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Thames Young Mariners

Overheating Assessment Report

12 October 2022

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1. Introduction

This report summarises the results of the CIBSE TM52 overheating analysis for the RIBA Stage 3 design for the Thames Young Mariners Development, located in Richmond, United Kingdom.

1.1. Project Description

Thames Young Mariners is an outdoor learning and development centre, which consists of a Main building, three residential blocks and a camping changing block, designed for a total occupancy of 240 people.

1.1.1. Main Building

Lower Ground Plan The lower ground floor maintains the relationship to the water's edge via the slipway of the existing development, comprising changing and drying facilities for water-based activities. Changing facilities are designed to provide flexibility and diversity in use by a variety of user groups, integrating accessible facilities for independent or inclusive use. Existing storage located adjacent to the building is to be transferred to the proposed floating pontoons indicated on the plan. These combine access to the water with storage with boats and equipment to support the multiple water-based activities

First Floor Plan These proposals show the relocated staff residential accommodation at first floor level. The scale of provision has been reviewed with SOLD to optimise the amount of accommodation and include overnight surveillance of the site, which is an important security measure necessary due to the equipment stored within the site. Access to this accommodation is distinct from the general use at upper ground floor level. To achieve the energy efficiency targets for this scheme, a plantroom is included at this level for the primary energy generation plant that serves this building and the adjacent Guest Residential Blocks. Air source heat pumps (ASHPs) will be located here, with heat rejection equipment positioned externally on the flat roof above the kitchen and changing areas

1.1.2. Guest Residential Blocks

The three Guest Residential Blocks are additional to the existing development and represent an important part of the long-term viability. These will enable school groups to extend their stay on the site to multiple days and fully experience what is on offer. A standard design for each block is proposed to enable application of offsite modular construction. The layout is organised around a central corridor with four bed dormitories sharing ensuite shower facilities. Additional guardian bedrooms are necessary for appropriate safeguarding of each group of children. The number of bedrooms is based on school group size. As for the changing facilities, our approach has been to integrate accessible sleeping provision alongside standard bedrooms so that groups can be fully inclusive. A small flexible room is included in each building for the school group to socialize and gather before and after activities.

1.1.3. Camping Changing Block

The proposed camping changing block is a new provision on site and will serve as a dedicated facility to camping guests throughout their stay at TYM. This accommodation is located adjacent to the camping area, providing improved access and provision and improving the overall operation of the site by providing discrete accommodation for different user groups.

The proposed site layout is shown in Figure 1-1 - Site Plan below.

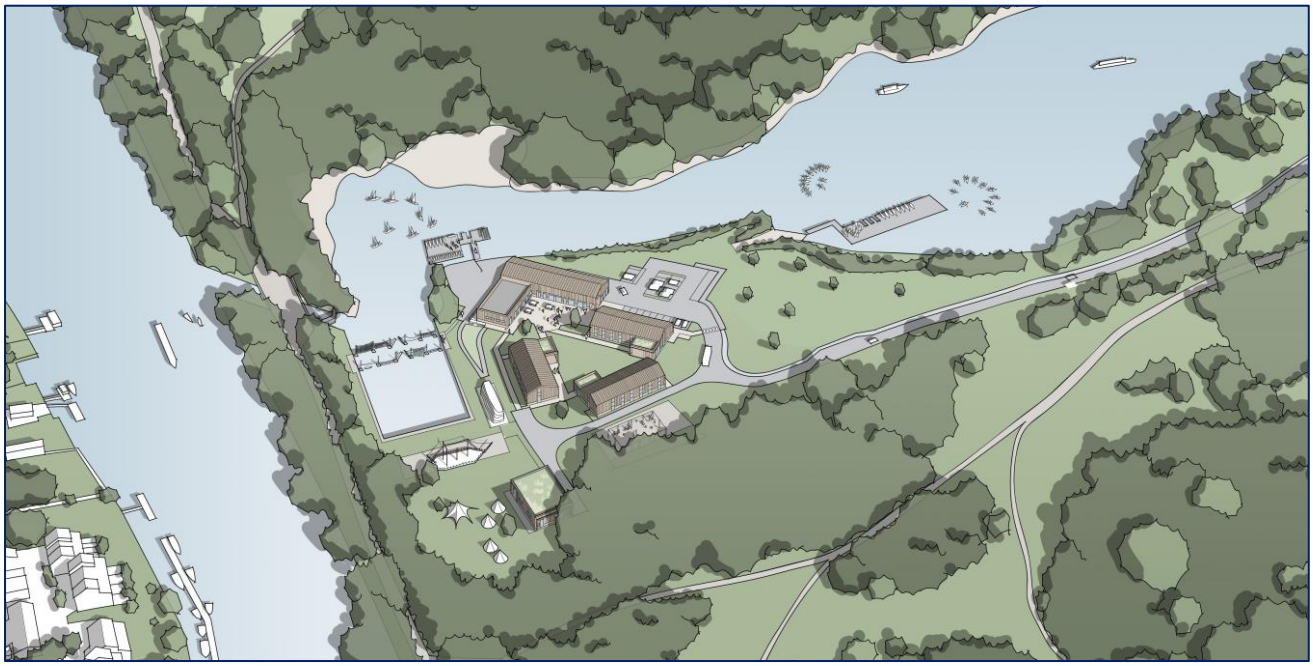

Figure 1-1 - Site Plan

2. Methodology

The development is assessed against the requirements of CIBSE TM52(2013). The overheating criteria as defined by CIBSE TM52 is as follows;

Table 2-1 - CIBSE TM52 (2013) Overheating Criteria

Criterion	Description
Criterion 1 – Hours of Exceedance	The number of hours during which Delta T ≥ 1 K during the period May to Sep inclusive shall be ≤ 3% of occupied hours
Criterion 2 – Daily Weighted Exceedance	Weighted exceedance ≤ 6 in any one day
Criterion 3 – Upper limit temperature	Delta T ≤ 4 K

TM52 requires compliance with 2 out of 3 criteria for the room to pass the overheating requirements.

The analysis is carried out using a Dynamic Simulation Model, built in IES-Virtual Environment 2022, a CIBSE AM11 compliant software. Thermal inputs such as fabric information, thermal templates and weather information are then fed into the model and is analysed using the ApacheSim Dynamic Simulation.

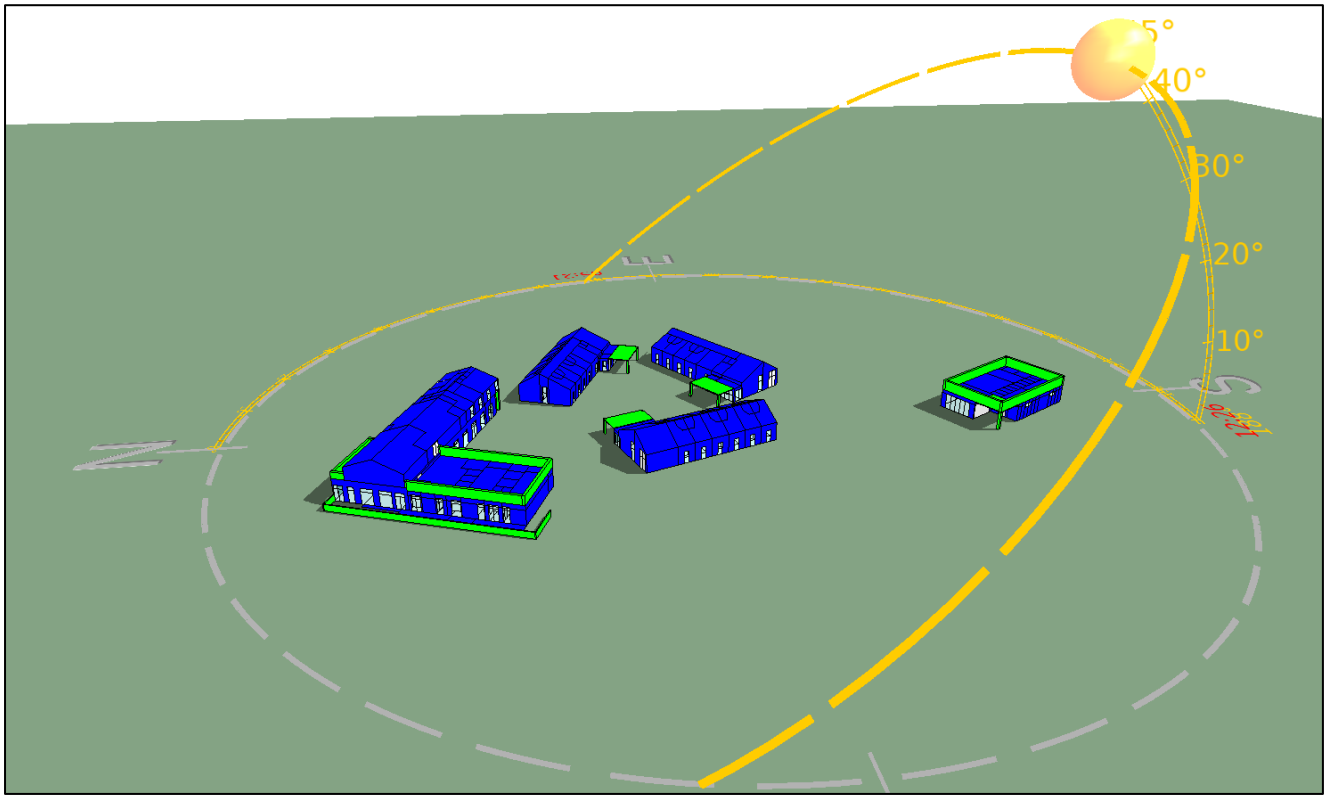

Figure 2-1 - Thames Young Mariners Energy Model

The building geometry is based on the layouts and elevations generated from a Revit model.

The building is to be ventilated by natural ventilation via the use of openable windows. The opening profile and degree of opening are modelled in MacroFlo. This allows the dynamic simulation to account for wind driven cooling, further mitigating the risk of overheating.

2.1. Disclaimer

Computer building simulation provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guarantee or warrantee of building performance in practice can be based on simulation results alone.

2.2. Weather file and Location

The weather file used in the IES analysis is the CIBSE Design Summer Year (DSY) weather file for London Heathrow i.e., London LHR_2020_DSY1. This weather file was used as based on project proximity.

2.3. Fabric U values

The fabric U values for the proposed development is as given below:

Element	**U-Values (W/m^{2}K)**
External Wall	0.13
Roof	0.10
Ground Floor	0.08
Windows (G value)	1.00 (0.4)
External Doors	1.00
Air Permeability	1 m^3/h.m^2 at 50 Pa

2.4. Thermal Templates

In IES, the internal gains, namely lighting, occupancy and equipment gains, are defined and assigned to the respective rooms via thermal templates. The lighting and equipment gains have been assumed for the project while occupancy has been referenced from the occupancy schedule shared by Pick Everard. A summary of the same is given below.

Table 2-2 - Internal Gains

Room Type	Lighting Gain (W/m^2)	Occupancy (No.)	Equipment (W/m^2)
Residential Blocks			
Dormitories	8	4	3
Social & Learning	12	38	10
Camping Block			
Classroom/Social	8	38	10
Main Building			
Main Hall	12	120	10
General Office	10	5	15
Flexible Meeting/Learning Room	10	38	5
Office	10	2	15
Catering Office	10	1	15
Bedroom	8	2	3
Living Area	10	5	5

2.5. Windows

Window settings have been applied using the IES MacroFlo module. The contribution of internal doors has not been taken into account, which is deemed to be conservative. The elevation drawings were used to determine the locations of the openings. A formula-based profile has been used to model the windows so that they open when outdoor air temperature is lower than the room air temperature or when the CO_2 levels within the room goes beyond 750 ppm.

The window openings for the residential blocks have been determined based on 100 mm restrictor for the windows, whereas for the residential spaces in the Main Block, the openings had to be increased to provide a free area, 30% of gross, to meet the TM52 requirements.

3. Results

The dynamic thermal modelling results have been used to assess the overheating risks of each modelled room between May to September. These results are output on an hourly basis for the simulation year and have been processed to determine whether compliance has been met against the criteria's set. As stated above, the rooms failing to meet at least 2 criteria set by TM52 are said to be at risk of overheating. The summary of the overheating results are shown in the table below.

Table 3-1 - TM52 results summary

Room Type	TM52 Result
Residential Blocks	
Dormitories	PASS
Social & Learning	FAIL
Camping Block	
Classroom/Social	FAIL
Main Building	
Main Hall	FAIL
General Office	FAIL
Flexible Meeting/Learning Room	FAIL
Office	FAIL
Catering Office	FAIL
Bedroom	PASS
Living Area	PASS
Kitchen & Servery	FAIL
Visitors Waiting & Entrance Lobby	PASS

Detailed results are available in Appendix A.

From the results, it can be concluded that the Social and Learning Spaces, Office spaces and the Kitchen are failing to meet the requirements of TM52, despite multiple optimistic assumptions and hence are under risk of overheating. Therefore, sufficient mechanical cooling or ventilation is to be provided to these spaces for thermal comfort.

Appendices

Appendix A.

A.1. TM 52 Overheating Results

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Pass/Fail
FF_017n Overnight Bedroom	71.9	2.5	10	2	2	PASS
FF_017o Bed 01	71.9	2.8	10	2	2	PASS
FF_017p Bed 01	71.9	2.7	8	2	2	PASS
FF_017q Bed 03 (Acc.)	71.9	0.5	3	1	-	PASS
FF_017v Living Area	71.9	2.3	6	2	-	PASS
GF_002 Visitors Waiting & Entrance Lobby	71.9	1.4	3	2	-	PASS
RB1_004 Guardian Dormitory	71.9	0.4	2	1	-	PASS
RB1_005 Dormitory	71.9	0.4	2	1	-	PASS
RB1_006 Dormitory	71.9	0.4	2	1	-	PASS
RB1_007 Dormitory	71.9	0	0	0	-	PASS
RB1_008 Guardian Dormitory	71.9	0	0	0	-	PASS
RB1_009 Dormitory	71.9	0.1	1	1	-	PASS
RB1_010 Dormitory	71.9	0.1	1	1	-	PASS
RB1_011 Dormitory	71.9	0.1	1	1	-	PASS
RB1_012 Dormitory	71.9	0.1	1	1	-	PASS
RB1_013 Guardian Dormitory	71.9	0	0	0	-	PASS
RB2_003 Acc Dormitory	71.9	0	0	0	-	PASS
RB2_004 Guardian Dormitory	71.9	0.2	2	1	-	PASS
RB2_005 Dormitory	71.9	0.2	2	1	-	PASS
RB2_006 Dormitory	71.9	0.1	1	1	-	PASS
RB2_007 Dormitory	71.9	0	0	0	-	PASS
RB2_008 Guardian Dormitory	71.9	0.1	1	1	-	PASS
RB2_009 Dormitory	71.9	0.5	2	1	-	PASS
RB2_010 Dormitory	71.9	0.5	3	1	-	PASS
RB2_011 Dormitory	71.9	0.5	3	1	-	PASS

RB2_012 Dormitory	71.9	0.5	2	1	-	PASS
RB2_013 Guardian Dormitory	71.9	0.1	1	1	-	PASS
RB3_003 Acc Dormitory	71.9	2.4	10	1	2	PASS
RB3_004 Guardian Dormitory	71.9	2.1	10	1	2	PASS
RB3_005 Dormitory	71.9	1.7	8	1	2	PASS
RB3_006 Dormitory	71.9	1.5	7	1	2	PASS
RB3_007 Dormitory	71.9	0.4	2	1	-	PASS
RB3_008 Guardian Dormitory	71.9	0.5	3	1	-	PASS
RB3_009 Dormitory	71.9	1.7	8	1	2	PASS
RB3_010 Dormitory	71.9	2	10	1	2	PASS
RB3_011 Dormitory	71.9	2	10	1	2	PASS
RB3_012 Dormitory	71.9	1.8	8	1	2	PASS
RB3_013 Guardian Dormitory	71.9	0.8	3	1	-	PASS
CB_018 Classroom / Social	71.9	100	192	26	1 & 2 & 3	FAIL
GF_005 General Office	71.9	26.8	29	4	1 & 2	FAIL
GF_008 First Aid	71.9	92.5	65	9	1 & 2 & 3	FAIL
GF_010 Flexible Meeting/Learning Room	71.9	97.9	103	13	1 & 2 & 3	FAIL
GF_012 Office	71.9	96.6	89	11	1 & 2 & 3	FAIL
GF_018 Main Hall	71.9	99.3	165	15	1 & 2 & 3	FAIL
GF_019 Kitchen + Servery	71.9	99.9	213	19	1 & 2 & 3	FAIL
GF_019g Catering Office	71.9	99.8	137	17	1 & 2 & 3	FAIL
RB1_002 Social & Learning	71.9	26.6	26	5	1 & 2 & 3	FAIL
RB2_002 Social & Learning	71.9	21.6	30	6	1 & 2 & 3	FAIL
RB3_002 Social & Learning	71.9	72.2	46	7	1 & 2 & 3	FAIL

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