ROYAL COLLEGE OF PHYSICIANS

5-8 ST ANDREWS PLACE

ASSESSMENT OF OVERHEATING RISK

REV 001, 13 JUNE 2022

VERSION CONTROL

REVISION	ISSUED FOR	DATE	AUTHOR	CHECKED BY
000	Client issue	31-05-22	AM	MF
001	LBC Comments incorporated	13-06-22	AM	AM

Disclaimer

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EXECUTIVE SUMMARY

FLOH Consulting has been appointed by Royal College of Physicians to consider the need for mechanical cooling within its Regency Terrace properties at St Andrews Place, off Regents Park, London. The study has been requested by London Borough of Camden in response to planning permission application reference 2022/0907.

This study follows the authors involvement in the building from 2008 to 2016 when various studies were undertaken and design strategies developed.

'CIBSE TM52 The limits of thermal comfort, avoiding overheating in European Buildings' states when considering existing buildings:

- '*As a subjective phenomenon, overheating can be best indicated by the observations of building occupants.*'

A history of staff complaints and previous analysis have identified the prevalence of overheating within the building. A 2016 study by the author concluded that cooling would be necessary to maintain acceptable conditions within occupied zones but since that time RCoP has attempted to use the spaces without intervention, without success.

A CIBSE TM52 analysis is accepted as the assessment of overheating risk within commercial buildings within the UK. A series of TM52 analyses have been undertaken on the subject building.

Opportunities to reduce overheating risk have been assessed through the application of the cooling hierarchy. As a Grade 1 listed building such opportunities are thus limited but notwithstanding some interventions were identified and assessed.

Unfortunately, even after the use of natural ventilation, internal blinds and high efficiency LED lighting none of the occupied zones met the TM52 comfort criteria.

The use of mechanical ventilation was not assessed since this would be extremely disruptive to building fabric and finishes and would require a large external plant area.

A solution using heat pump technology would require a compact external plant installation and could be distributed through the building more sympathetically. Indeed there are already such installations within adjacent buildings.

A further benefit of the proposed approach is that it will affect a step to reducing carbon emissions locally as the systems can also be used for heating, thereby reducing the demand on existing gas fired plant which serves the building.

For these reasons, the design team has proposed a heat pump based solution.

1.0 INTRODUCTION

FLOH Consulting Ltd. has been engaged by Royal College of Physicians, via Swift Interiors and Facilities Ltd., to undertake an assessment of overheating risk within some its properties on St Andrews Place, Regents Park, London.

In response to a planning application for the installation of new external plant installations London Borough of Camden has stated:

- *"New active cooling requires a dynamic thermal assessment demonstrating that there is a risk of overheating after other more passive measures of the cooling hierarchy have been incorporated. See para 8.41 of the local plan."*

This study has been commissioned to respond to that request.

1.1 The project

Properties at 5-8 St Andrews Place are used as office accommodation by Royal College of Physicians. The spaces suffer from overheating and regular staff complaints so the College intends to install comfort cooling to provide a limited degree of conditioning within them.

1.2 The building

1-8 St Andrews Place is a row of Grade 1 listed terraced properties that were designed by Architect John Nash and constructed between 1823 and 1826. Properties occupy basement, ground and three upper floors with the uppermost floor partially extending into the roof void level.

For the purposes of this report, the term 'building' refers collectively to houses 5-8. Individual houses are referred to by their respective house number.

Comfort cooling is currently provided to Houses 1 and 2 by an early VRF system which was reported as being the first installation of its type in the UK. That system uses refrigerant pipework distribution via vertical risers to the rear of the property. Pipelines connect indoor units to external condensing units at roof level.

A number of other unitary split type heat pump installations are provided for the IT data room and individual meeting spaces in other houses.

1.3 Aims and objectives

Are to:

- Gather information on the construction, layout and use of the subject accommodation
- Consider the application of the cooling hierarchy
- Construct a three dimensional model of the building
- Assess overheating risk using the CIBSE TM52[1] methodology
- Report findings and make recommendations

1.4 Structure and content

Consideration is given to the policy requirements and the cooling hierarchy. Various analyses are then conducted and reported on before a general discussion of the study and findings is provided.

1.5 Terms of reference

- None applicable

[1] TM52: The limits of thermal comfort: Avoiding overheating in European buildings (2013), CIBSE

1.6 Glossary of terms

ADL	Building Regulations Approved Document Part L
ASHP	Air source heat pump
AQ	Air quality
CCU	Carbon capture and utilisation
CH	Communal heating
CHP	Combined heat and power
CIBSE	Chartered Institute of Building Services Engineers
DH	District heating
DHWS	Domestic hot water service
DER	Dwelling emission rate
DX	Direct expansion type comfort cooling and/or heating system
FHS	Future Homes Standard
FLOH	FLOH Consulting Limited
GSHP	Ground source heat pump
LPHW	Low pressure hot water
PV	(Solar) Photovoltaic
SAP	Standard assessment procedure
STH	Solar Thermal
TER	Target emission rate
VRV/VRF	Variable refrigerant volume / flow comfort cooling and heating system
SWSHP	Surface water source heat pump
WSHP	Water Source Heat Pump

1.7 Disclaimer

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2.0 THE REQUIREMENT

In its response the planning application for permission to install new external plant installations London Borough of Camden has referred to its local plan[2] and specifically paragraph 8.41 which states:

8.41 All new developments will be expected to submit a statement demonstrating how the London Plan's 'cooling hierarchy' has informed the building design. Any development that is likely to be at risk of overheating (for example due to large expanses of south or south west facing glazing) will be required to complete dynamic thermal modelling to demonstrate that any risk of overheating has been mitigated.

This application is not a new development and the stated clause should not be applied in this manner. Notwithstanding this position the client has duly complied and the associated assessment is included herein, starting with consideration of the cooling hierarchy.

2.1 The cooling hierarchy

In its local plan London Borough of Camden defines the cooling hierarchy as:

8.43 The cooling hierarchy includes:

- *Minimise internal heat generation through energy efficient design;*
- *Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;*
- *Manage the heat within the building through exposed internal thermal mass and high ceilings;*
- *Passive ventilation;*
- *Mechanical ventilation; and*
- *Active cooling.*

This approach is an earlier version of that now published within the London Plan[3] under Policy SI 4 Managing heat risk:

A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

- *1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure*
- *2) minimise internal heat generation through energy efficient design*
- *3) manage the heat within the building through exposed internal thermal mass and high ceilings*
- *4) provide passive ventilation*
- *5) provide mechanical ventilation*
- *6) provide active cooling systems.*

[2] Camden Local Plan 2017, London Borough of Camden, 2017
[3] The London Plan, The Spatial Development Strategy for Greater London, 2021 Edition, GLA, March 2021

2.2 Application in an existing setting

It is clear that the requirements above are aimed at and apply to new development. It is however important to consider how such approaches could be applied to the subject building.

Table 2.1: Consideration of the cooling hierarchy

Stage	Considerations	Opportunity
1) Reduce the amount of heat entering a building through orientation, shading……etc.	There are no opportunities to modify the existing building, footprint, façade or external features at it is a Grade 1 listed building. Internal blinds could reduce solar penetration.	Blinds have been installed internally but these interact with openable windows and affect daylight penetration so use cannot be guaranteed.
2) Minimise internal heat generation through energy efficient design	Current use is generally office accommodation with internal gains from equipment and lighting. Occupancy levels have been maximised as part of organisational masterplanning.	Internal heat gains are relatively high due to occupancy density and associated equipment. Lighting gains could be reduced by a move towards energy efficient LED lighting types.
3) Manage the heat within the building through exposed internal thermal mass and high ceilings	This is already a key feature of the building and cannot be improved upon.	Already far better than even most modern buildings.
4) Provide passive ventilation	The building is predominantly naturally ventilated via openable windows, save for some localised extract to kitchen and sanitary accommodation. Issues of privacy between adjacent rooms and public footpaths externally, noise ingress and air quality.	Passive ventilation is already the predominant feature but it is limited to that required for minimum fresh air provision. Windows are normally opened slightly to allow a degree of air change but to avoid aforementioned issues with privacy, noise, air quality and interference with blinds.
5) Provide mechanical ventilation	This would require internal and/or external plant and the associated interconnecting ductwork which would disturb the building fabric and finishes.	None, due to building sensitivity.
6) Provide active cooling systems.	A refrigerant based heat pump installation is proposed to provide direct cooling and heating of the spaces. This approach is the least intrusive, requiring only minimal builders work to facilitate.	Feasible and lowest impact. Proposals include refrigerant based heat pump installation for direct conditioning. The installation is being provided in a manner so it can be decommissioned and fabric made good in future.

3.0 AN OVERVIEW OF THE CIBSE TM 52 PROCESS

3.1 Adaptive Comfort Criteria

The following three criteria, taken together, are used to assess the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the three criteria is classed as overheating.

3.1.1 Hours of exceedance

The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1K or more during the occupied hours of a typical non-heating season (1st May to 30th September).

- *The number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours. ΔT is defined as operative temperature less the maximum acceptable temperature. ΔT is rounded to the nearest whole degree.*

3.1.2 Daily weighted exceedance

The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.

- *To allow for the severity of overheating, the weighted exceedance shall be less than or equal to 6 in any one day.*

3.1.3 Upper limit temperature

The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

- *To set an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4K.*

Further information on these criteria can be found in TM52, section 6.1.2.

3.2 Building categories

Table 3.1: Classification of building types from TM52

Category	Explanation	Suggested acceptable range (K)
Category I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	2
Category II	Normal expectation (for new buildings and renovations)	3
Category III	A moderate expectation (used for existing buildings)	4

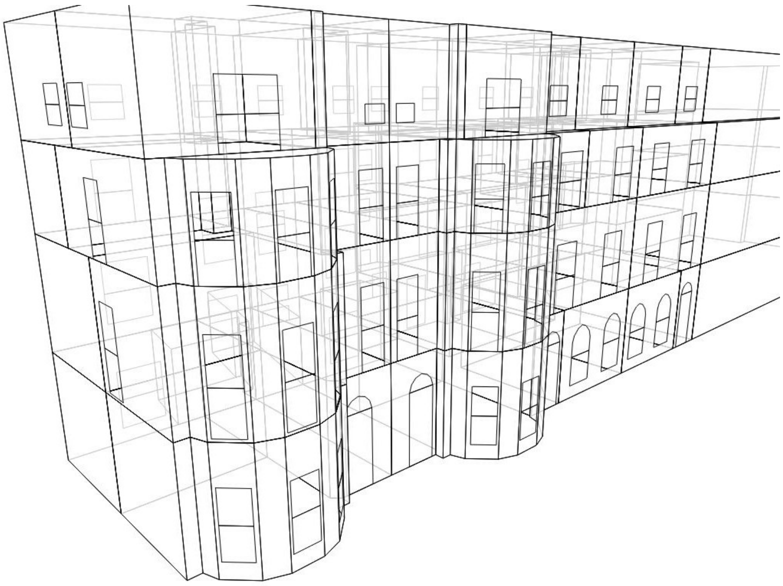
CIBSE suggest that designers should aim to remain within the Category II limits. Given the limited flexibility by virtue of the building stature, it will be classified as Category III. This allows a greater temperature deviation and should increases the chance of compliance.

4.0 DYNAMIC THERMAL SIMULATION

4.1 Introduction

Here the parameters and outcomes of the modelling exercise are presented. A three dimensional model of the building was created to allow dynamic thermal simulation and bulk airflow analysis of the subject areas.

Figure 4.1: Model extract



Note that analysis considers occupied rooms only, transient spaces are not included in the analysis, but are included within the model to ensure that heat transfer throughout the building is considered appropriately.

4.2 Model parameters

Variables in the model were configured as follows:

Table 4.1: Fabric performance

Element	Value ((W.m^{-2}).K^{-1})
Roof	0.41
Wall	1.50
Floor	1.12
Windows, roof window, rooflights	5.55
Air Permeability ((m^3.hr^{-1}).m^{-2} at 50Pa)	20.0

Table 4.2: Internal gains

Variable	Value	Application profile
Internal lighting gain	15 W.m^{-2}	100%, 0800 - 2000
Small power	25 W.m^{-2}	100%, 0800 - 1800
Occupancy	1 person per 8m^2	100%, 0800 - 1800

4.3 Weather data

When assessing overheating risk by simulation CIBSE TM52 recommends:

'In order for the simulation to be applicable in periods when overheating is likely to occur, it is suggested that an appropriate 'design summer year' (DSY) weather file (see chapters 2 and 5 of CIBSE Guide A (CIBSE, 2006)) is used in the simulation.'

The DSY is a single continuous year rather than a composite one made up from average months and is used for overheating analysis. DSY datasets are available for 14 UK sites, including London.

With reference to London CIBSE TM49[4] discusses the selection of particular weather data and states:

To enable allowance to be made for the urban heat island of London weather data for other weather stations in and around London have been examined in addition to Heathrow Airport (LHR). Generally, there is a lack of weather observation stations measuring air temperatures within the capital with a particular scarcity of hourly observations. Two additional weather stations with long records of hourly weather observations were identified, however: London Weather Centre (LWC) and Gatwick Airport (GTW). Through comparison with weather data from other observation stations, it was found that LWC and GTW provide representative sites for inner urban and rural climate in the London area, respectively. LHR is representative of intermediate urban and suburban locations

The subject site is located on the fringe of Regents Park in an urban/suburban location so the LHR DSY is considered most applicable.

4.4 Iterations

Simulations have been performed as follows:

- TM001 - Fabric performance and internal gains as above, windows closed, no blinds
- TM002 - As 001, windows open to 25%
- TM003 - As 001, with internal blinds
- TM004 - As 003, but with LED lighting

4.5 Results

TM52 summary results are included at appendix A. Performance is summarised in table 4.3 below.

When referring to the TM52 results sheets note the following basis for reading the figures presented.

- Criteria 1 - This displays the percentage hours when the difference in operative temperature minus the maximum acceptable temperature is greater than or equal to 1K.
- Criteria 2 - This displays the maximum daily degree hours found for the space. This fails if it is greater than 6.
- Criteria 3 - This displays the maximum ΔT for the space. This space fails if it is greater than or equal to 4K.

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[4] Design summer years for London, CIBSE TM49:2014, CIBSE

Table 4.3: Summary of performance

Model	Rooms failing	Rooms passing
TM101	40	0
TM102	40	0
TM103	40	0
TM104	40	0

Note that as per CIBSE TM52, a room is classed as ‘failing’ if two of the three TM52 criteria are not met.

5.0 DISCUSSION

The significance of the building and its stature limit any opportunities to modify the fabric to enhance its summertime performance. Indeed, its solid walls and high ceilings, all with dense internal finishes are the best performing elements to dampen internal temperature swing and exploit thermal mass. Inclusion of insulation in these elements would worsen conditions.

Opposing this benefit however is the density of use of the spaces and large areas area of clear glazing create significant internal heat gains. Internal blinds are already being used but these interact with the passive ventilation and cause nuisance when windows are opened.

Model iterations have aimed to demonstrate conditions generally with windows open and closed and blinds in use. The representative condition will be a combination of all three scenarios since occupants will all manage their spaces and hence local environment differently.

Under each of the scenarios a significant degree of overheating has been demonstrated such that none of the rooms demonstrate compliance with TM52.

A further simulation was been performed to assess the impact of a move to LED lighting installations and a slight improvement is suggested. Royal College of Physicians is advised to implement this change as it will offer a good payback and will contribute to wider decarbonisation.

As part of the strategic masterplanning exercises the author undertook a similar exercise on this building in 2016 which included a TM52 assessment of overheating risk and the building failed at that time. Active cooling was recommended then but the client had elected to try and manage conditions, which has been unsuccessful.

This analysis has not included an assessment of future climate change scenarios, which is required under the London Plan. Such analysis would only serve to worsen performance and reinforce the need for cooling in this application.

Potential future benefits of electrification of this building should be considered. The proposed systems would overcome summertime overheating but would also provide a step towards decarbonisation as the new installations will use the reverse cycle ability of the proposed heat pumps to heat the spaces served. Over time this will reduce the reliance on existing gas fired boilers that serve the building.

6.0 CONCLUDING REMARKS

Royal College of Physicians has procured this study to respond to a request from London Borough of Camden to demonstrate the need for active cooling.

This has been achieved through a consideration of how the stages of the cooling hierarchy could be applied to the building and demonstrated by a detailed CIBSE TM52 assessment.

It is not possible to significantly modify a Grade 1 listed building to reduce potential cooling demand, nor would it be desirable, and through the stages of the cooling hierarchy the need for active cooling has been demonstrated as the most effective and least intrusive option.

APPENDIX A – CIBSE TM52 RESULTS SUMMARIES

TM52 OVERHEATING ANALYSIS

Project: 5-8 Nash Terraces
Reference: F2280
Date: 31 May 2022

Model reference: F2280TM
Iteration: 101

Assessment: TM52
Description: *Excluding blinds to all windows & doors, all openable windows closed, no aux vent*

INPUT INFORMATION

Location:	London Heathrow, United Kingdom
Simulation weather file:	London_LHR_DSY1
Building category:	Category III (existing build)
Wall:	1.5 W/m^2K
Roof:	0.41 W/m^2K
Floor:	1.12 W/m^2K
Window (u-value):	5.55 W/m^2K
Window (g-value):	0.87
Infiltration rate:	1.0 ach
Windows open?	N
Extent opening / opening profile:	n/a
Blinds?	N
Type:	n/a
Opening profile:	n/a
Mechanical vent?	N
Mode:	n/a
Flow rate / operation profile:	n/a

RESULTS

CIBSE TM52 output:

Passed: 0 rooms
Failed: 40 rooms
Unoccupied: 0 rooms

Passed (TM52): 0 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
-	-	-	-	-	-

TM52 OVERHEATING ANALYSIS

Project:	5-8 Nash Terraces
Reference:	F2280
Date:	31 May 2022
Model reference:	F2280TM
Iteration:	101

Assessment: TM52

Description: *Excluding blinds to all windows & doors, all openable windows closed, no aux vent*

Failed (TM52): 40 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
00_05_FRONT ROOM	24.2	45	6	1 & 2 & 3	Fail
00_05_REAR ROOM	31.2	51	7	1 & 2 & 3	Fail
00_06_FRONT ROOM	25.8	46	6	1 & 2 & 3	Fail
00_06_REAR ROOM	33.4	53	7	1 & 2 & 3	Fail
00_07_FRONT ROOM	25.8	46	7	1 & 2 & 3	Fail
00_07_REAR ROOM	27.2	50	6	1 & 2 & 3	Fail
00_08_FRONT ROOM	21	42	6	1 & 2 & 3	Fail
00_08_REAR ROOM	26	49	6	1 & 2 & 3	Fail
01_05_FRONT ROOM	61	81	10	1 & 2 & 3	Fail
01_05_REAR ROOM	66.6	87	10	1 & 2 & 3	Fail
01_06_FRONT ROOM	63.7	83	11	1 & 2 & 3	Fail
01_06_REAR ROOM	65.9	85	10	1 & 2 & 3	Fail
01_07_FRONT ROOM	60.9	82	11	1 & 2 & 3	Fail
01_07_REAR ROOM	63.6	83	10	1 & 2 & 3	Fail
01_08_FRONT ROOM	55.7	79	10	1 & 2 & 3	Fail
01_08_REAR ROOM	54.5	77	9	1 & 2 & 3	Fail
02_05_FRONT ROOM	78	102	13	1 & 2 & 3	Fail
02_05_REAR ROOM 01	80.2	106	12	1 & 2 & 3	Fail
02_05_REAR ROOM 02	63.7	81	9	1 & 2 & 3	Fail
02_06_FRONT ROOM 01	73.8	93	12	1 & 2 & 3	Fail
02_06_FRONT ROOM 02	64.3	87	11	1 & 2 & 3	Fail
02_06_REAR ROOM	80.3	107	12	1 & 2 & 3	Fail
02_07_FRONT ROOM	73.2	97	13	1 & 2 & 3	Fail
02_07_REAR ROOM	77.1	99	11	1 & 2 & 3	Fail
02_08_FRONT ROOM	75.2	100	13	1 & 2 & 3	Fail
02_08_REAR ROOM	65.7	92	11	1 & 2 & 3	Fail
03_05_FRONT ROOM 01	50.4	73	9	1 & 2 & 3	Fail
03_05_FRONT ROOM 02	46.5	72	9	1 & 2 & 3	Fail
03_05_REAR ROOM 01	68.9	91	11	1 & 2 & 3	Fail
03_05_REAR ROOM 02	56.8	79	9	1 & 2 & 3	Fail
03_06_FRONT ROOM 01	50.4	73	9	1 & 2 & 3	Fail
03_06_FRONT ROOM 02	47.5	69	9	1 & 2 & 3	Fail
03_06_REAR ROOM	74.5	97	12	1 & 2 & 3	Fail
03_07_FRONT ROOM 01	60	82	10	1 & 2 & 3	Fail
03_07_FRONT ROOM 02	34.2	58	7	1 & 2 & 3	Fail
03_07_REAR ROOM 01	66.8	88	11	1 & 2 & 3	Fail
03_07_REAR ROOM 02	56.9	77	9	1 & 2 & 3	Fail
03_08_FRONT ROOM 01	47.5	72	9	1 & 2 & 3	Fail
03_08_FRONT ROOM 02	30.8	55	7	1 & 2 & 3	Fail
03_08_REAR ROOM	54.4	78	9	1 & 2 & 3	Fail

Legend

Ta Indoor operative temparature

To Outdoor temperature

TM52 OVERHEATING ANALYSIS

Project:	5-8 Nash Terraces
Reference:	F2280
Date:	31 May 2022
Model reference:	F2280TM
Iteration:	102

Assessment: TM52

Description: *Excluding blinds to all windows & doors, all openable windows open 25% >22 deg.C, no aux vent*

INPUT INFORMATION

Location:	London Heathrow, United Kingdom
Simulation weather file:	London_LHR_DSY1
Building category:	Category III (existing build)
Wall:	1.5 W/m^2K
Roof:	0.41 W/m^2K
Floor:	1.12 W/m^2K
Window (u-value):	5.55 W/m^2K
Window (g-value):	0.87
Infiltration rate:	1.0 ach
Windows open?	Y
Extent opening / opening profile:	Windows open 25% of openable area when Ta > 22°C Windows openable between 0700 to 2200 (ground flr) Windows openable between 0000 to 2400 (upper flrs) Windows will only open when Ta > To
Blinds?	N
Type:	n/a
Opening profile:	n/a
Mechanical vent?	N
Mode:	n/a
Flow rate / operation profile:	n/a

RESULTS

CIBSE TM52 output:

Passed:	0 rooms
Failed:	40 rooms
Unoccupied:	0 rooms

Passed (TM52): 0 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
-	-	-	-	-	-

FLOH

Project: 5-8 Nash Terraces
Reference: F2280
Date: 31 May 2022

Model reference: F2280TM
Iteration: 102

Assessment: TM52
Description: *Excluding blinds to all windows & doors, all openable windows open 25% >22 deg.C,*

Failed (TM52): 40 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
00_05_FRONT ROOM	6.1	24	5	1 & 2 & 3	Fail
00_05_REAR ROOM	12	34	5	1 & 2 & 3	Fail
00_06_FRONT ROOM	5.7	22	4	1 & 2	Fail
00_06_REAR ROOM	11.9	34	5	1 & 2 & 3	Fail
00_07_FRONT ROOM	4.4	22	5	1 & 2 & 3	Fail
00_07_REAR ROOM	8.4	26	4	1 & 2	Fail
00_08_FRONT ROOM	4.2	21	4	1 & 2	Fail
00_08_REAR ROOM	10.9	29	4	1 & 2	Fail
01_05_FRONT ROOM	16.8	41	7	1 & 2 & 3	Fail
01_05_REAR ROOM	25.5	48	7	1 & 2 & 3	Fail
01_06_FRONT ROOM	14.9	36	7	1 & 2 & 3	Fail
01_06_REAR ROOM	22.7	45	6	1 & 2 & 3	Fail
01_07_FRONT ROOM	8.3	31	6	1 & 2 & 3	Fail
01_07_REAR ROOM	20.8	42	6	1 & 2 & 3	Fail
01_08_FRONT ROOM	7	29	5	1 & 2 & 3	Fail
01_08_REAR ROOM	21.2	42	6	1 & 2 & 3	Fail
02_05_FRONT ROOM	27.5	52	9	1 & 2 & 3	Fail
02_05_REAR ROOM 01	28.8	53	7	1 & 2 & 3	Fail
02_05_REAR ROOM 02	33	56	7	1 & 2 & 3	Fail
02_06_FRONT ROOM 01	21.6	44	7	1 & 2 & 3	Fail
02_06_FRONT ROOM 02	9.6	32	6	1 & 2 & 3	Fail
02_06_REAR ROOM	33.2	58	8	1 & 2 & 3	Fail
02_07_FRONT ROOM	10.2	35	6	1 & 2 & 3	Fail
02_07_REAR ROOM	29.5	54	7	1 & 2 & 3	Fail
02_08_FRONT ROOM	11.1	38	6	1 & 2 & 3	Fail
02_08_REAR ROOM	23.5	44	6	1 & 2 & 3	Fail
03_05_FRONT ROOM 01	19.5	48	7	1 & 2 & 3	Fail
03_05_FRONT ROOM 02	18.5	47	7	1 & 2 & 3	Fail
03_05_REAR ROOM 01	39	64	8	1 & 2 & 3	Fail
03_05_REAR ROOM 02	26.7	56	7	1 & 2 & 3	Fail
03_06_FRONT ROOM 01	16.4	42	6	1 & 2 & 3	Fail
03_06_FRONT ROOM 02	11.7	37	6	1 & 2 & 3	Fail
03_06_REAR ROOM	42.7	67	9	1 & 2 & 3	Fail
03_07_FRONT ROOM 01	16.5	39	7	1 & 2 & 3	Fail
03_07_FRONT ROOM 02	7.1	30	4	1 & 2	Fail
03_07_REAR ROOM 01	31.9	55	8	1 & 2 & 3	Fail
03_07_REAR ROOM 02	20.1	46	6	1 & 2 & 3	Fail
03_08_FRONT ROOM 01	7.5	28	5	1 & 2 & 3	Fail
03_08_FRONT ROOM 02	6.2	27	4	1 & 2	Fail
03_08_REAR ROOM	14.6	42	6	1 & 2 & 3	Fail

Legend

Ta Indoor operative temparature
To Outdoor temperature

Project:	5-8 Nash Terraces
Reference:	F2280
Date:	31 May 2022
Model reference:	F2280TM
Iteration:	103

Assessment: TM52

Description: *Excluding blinds to all windows & doors, all openable windows closed, no aux vent, blinds included*

INPUT INFORMATION

Location:	London Heathrow, United Kingdom
Simulation weather file:	London_LHR_DSY1
Building category:	Category III (existing build)
Wall:	1.5 W/m^2K
Roof:	0.41 W/m^2K
Floor:	1.12 W/m^2K
Window (u-value):	5.55 W/m^2K
Window (g-value):	0.87
Infiltration rate:	1.0 ach
Windows open?	N
Extent opening / opening profile:	n/a
Blinds?	Y
Type:	Light coloured roller
Opening profile:	>100 W/m2 Lower blind <50 W/m2 Raise blind
Mechanical vent?	N
Mode:	n/a
Flow rate / operation profile:	n/a

RESULTS

CIBSE TM52 output:	Passed:	0 rooms
	Failed:	40 rooms
	Unoccupied:	0 rooms

Passed (TM52): 0 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
-	-	-	-	-	-

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TM52 OVERHEATING ANALYSIS

Project: 5-8 Nash Terraces
Reference: F2280
Date: 31 May 2022

Model reference: F2280TM
Iteration: 103

Assessment: TM52
Description: *Excluding blinds to all windows & doors, all openable windows closed, no aux vent,*

Failed (TM52): 40 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
00_05_FRONT ROOM	11.4	32	5	1 & 2 & 3	Fail
00_05_REAR ROOM	12.5	34	4	1 & 2	Fail
00_06_FRONT ROOM	10.9	31	5	1 & 2 & 3	Fail
00_06_REAR ROOM	12.2	33	4	1 & 2	Fail
00_07_FRONT ROOM	10.2	30	5	1 & 2 & 3	Fail
00_07_REAR ROOM	10.1	29	4	1 & 2	Fail
00_08_FRONT ROOM	7.7	26	4	1 & 2	Fail
00_08_REAR ROOM	9.5	30	4	1 & 2	Fail
01_05_FRONT ROOM	46.5	66	9	1 & 2 & 3	Fail
01_05_REAR ROOM	46.2	67	8	1 & 2 & 3	Fail
01_06_FRONT ROOM	44.9	63	8	1 & 2 & 3	Fail
01_06_REAR ROOM	42.6	61	7	1 & 2 & 3	Fail
01_07_FRONT ROOM	39	59	8	1 & 2 & 3	Fail
01_07_REAR ROOM	35.4	59	7	1 & 2 & 3	Fail
01_08_FRONT ROOM	31.8	56	8	1 & 2 & 3	Fail
01_08_REAR ROOM	28.8	51	6	1 & 2 & 3	Fail
02_05_FRONT ROOM	67.8	87	11	1 & 2 & 3	Fail
02_05_REAR ROOM 01	63.6	80	9	1 & 2 & 3	Fail
02_05_REAR ROOM 02	44.8	62	7	1 & 2 & 3	Fail
02_06_FRONT ROOM 01	59.1	77	10	1 & 2 & 3	Fail
02_06_FRONT ROOM 02	43.3	64	8	1 & 2 & 3	Fail
02_06_REAR ROOM	64.9	81	10	1 & 2 & 3	Fail
02_07_FRONT ROOM	55.8	76	10	1 & 2 & 3	Fail
02_07_REAR ROOM	56.9	73	9	1 & 2 & 3	Fail
02_08_FRONT ROOM	52.9	73	10	1 & 2 & 3	Fail
02_08_REAR ROOM	40.5	66	8	1 & 2 & 3	Fail
03_05_FRONT ROOM 01	38.6	63	8	1 & 2 & 3	Fail
03_05_FRONT ROOM 02	35.8	63	8	1 & 2 & 3	Fail
03_05_REAR ROOM 01	55.5	77	9	1 & 2 & 3	Fail
03_05_REAR ROOM 02	40.7	67	8	1 & 2 & 3	Fail
03_06_FRONT ROOM 01	35.8	57	7	1 & 2 & 3	Fail
03_06_FRONT ROOM 02	31.3	56	7	1 & 2 & 3	Fail
03_06_REAR ROOM	60.8	80	10	1 & 2 & 3	Fail
03_07_FRONT ROOM 01	43.6	66	9	1 & 2 & 3	Fail
03_07_FRONT ROOM 02	19.3	44	6	1 & 2 & 3	Fail
03_07_REAR ROOM 01	49.7	70	9	1 & 2 & 3	Fail
03_07_REAR ROOM 02	34.2	58	7	1 & 2 & 3	Fail
03_08_FRONT ROOM 01	29.2	55	7	1 & 2 & 3	Fail
03_08_FRONT ROOM 02	17.6	40	5	1 & 2 & 3	Fail
03_08_REAR ROOM	32.9	59	7	1 & 2 & 3	Fail

<u>Legend</u>

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TM52 OVERHEATING ANALYSIS

Project:	5-8 Nash Terraces
Reference:	F2280
Date:	31 May 2022
Model reference:	F2280TM
Iteration:	104

Assessment: TM52

Description: *Excluding blinds to all windows & doors, all openable windows closed, no aux vent, blinds included, LED lighting*

INPUT INFORMATION

Location:	London Heathrow, United Kingdom	
Simulation weather file:	London_LHR_DSY1	
Building category:	Category III (existing build)	
Wall:	1.5	W/m^2K
Roof:	0.41	W/m^2K
Floor:	1.12	W/m^2K
Window (u-value):	5.55	W/m^2K
Window (g-value):	0.87	
Infiltration rate:	1.0	ach
Windows open?	N	
Extent opening / opening profile:	n/a	
Blinds?	Y	
Type:	Light coloured roller	
Opening profile:	>100 W/m2 Lower blind	
	<50 W/m2 Raise blind	
Mechanical vent?	N	
Mode:	n/a	
Flow rate / operation profile:	n/a	

RESULTS

CIBSE TM52 output:	Passed:	0 rooms
	Failed:	40 rooms
	Unoccupied:	0 rooms

Passed (TM52): 0 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
-	-	-	-	-	-

TM52 OVERHEATING ANALYSIS

Project:	5-8 Nash Terraces
Reference:	F2280
Date:	31 May 2022
Model reference:	F2280TM
Iteration:	104

Assessment: TM52

Description: *Excluding blinds to all windows & doors, all openable windows closed, no aux vent,*

Failed (TM52): 40 rooms

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	CIBSE TM52 criteria failing	CIBSE TM52 status
00_05_FRONT ROOM	6.4	24	4	1 & 2	Fail
00_05_REAR ROOM	8.2	26	4	1 & 2	Fail
00_06_FRONT ROOM	6.2	22	4	1 & 2	Fail
00_06_REAR ROOM	8.1	25	4	1 & 2	Fail
00_07_FRONT ROOM	6.1	23	4	1 & 2	Fail
00_07_REAR ROOM	5.7	23	3	1 & 2	Fail
00_08_FRONT ROOM	5.1	21	4	1 & 2	Fail
00_08_REAR ROOM	6.2	23	3	1 & 2	Fail
01_05_FRONT ROOM	32.7	55	8	1 & 2 & 3	Fail
01_05_REAR ROOM	32.9	56	7	1 & 2 & 3	Fail
01_06_FRONT ROOM	31.4	52	7	1 & 2 & 3	Fail
01_06_REAR ROOM	30.4	52	6	1 & 2 & 3	Fail
01_07_FRONT ROOM	28.3	49	7	1 & 2 & 3	Fail
01_07_REAR ROOM	25.6	49	6	1 & 2 & 3	Fail
01_08_FRONT ROOM	23.6	48	7	1 & 2 & 3	Fail
01_08_REAR ROOM	20.3	43	5	1 & 2 & 3	Fail
02_05_FRONT ROOM	55.2	73	10	1 & 2 & 3	Fail
02_05_REAR ROOM 01	50.5	70	8	1 & 2 & 3	Fail
02_05_REAR ROOM 02	29.2	52	6	1 & 2 & 3	Fail
02_06_FRONT ROOM 01	45.6	64	8	1 & 2 & 3	Fail
02_06_FRONT ROOM 02	31.5	54	7	1 & 2 & 3	Fail
02_06_REAR ROOM	52.6	70	8	1 & 2 & 3	Fail
02_07_FRONT ROOM	43.3	64	9	1 & 2 & 3	Fail
02_07_REAR ROOM	42.4	62	7	1 & 2 & 3	Fail
02_08_FRONT ROOM	43.1	66	9	1 & 2 & 3	Fail
02_08_REAR ROOM	32.1	59	7	1 & 2 & 3	Fail
03_05_FRONT ROOM 01	26.1	52	7	1 & 2 & 3	Fail
03_05_FRONT ROOM 02	24	52	7	1 & 2 & 3	Fail
03_05_REAR ROOM 01	41.3	66	8	1 & 2 & 3	Fail
03_05_REAR ROOM 02	28.6	58	7	1 & 2 & 3	Fail
03_06_FRONT ROOM 01	24.3	48	6	1 & 2 & 3	Fail
03_06_FRONT ROOM 02	20.3	46	6	1 & 2 & 3	Fail
03_06_REAR ROOM	48.8	69	9	1 & 2 & 3	Fail
03_07_FRONT ROOM 01	31.5	55	7	1 & 2 & 3	Fail
03_07_FRONT ROOM 02	11.7	34	5	1 & 2 & 3	Fail
03_07_REAR ROOM 01	36.1	60	8	1 & 2 & 3	Fail
03_07_REAR ROOM 02	22.1	49	6	1 & 2 & 3	Fail
03_08_FRONT ROOM 01	22.3	47	6	1 & 2 & 3	Fail
03_08_FRONT ROOM 02	10.4	34	5	1 & 2 & 3	Fail
03_08_REAR ROOM	27.2	50	6	1 & 2 & 3	Fail

<u>Legend</u>

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