



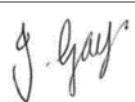
ROLTON GROUP
ENGINEERING THE FUTURE™

MECHANICAL AND ELECTRICAL
BUILDING SERVICES THERMAL
COMFORT STUDY

FOR

THE ORACLE, READING – BUILD TO
RENT SCHEME

PROJECT NUMBER:	21-0388
DOCUMENT REFERENCE:	210388-RGL-ZZ-XX-RP-U-95-0004
REVISION:	S2-P01

	NAME	POSITION	SIGNATURE
AUTHOR	Kasia Hignett BEng	Project Engineer	
CHECKER	Alex Lindley BEng (Hons) AMEI	Senior Engineer	
VERIFIER	Ian Gay BEng (Hons)	Senior Engineer	

REVISION

REVISION	ISSUE DATE	REASON FOR ISSUE
S2-P01	30.11.2022	Issued for information

ISSUING OFFICE

HIGHAM FERRERS OFFICE

Rolton Group Ltd
The Charles Parker Building
Midland Road
Higham Ferrers
Northants
NN10 8DN

PETERBOROUGH OFFICE

Rolton Group Ltd
26 Commerce Road
Lynch Wood
Peterborough
PE2 6LR

BIRMINGHAM OFFICE

Rolton Group Ltd
The David Rolton Building
Twelve Quartz Point
Stonebridge Road
Birmingham
B46 3JL

01933 410909 | www.rolton.com | enquiries@rolton.com

NOTE: IMPORTANT INFORMATION ABOUT YOUR RIGHTS TO READ AND USE THE CONTENT
OF THIS DOCUMENT ARE CONTAINED AT THE BACK OF THIS DOCUMENT

CONTENTS

1.0 INTRODUCTION 1

1.1 YIELD HALL PLACE 1 (FORMER DEBENHAMS) 1

1.2 YIELD HALL PLACE 2 (VUE CINEMA) 1

1.3 THERMAL COMFORT 2

2.0 RESULTS ANALYSIS 5

2.1 PMV FREQUENCY 6

2.2 PPD FREQUENCY.....7

2.3 CONCLUSION 7

IMPORTANT INFORMATION

1.0 INTRODUCTION

Rolton Group Ltd (RGL) are appointed to provide an assessment of thermal comfort for the new proposed commercial units at The Oracle in Reading.

The development comprises of two new construction buildings in the place of existing shopping mall and cinema.

1.1 YIELD HALL PLACE 1 (FORMER DEBENHAMS)

1.1.1 DESCRIPTION OF DEVELOPMENT

Mixed use development comprising part demolition of the former department store and erection of a new building comprising build to rent residential use (Class C3) and commercial uses within Uses Class E. Reconfiguration and change of use of remaining department store floor space (Class E) to uses within Use Class E and / or bar and / or experiential leisure use, associated public realm, infrastructure works and external alterations to shopping centre, including creation of new shopping centre entrance. The proposed new commercial units at The Oracle in Reading are as following:

1.1.2 SCHEME DETAILS

- Proposed leisure unit: 935 sqm (GIA/Gross Internal Area).
- Retained retail floor space: 3,541 sqm (including riverside floor back of house).
- Ground floor co-working space and maker units: 728 sqm.

1.2 YIELD HALL PLACE 2 (VUE CINEMA)

1.2.1 DESCRIPTION OF DEVELOPMENT

Mixed use development comprising the demolition of existing buildings and erection of new building comprising build-to-rent residential use (Class C3), cinema and ground floor commercial uses within Use Class E, associated public realm and infrastructure works.

1.2.2 SCHEME DETAILS

- No of Residential units: 247.
- Replacement cinema 2,653 sqm / 6 screens.
- Ground floor commercial space (excluding cinema) 464 sqm.

A computer model has been developed in accordance with the drawings provided by the Architect issued on 04.11.2022.

Full details of the mechanical and electrical system designs are included within the Energy Statement (ES) Report 210388-RGL-ZZ-XX-RP-U-95-0002.

This report is intended as an addendum to the ES report. Reference should therefore be made to this ES report for the mechanical and electrical system efficiencies.

This report contains details of the passive design measures implemented and incorporated within the development following completion of the modelling exercise.

1.3 THERMAL COMFORT

Thermal comfort is very difficult to define as you need to consider a range of environmental factors, work-related and personal factors when deciding what makes a comfortable environment temperature.

The factors that affect the way occupants perceive the temperature of their environment include, but are not limited to:

- Metabolic rate
- Amount of clothing worn
- Humidity
- Surrounding surface temperatures
- Air flow velocities
- Air temperature

1.3.1 PREDICTED MEAN VOTE (PMV)

The 'predicted mean vote' (PMV) predicts the average vote of large group of people's perception of the temperature of the environment. The PMV index using seven scales to measure thermal comfort as shown in Table 1.

PMV	
SENSATION	SCORE
Hot	+3
Warm	+2
Slightly Warm	+1
Neutral	0
Slightly Cool	-1
Cool	-2
Cold	-3

Table 1 – Thermal Comfort Scale

1.3.2 PREDICTED PERCENTAGE DISSATISFIED (PPD)

The predicted percentage dissatisfied (PPD) attempts to quantify the percentage of people whose predicted mean vote would be outside of the range $-1.0 > \text{PMV} > 1.0$, as these people are likely to be dissatisfied with the current environmental conditions (see Figure 1).

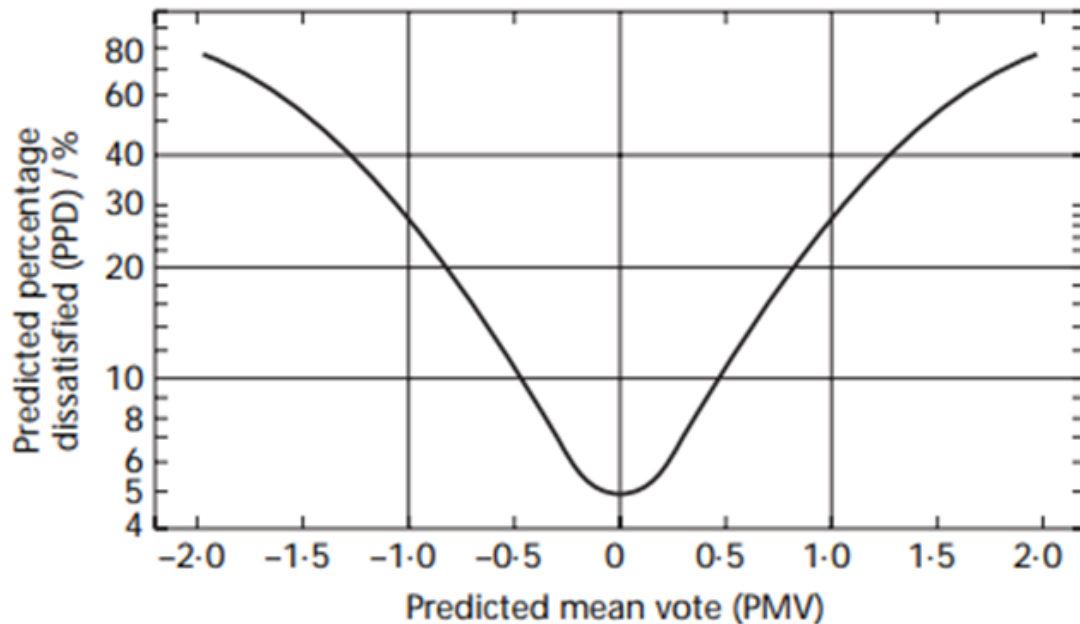


Figure 1 – PPD in relation to the PMV

Chartered Institution of Building Services Engineers (CIBSE) Guide A uses the Predicted Percentage Dissatisfied to provide guidance regarding suitable temperature ranges for summer and winter, for a range of different building types.

From Building Research Establishment Environmental Assessment Method (BREEAM) HEA 04 (2018):
"Thermal comfort levels in occupied spaces meet the Category B requirements set out in Table A.1 of Annex A of ISO 7730:2005."

From CIBSE Guide A:

"As the individual thermal sensation votes will be scattered around the mean predicted value (i.e. PMV), it is useful also to predict the percentage of people who would be dissatisfied, taken as those who would vote $> +1$ or < -1 on the sensation scale."

A dynamic simulation model was created to assess the design. TAS is a Dynamic Simulations Modelling (DSM) software package that has the capabilities of enabling the user to create a virtual representation of a building.

The building was modelled using Tas Software incorporating calculation engine version v9.5.4.

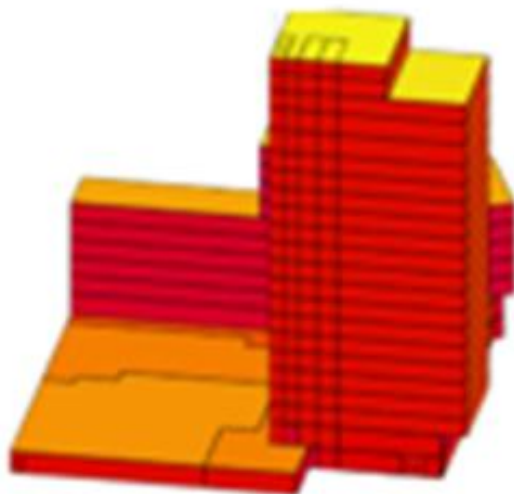


Figure 2 - Current Yield Hall Place 1 3D View - TAS software.

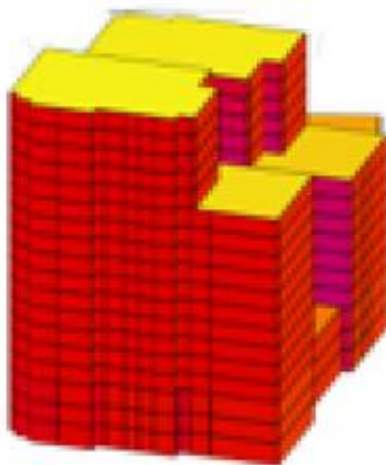


Figure 3 - Current Yield Hall Place 2 3D View TAS software.

2.0 RESULTS ANALYSIS

This report summarises the results of the thermal modelling performed at RIBA Stage 2, and contains supporting information required to satisfy some of the requirements for – BREEAM New Construction (NC) 2018 associated credits.

The following results have been obtained using current weather data.

- Test Reference Year (TRY): 2006 and 2016 The TRY is composed of 12 separate months of data each chosen to identify an average month from the collected data.

Internal design conditions are taken from the standard of the National Calculation Methodology (NCM) database (v 6.1.b) for Non-Domestic Buildings.

ZONE	SUMMER DESIGN SETPOINT TEMPERATURE (COOLING SEASON) [°C]	WINTER DESIGN SETPOINT TEMPERATURE (HEATING SEASON) [°C]
YHP 1		
Leisure	25	23
Retained Retail	23	20
Co-working	24	22
Restaurant	25	23
YHP 2		
Cinema 1	25	22
Cinema 2	25	22
Retail	23	20

Table 2 - Design temperatures for each zone.

2.1 PMV FREQUENCY

The tables below give details of the projected PMV for each of the occupied areas being considered in the report.

ZONE	$-3 \leq \text{PMV} < -2.5$	$-2.5 \leq \text{PMV} < -2$	$-2 \leq \text{PMV} < -1.5$	$-1.5 \leq \text{PMV} < -1$	$-1 \leq \text{PMV} < -0.5$	$-0.5 \leq \text{PMV} < 0$	$0 \leq \text{PMV} < 0.5$	$0.5 \leq \text{PMV} < 1$	$1 \leq \text{PMV} < 1.5$	$1.5 \leq \text{PMV} < 2$	$2 \leq \text{PMV} < 2.5$	$2.5 \leq \text{PMV} < 3$
YHP 1												
Leisure	0	0	0	0	0	0	716	744	0	0	0	0
Retained Retail	0	0	0	0	0	160	3,125	0	0	0	0	0
Co-working	0	0	0	0	314	2,094	1,241	1	0	0	0	0
Restaurant	0	0	0	0	141	700	593	26	0	0	0	0
YHP 2												
Cinema 1	0	0	0	0	1,001	729	747	78	0	0	0	0
Cinema 2	0	0	0	0	1,076	677	725	77	0	0	0	0
Retail	0	0	0	0	0	777	2,487	21	0	0	0	0

Table 3 – PMV frequency results

2.2 PPD FREQUENCY

The tables below give details of the projected PPD for each of the occupied areas being considered in the report.

ZONE	0% ≤ PPD < 10%	10% ≤ PPD < 20%	20% ≤ PPD < 30%	30% ≤ PPD < 40%	40% ≤ PPD < 50%	50% ≤ PPD < 60%	60% ≤ PPD < 70%	70% ≤ PPD < 80%	80% ≤ PPD < 90%	90% ≤ PPD ≤ 100%
YHP 1										
Leisure	682	769	9	0	0	0	0	0	0	0
Retained Retail	3,279	6	0	0	0	0	0	0	0	0
Co-working	3,320	308	22	0	0	0	0	0	0	0
Restaurant	1,272	188	0	0	0	0	0	0	0	0
YHP 2										
Cinema 1	1,405	1,129	21	0	0	0	0	0	0	0
Cinema 2	1,351	1,177	27	0	0	0	0	0	0	0
Retail	3,258	27	0	0	0	0	0	0	0	0

Table 4 - PPD results summary

2.3 CONCLUSION

The recommended acceptable PMV range for thermal comfort given by EN ISO 7730:2005 for category B is between -0.5 and +0.5 for an interior space, with a recommended maximum of 10% thermally dissatisfied persons among a large group of people.

The results from the table 3 for Yield Hall Place 1 demonstrate the tight control of temperatures achievable using the proposed temperature setpoints, with 1226 hours falling outside recommended acceptable range, meaning that the 12% of occupied hours falling outside this range.

The results from the table 2 for Yield Hall Place 2 demonstrate the tight control of temperatures achievable using the proposed temperature setpoints, with 2,253 hours falling outside recommended acceptable range, meaning that the 26.8% of occupied hours falling outside this range.

However, the recommended acceptable PMV range for thermal comfort given by CIBSE Guide A is between -1.0 and +1.0 for an interior space.

The results from the table 3 demonstrate the tight control of temperatures achievable using the proposed temperature setpoints, with no hours falling outside recommended acceptable range.

The results presented above illustrate that the building design for Yield Hall Place 1 and 2 and services strategy are designed to deliver operative temperatures in line with the criteria set out in CIBSE Guide A.

To understand why the occupants are uncomfortable, refer to the Predicted Mean Vote results in conjunction with Table 1 - Thermal Comfort Scale. A negative PMV suggests the occupants are too cold, and a positive PMV suggests the occupants are too warm.

There could be various reasons for why the occupants are either too hot or too cold, including:

- Poor choice of heating/cooling set-points.
- No heating/cooling/ventilation to a space.
- Insufficient heating/cooling loads.
- High proportion of radiant surfaces (causing significant difference between dry bulb and resultant temperatures).
- High air velocity in the space.

IMPORTANT INFORMATION

THIS PAGE CONTAINS IMPORTANT INFORMATION ABOUT THE RIGHTS TO USE THIS DOCUMENT. IF YOU DO NOT ACCEPT THE FOLLOWING CONDITIONS FOR THE USE AND RELIANCE OF THIS DOCUMENT PLEASE RETURN IT TO THE AUTHOR OR TO THE MANAGING DIRECTOR OF ROLTON GROUP LTD BY RECORDED DELIVERY AND WITH COVERING LETTER.

DEFINITIONS

The Client: **THE ORACLE LIMITED PARTNERSHIP**

The Development: **THE ORACLE, READING - BUILD TO RENT SCHEME**

CONFIDENTIALITY

Rolton Group Ltd will keep confidential and not disclose to any person or use any confidential information or any technical operational administrative business information relating to the Client the Development or otherwise without the Client's prior written authority.

COPYRIGHT

All design rights and copyright and intellectual Property in this document and the referenced documents herein ("the Report") shall remain vested in Rolton Group Ltd and Rolton Group Ltd grants to the Client a royalty-free, non-exclusive licence to use and to reproduce the Report in full but not in part for all purposes relating to the Development including (without limitation) the construction completion reconstruction modification alteration maintenance reinstatement repair use letting sale promotion and advertisement thereof. Such licence shall not include a licence to reproduce the designs contained in the Report and shall not include a license for the Report to be modified in any way. The licence shall include the right without the consent of Rolton Group Ltd to assign the licence or grant a sub-licence to any person whatsoever provided that Rolton Group shall not be liable for any such use by the Client or any assignee or licensee for any purposes other than that for which the same were provided by Rolton Group.

INFORMATION PROVIDED BY OTHERS

Where copies of any documents information reports investigations findings and/or details of any preliminary works carried out in respect of the Development ("Other Documents") have been provided to Rolton Group Ltd by any party not limited to the Client then Rolton Group Ltd has made full regard to the Other Documents when considering the findings designs and recommendations made by Rolton Group Ltd in the Report.

Unless specifically stated to be otherwise Rolton Group have relied on the Other Documents for the findings designs and recommendations in the Report and any errors or omissions in the Other Documents shall operate to exclude or limit the Rolton Group Ltd liability for any findings designs and recommendations in the Report unless such error or omission should reasonably have been identified by a properly qualified and competent consultant or person experienced in the provision of like services as those provided by Rolton Group Ltd for a Development of similar type size scope and complexity.

THIRD PARTY RIGHTS

By acceptance of this Report the Client confirms and Rolton Group Ltd agree that any contracts or agreements between Rolton Group Ltd and the Client shall not be enforceable under the Contracts (Rights of Third Parties) Act 1999 by any person not a party to them.

FREEDOM OF INFORMATION

Authorised or unauthorised copies of this document may come into the possession of organisations that are designated under the Freedom of Information Act 2000 ("the Act"). Such organisations that are designated in the Act are requested by Rolton Group to respect the above statements relating to confidentiality and copyright. It is possible that the disclosure of the information in the Report may be in breach of certain exceptions of the Act such as Part II Section 41, 42, 43. Rolton Group has invested and imparted substantial skill economic resources and labour in producing the Report and any disclosure shall prejudice the commercial interests of the Rolton Group Ltd. Where there are breaches of the exemption requirements of the Act by the disclosure of information in this Report then Rolton Group Ltd will pursue for legal recourse including for but not limited to recovery of losses and damages.

Rolton Group Limited, Registered in England No. 1547400.