical supply and extract ventilation via a heat recovery ventilation system.
- Core Area Heating Radiators fed by gas fired boiler LTHW system.
- Domestic Hot Water Indirect fired via LTHW boiler system.



For thermal assessment purposes the shell warehouse area is assumed to be heated by direct/indirect gas fired heaters. A gas service will be provided to the space but left capped off for extension by the tenant as considered necessary to serve either convector unit heaters or radiant tubular heaters. These systems are preferred by tenants as they offer the most flexibility in terms of control and efficiency in performance compared to water based systems.

The aim of this overheating risk analysis is to prove that the above is an appropriate servicing strategy.

2.00 OVERHEATING RISK ANALYSIS PRINCIPLES

2.01 General

The “Testing for the presence or likelihood of overheating” criteria as set out in TM52 and the subsequent 2015 edition the CIBSE Guide A the overheating analysis shall be undertaken in two separate stages:

Stage	Operating Mode	Overheating Analysis Assessment Method
1	Free running i.e. no mechanical comfort cooling provided	Indoor operative temperature
2	Mechanical comfort cooling	Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD)

It should be noted that the base information for naturally ventilated buildings utilised in TM52 is taken from BS EN 15251 which is based purely on office buildings and is assumed to apply to a wider variety of buildings. However as noted in the 2015 edition of CIBSE Guide A “This assumption should be treated with caution and consideration should be given to any specific circumstances in any particular building”.

2.02 Software Utilised

The modelling software used to carry out this analysis is a product of Environmental Design Solutions Ltd (EDSL) called TAS, version 9.4.2 This is a dynamic simulation software which is constructed in accordance with CIBSE AM11. TAS can provide a full dynamic thermal analysis for simple or complex building HVAC systems. Using this software, it will be illustrated how the buildings perform against the overheating / thermal comfort parameters, as set out in CIBSE TM52 and the subsequent 2015 edition of the CIBSE Guide A for mechanically cooled buildings.

2.03 Overheating Risk Criteria

2.03.01 Free Running Building

The TM52 overheating compliance criteria for a free running building to be regarded as not overheating is that two of the three criteria, set out below need to be met.

The pass / fail limits for the three criteria are summarised below:



Criterion 1	Hours of Exceedance (H_e)	The first criterion sets a limit of 3% for the number of occupied hours that the operative temperature (T_{op}) can exceed T_{max} during a typical non-heating season. T_{max} being exceeded is indicated by $\Delta T > 1K$
Criterion 2	Daily Weighted Exceedance (W_e)	The second criterion deals with the severity of overheating within any one day, which is given in terms of temperature rise and duration and sets a daily limit for acceptability. This is indicated by the weighted exceedance being less than or equal to 6
Criterion 3	Upper Limit Temperature (T_{upp})	The third criterion sets an absolute maximum acceptable temperature for a room. This is indicated by ΔT not exceeding 4 K.

Where the following, in the above table are defined as:

Operative temperature (T_{op})	The resultant hourly room air temperature calculated by the dynamic simulation software
Maximum acceptable temperature (T_{max})	T_{max} is calculated for each day from the running mean of the outdoor temperature. In accordance with Category II in BS EN 15251 T_{max} has been set at a maximum acceptable temperature of 3K above the comfort temperature.
Non-heating season	1 st May to 30 th September
Delta T (ΔT)	This is a simple equation where $\Delta T = T_{op} - T_{max}$

2.03.02 Mechanically Comfort Cooled Building

The TM52 overheating compliance criteria for a mechanically cooled building are as set out below in the extract from TM52.

A mechanically cooled building should aim to provide an indoor environment where the PMV index is near to or equal to zero. According to Table 2, it will be considered as overheating if the value of the PMV index is above 0.5 (PPD $\geq$ 10%).

However, this criterion has been further refined in the 2015 edition of the CIBSE Guide A. The applicable extract from the 2015 CIBSE Guide A is as follows:

A mechanically cooled building should aim to provide an indoor environment where the PMV index is near to or equal to zero. It will be considered as overheating if the value of the PMV index is above 0.5 (equivalent to a PPD of 10%).

The predicted indoor temperature or values of PMV should not exceed the tabulated values for more than 3% of occupied hours.

For heated and mechanically cooled buildings, the PMV (Predicted Mean Vote) is an index that predicts the mean votes of a large group of persons on the seven-point thermal sensation scale (below) based on the heating balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment.

PPD (predicted percentage dissatisfied) is an index that establishes a quantitative prediction of the percentage of thermally dissatisfied people who feel too cool or too warm. For the purposes of ISO 7730, thermally dissatisfied people are those who will feel hot, warm, cooler or cold.



Seven Point Thermal Sensation Scale	
3	Hot
2	Warm
1	Slightly warm
0	Neutral
-1	Slightly cool
-2	Cool
-3	Cold

Based on the ISO 7730 if you fall between 1 and -1 of the thermal sensation scale the occupants of the building are thermally satisfied.

As the PPD (predicted percentage dissatisfied) is an index that establishes a quantitative prediction of the percentage of thermally dissatisfied people who feel too cool or too warm based on the Seven Point Thermal Sensation Scale the PPD results include dissatisfied people who are “slightly cool”, “cool” or “cold”. From an overheating perspective, the occupants whose perception is that they are too cool needs to be discounted when applying the above compliance criteria.

2.04 Design Summer Year (DSY)

The GLA require three CIBSE TM49 DSY to be simulated. The three years are:

- 1976: a year with a prolonged period of sustained warmth.
- 1989: a moderately warm summer (current design year for London).
- 2003: a year with a very intense single warm spell.

Also, to take account of the urban heat island effect appropriate for the development each the DSY data is available for three different locations as set out below:

- The Greater London Authority Central Activity Zone (CAZ) and other high density urban areas (e.g. Canary Wharf): London Weather Centre data.
- Lower density urban and suburban areas: London Heathrow airport data.
- Rural and peri-urban areas around the edge of London: Gatwick Airport data.

The location applicable to Stone Close Development is London Heathrow Airport.



3.00 Overheating Risk Analysis

3.01 General

In accordance with the applicant's development standards the office accommodation to each industrial unit is proposed to be mechanically comfort cooled as set out section 1.03 of this report. Therefore, the risk of overheating during occupied hours in these areas is minimised due to the provision of the comfort cooling.

However, in line with the applicant's preferred specification the office accommodation has the ability to operate in a 'mixed mode' manner as the office areas are provided with individual on/off control of the comfort cooling system and openable windows. The opening aperture of the centre pivot window is restricted to a maximum of distance of 150 mm and hence putting a restriction on the amount of natural ventilation available. Hence the office accommodation can be assumed to have the ability to operate in a 'free running' mode as set out in TM52 albeit with a restricted window opening.

As the office accommodation has openable windows and comfort cooling this overheating risk analysis has been undertaken in two parts. Firstly, the initial risk analysis has been run without comfort cooling and secondly a comfort cooled analysis has been simulated. It is expected that the office accommodation should be capable of operating for significant periods without the need for comfort cooling.

As with all mechanically comfort cooled buildings a slight risk of overheating still does exist if the prevailing ambient conditions are in excess of the design criteria external temperatures.

The applicable accommodation use/designation National Calculation Method (NCM) internal heat gains have been used in this Overheating Risk Analysis.

3.02 Free Running Analysis

The free running analysis has been dynamically simulated and the subsequent associated results calculated for office accommodation for each of the three TM49 DSY's in accordance with the recommendations of TM52. The results for each of the sample rooms for each DSY are summarised in the following sub sections of this report.

Using the dynamic software, the resultant room air temperature has been calculated for each occupied hour in each room / zone for each of the three TM49 design summer years. The software does not calculate the operative temperature however TM52 accepts that simulated room air temperatures from dynamic modelling software are acceptable for use in place of the operative temperature.

In addition, the running mean of the outdoor temperature (T_{rm}) has been calculated from the DSY weather data for the non-heating season, 1st May to 30th September and hence the limiting maximum acceptable temperature (T_{max}) for the assessed rooms has been calculated.

The occupied hours applied to the different areas of the building area as follows:

- Office Accommodation 0800 hours to 1800 hours



3.02.01 Free Running Analysis

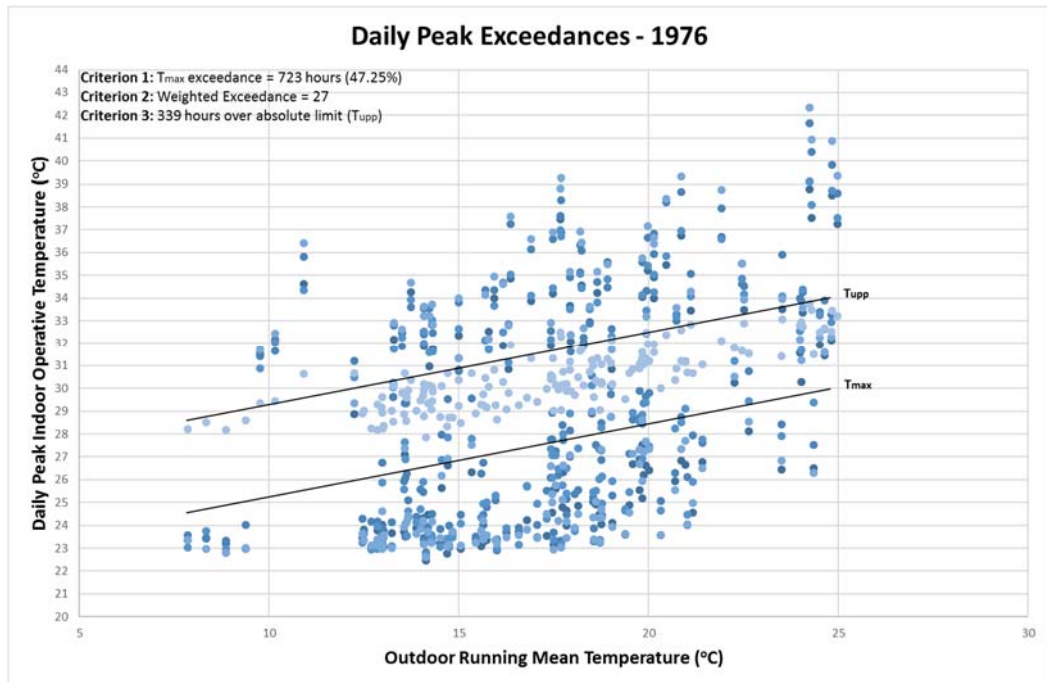
To be regarded as not at risk from overheating two of the three TM52 free running criteria must be met.

3.02.02 Free Running Analysis - TM49 DSY: 1976 LHR

A summary of the dynamic simulation results is as follows:

TM49 DSY: 1976 LHR		
Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 47.25 % The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
Criterion 2	The worst case calculated W_e is 27 The limiting value of W_e is 6 hence this criterion is failed.	Fail
Criterion 3	ΔT exceeds 4K for a total of 339 occupied hours during the assessed summer period.	Fail
Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	Fail

These results are shown graphically below:





Based on the recommendations of TM52 the unit is shown to have a risk of overheating when operating in free running mode for the 1976 DSY.

The unit has been shown to fail all 3 criteria and hence based on the recommendations of TM52 have a predicted risk of overheating during prolonged periods of high external ambient temperature when operating in free running mode for the 1976 DSY.

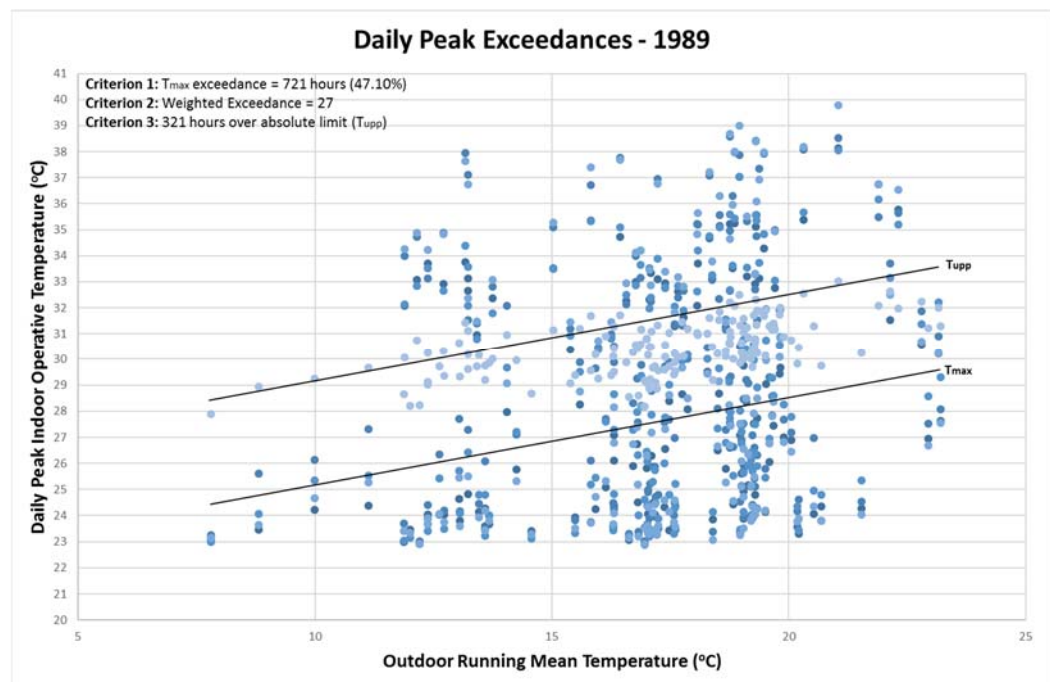
Therefore, additional measures need to be employed to reduce the predicted risk of overheating. See section 4.00 of this report for further details.

3.02.03 Free Running Analysis - TM49 DSY: 1989 LHR

A summary of the dynamic simulation results is as follows:

TM49 DSY: 1989 LHR		
Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 47.10 % The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
Criterion 2	The worst case calculated W_e is 27 The limiting value of W_e is 6 hence this criterion is failed.	Fail
Criterion 3	ΔT exceeds 4K for a total of 321 occupied hours during the assessed summer period.	Fail
Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	Fail

These results are shown graphically below:





Based on the recommendations of TM52 the unit is shown to have a risk of overheating when operating in free running mode for the 1989 DSY.

The unit has been shown to fail all 3 criteria and hence based on the recommendations of TM52 have a predicted risk of overheating during prolonged periods of high external ambient temperature when operating in free running mode for the 1989 DSY.

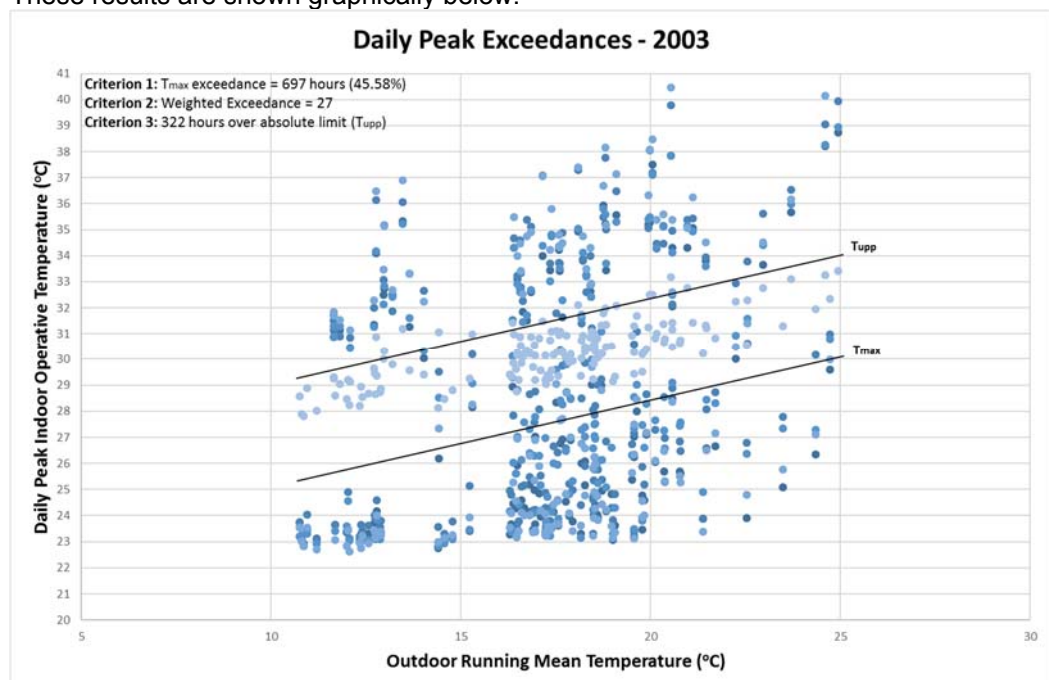
Therefore, additional measures need to be employed to reduce the predicted risk of overheating. See section 4.00 of this report for further details.

3.02.04 Free Running Analysis - TM49 DSY: 2003 LHR

A summary of the dynamic simulation results is as follows:

TM49 DSY: 2003 LHR		
Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 45.58 % The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
Criterion 2	The worst case calculated W_e is 27 The limiting value of W_e is 6 hence this criterion is failed.	Fail
Criterion 3	ΔT exceeds 4K for a total of 322 hours during the assessed summer period.	Fail
Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	Fail

These results are shown graphically below:





Based on the recommendations of TM52 the unit is shown to have a risk of overheating when operating in free running mode for the 2003 DSY.

The unit has been shown to fail all 3 criteria and hence based on the recommendations of TM52 have a predicted risk of overheating during prolonged periods of high external ambient temperature when operating in free running mode for the 2003 DSY.

Therefore, additional measures need to be employed to reduce the predicted risk of overheating. See section 4.00 of this report for further details.



Stone Close, West Drayton Overheating Risk Analysis

3.03 Mechanical Comfort Cooling Analysis

Using the dynamic software, the PMV and the PPD has been established for the office area for each unit for each of the three TM49 design summer years.

In accordance with TM52 the building would be regarded as at risk from overheating the if the PMV index is above 5% for more than 3% of the occupied hours.

3.03.01 Mechanical Comfort Cooling Analysis – TM49 DSY: 1976 LHR

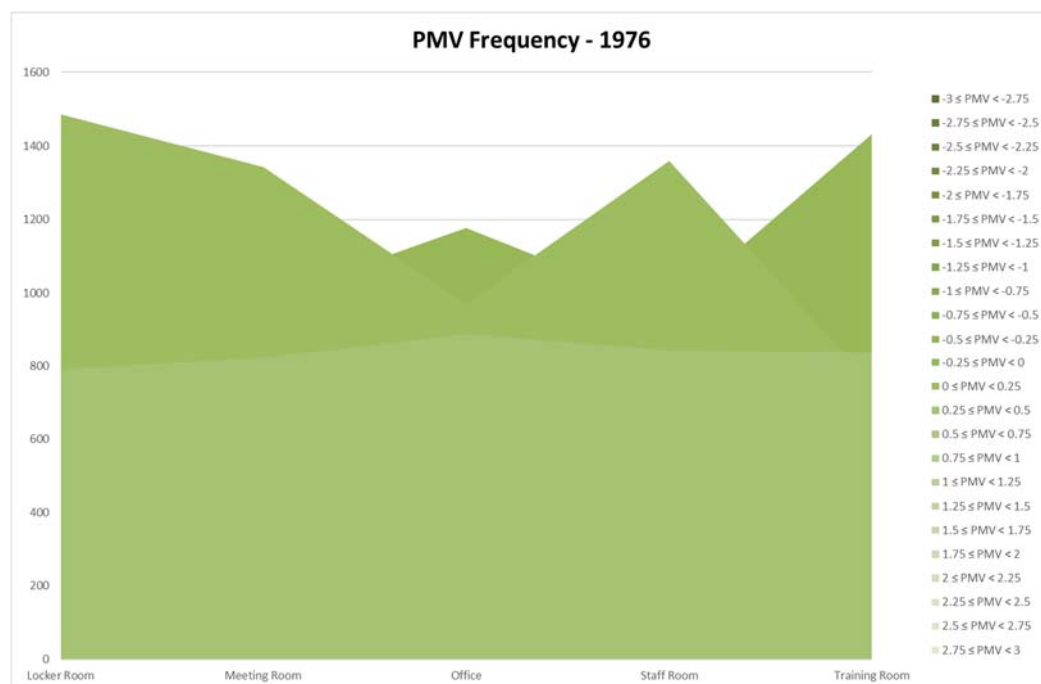
The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25 ≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	540.4	1090.0	1183.0	836.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8	29.9	32.4	22.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between $-1.0 \leq \text{PMV} < 1.0$ frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 edition risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	$0\% \leq \text{PPD} < 10\%$	$10\% \leq \text{PPD} < 20\%$	$20\% \leq \text{PPD} < 30\%$	$30\% \leq \text{PPD} < 40\%$	$40\% \leq \text{PPD} < 50\%$	$50\% \leq \text{PPD} < 60\%$	$60\% \leq \text{PPD} < 70\%$	$70\% \leq \text{PPD} < 80\%$	$80\% \leq \text{PPD} < 90\%$	$90\% \leq \text{PPD} \leq 100\%$
Average (hr)	3650.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1976 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.



Stone Close, West Drayton Overheating Risk Analysis

3.03.02 Mechanical Comfort Cooling Analysis – TM49 DSY: 1989 LHR

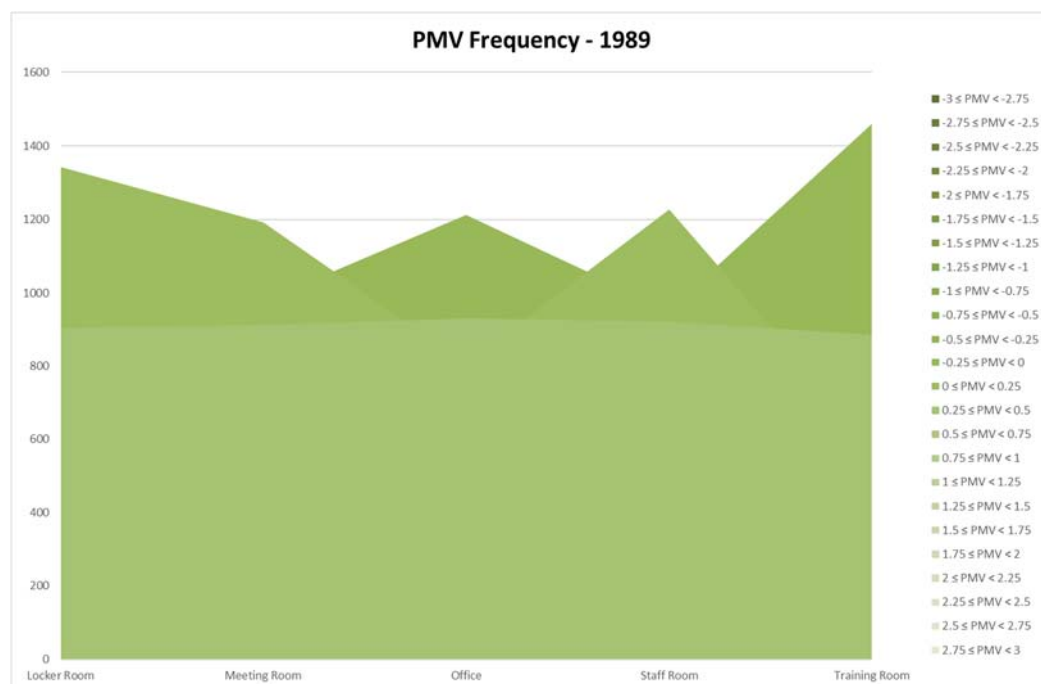
The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25 ≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	604.4	1101.2	1032.8	911.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6	30.2	28.3	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between $-1.0 \leq PMV < 1.0$ frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	$0\% \leq PPD < 10\%$	$10\% \leq PPD < 20\%$	$20\% \leq PPD < 30\%$	$30\% \leq PPD < 40\%$	$40\% \leq PPD < 50\%$	$50\% \leq PPD < 60\%$	$60\% \leq PPD < 70\%$	$70\% \leq PPD < 80\%$	$80\% \leq PPD < 90\%$	$90\% \leq PPD < 100\%$
Average (hr)	3650.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1989 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.



3.03.03 Mechanical Comfort Cooling Analysis – TM49 DSY: 2003 LHR

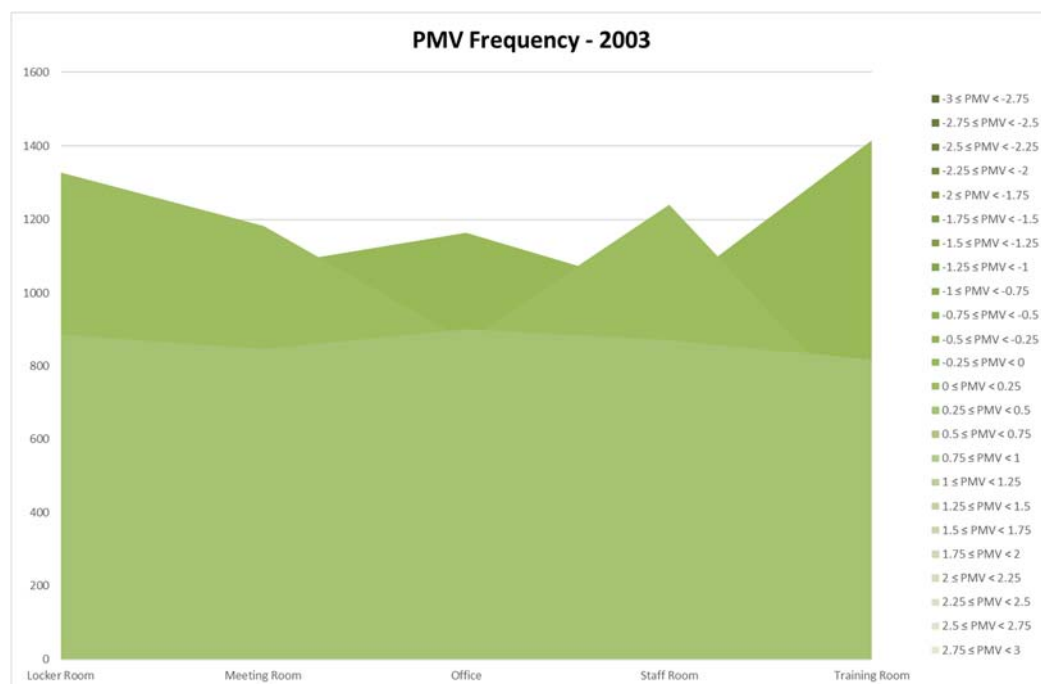
The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	$-3 \leq \text{PMV} < -2.75$	$-2.75 \leq \text{PMV} < -2.5$	$-2.5 \leq \text{PMV} < -2.25$	$-2.25 \leq \text{PMV} < -2$	$-2 \leq \text{PMV} < -1.75$	$-1.75 \leq \text{PMV} < -1.5$	$-1.5 \leq \text{PMV} < -1.25$	$-1.25 \leq \text{PMV} < -1$	$-1 \leq \text{PMV} < -0.75$	$-0.75 \leq \text{PMV} < -0.5$	$-0.5 \leq \text{PMV} < -0.25$	$-0.25 \leq \text{PMV} < 0$	$0 \leq \text{PMV} < 0.25$	$0.25 \leq \text{PMV} < 0.5$	$0.5 \leq \text{PMV} < 0.75$	$0.75 \leq \text{PMV} < 1$	$1 \leq \text{PMV} < 1.25$	$1.25 \leq \text{PMV} < 1.5$	$1.5 \leq \text{PMV} < 1.75$	$1.75 \leq \text{PMV} < 2$	$2 \leq \text{PMV} < 2.25$	$2.25 \leq \text{PMV} < 2.5$	$2.5 \leq \text{PMV} < 2.75$	$2.75 \leq \text{PMV} \leq 3$
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	613.0	1116.8	1054.8	865.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.8	30.6	28.9	23.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between $-1.0 \leq \text{PMV} < 1.0$ frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	$0\% \leq \text{PPD} < 10\%$	$10\% \leq \text{PPD} < 20\%$	$20\% \leq \text{PPD} < 30\%$	$30\% \leq \text{PPD} < 40\%$	$40\% \leq \text{PPD} < 50\%$	$50\% \leq \text{PPD} < 60\%$	$60\% \leq \text{PPD} < 70\%$	$70\% \leq \text{PPD} < 80\%$	$80\% \leq \text{PPD} < 90\%$
Average (hr)	3650.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 2003 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.



4.00 OVERHEATING / THERMAL COMFORT STRATEGY

The TM52 free running overheating results for the office accommodation for each of the three TM49 design summer years are summarised below:

- The unit has a risk of overheating due to failing each of the three TM52 criterion for each of the three TM49 design summer years.

Therefore, additional measures need to be included to alleviate the small overheating risk.

The modelled scheme already incorporates the following passive measures to reduce the risk of overheating:

- Openable windows.
- High performance glazing that has a 'U' value of 1.60 W/m²K and a 'g' value of 0.40.
- LED lighting to reduce internal casual heat gains.
- Predominantly north facing glazing to the office accommodation.

Therefore, additional passive measures are not applicable. Hence a mechanical ventilation or comfort cooling solution is required.

The additional mechanical ventilation of comfort cooling measures to be incorporated to the office accommodation needs to cater for the design weather data, the design internal heat gains plus the operational requirements / constraints of the future tenant. From an operational point of view the industrial unit needs to provide the following:

- Restrict the external noise intrusion in to the unit.
- Provide a comfortable internal environment for the occupants during the day and potentially night occupied periods.

Two main strategies have been considered:

1. The application of a night cooling strategy i.e. flooding the office accommodation with external ambient air during the night.
2. Adding mechanical comfort cooling.

A natural ventilation night time cooling strategy has been discounted for the following reasons:

- The windows have a restricted opening size, already included in the assessment that cannot be increased.

A mechanical ventilation night time cooling strategy has been discounted for the following reasons:

- Night cooling strategies are generally applied to buildings during their unoccupied periods as the need to negate draughts in the occupied zones is unnecessary.
- The volume of supply air to the office accommodation would cause draughts in the occupied zones and therefore cause discomfort.
- The ductwork risers and distribution ductwork would be impractically large.
- The required large air change rates in the rooms are impractical to provide and are likely to cause excessive noise.

Hence a night time cooling strategy cannot be applied to the office accommodation.



Therefore, additional mechanical ventilation measures are not applicable. Hence a mechanical comfort cooling system is required.

The TM52 mechanical comfort cooling overheating risk analysis, the PMV and PPD results indicate that overheating in the comfort cooled office accommodation is not a risk.

Hence the proposed mechanical heat recovery ventilation system in conjunction with the mechanical comfort cooling system, as per the applicant's preferred development specification is appropriate.

5.00 CONCLUSION

The office accommodation of the industrial unit has been analysed for the overheating risk in free running mode and mechanically comfort cooled mode in accordance with the requirements of TM52 and against the three GLA recommended TM49 design summer years.

For the free running criteria:

- The unit has a risk of overheating due to failing each of the three TM52 criterion.

The modelling already includes the appropriate passive measures to help mitigate the overheating risk. The measures included are summarised below:

- Openable windows albeit with a restricted opening to the office accommodation.
- High performance glazing that has a 'U' value of 1.60 W/m²K and a 'g' value of 0.40.
- LED lighting to reduce internal casual heat gains.
- Predominantly north facing glazing to the office accommodation

The provision of openable windows will be maintained in the unit to allow the future tenants the choice of operating the building in free running mode as the prevailing whether conditions allow.

To alleviate the predicted overheating the office accommodation in the industrial unit will be provided with comfort cooling. The office accommodation in the unit passes the TM52 mechanical cooled building overheating criteria.

Therefore, the proposed comfort cooling systems to the office accommodation are appropriate for inclusion in the industrial unit.

This report accounts for all relevant design features and includes for the anticipated building usage. Should the final design and/or use of the building differ from the described, or should the actual weather differ from the accredited weather files, then 'out of range' temperature may occur beyond that predicted.