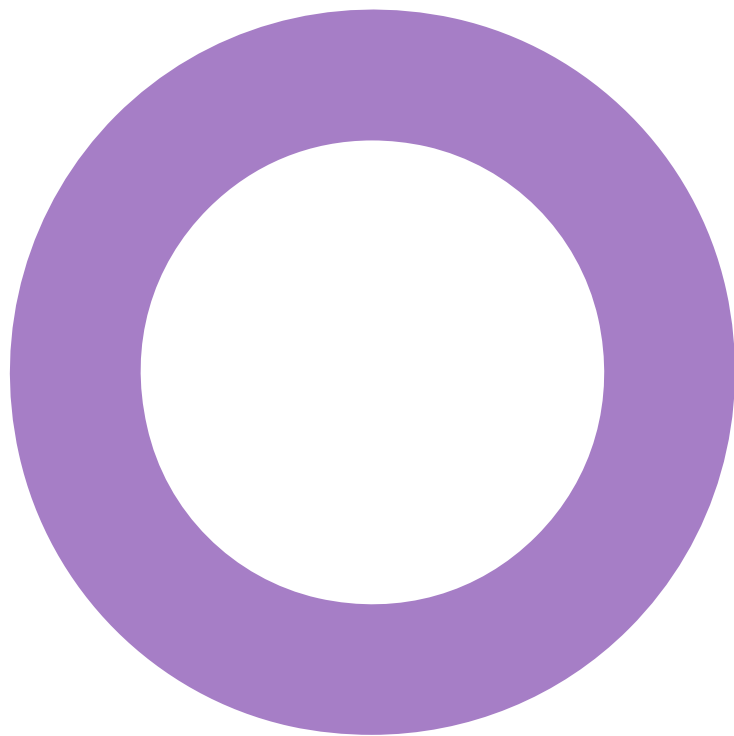


**Stag Brewery.**  
**London.**  
**Reselton Properties Limited.**

**SUSTAINABILITY**

OVERHEATING RISK ASSESSMENT - SCHOOL  
BB101 AND CIBSE GUIDE A  
REVISION 05 - 24 JANUARY 2023



## Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	28/07/2022	For issue	E. Jolly	A. Cane	G. Jones
02	18/08/2022	Updated following discussions with the design team.	E. Jolly	T. Brown	G. Jones
03	18/08/2022	Updated following comments from GE.	E. Jolly	T. Brown	G. Jones
04	23/01/2023	Updated following additional iterations of analysis for discussion with project team.	O. Bialas	E. Jolly	G. Jones
05	24/01/2023	For issue to LBRuT.	O. Bialas	E. Jolly	G. Jones

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Project number: 23/10513

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## Executive summary.

This note summarises the results of an analysis of overheating risk of the proposed Secondary School with 6<sup>th</sup> Form scheme at Former Stag Brewery masterplan in London.

This analysis evaluates the impact of room occupancy, orientation, room size, glazing ratio, internal fit-out and ventilation strategy on indoor thermal comfort. This has been carried out in accordance with BB101 (2018) - Ventilation of School Buildings, for areas that are naturally ventilated and CIBSE Guide A - Environmental Design for rooms that are mechanically ventilated. A dedicated thermal model has been used to assess the proposed building against the standard criteria.

### Analysis iterations.

An initial assessment was undertaken on the School in August 2022 (Baseline) which demonstrated that the occupied rooms were at risk of overheating based on the current design. The following iterations have been undertaken, as agreed with the client, to consider potential design measures to mitigate overheating risk:

1. Glazing g-value reduced to 0.20 (previously 0.30)
2. Mechanically ventilated rooms only – Mechanical ventilation increased by 50%
3. Introduce external shading to South (450mm deep horizontal overhangs) and East/West facing (450mm vertical fins at 900mm centre) facades.
4. Increased natural ventilation rate by introduction of an inward opening ventilation panel with external screen (currently bottom hung windows with 100-200mm restrictors. This is to replace the spandrel panel currently located below the glazed windows. U-values to match current spandrel panel performance.
5. Reduced glazing area by 30%.
6. Mechanically ventilated rooms only – Increased ventilation rate to 3 air changes per hour (ach).

### Summary of results.

There are two assessment criteria which has been followed dependant on the ventilation strategy for the room:

- BB101 (2018): Ventilation of School Buildings – Applied where the room is predominantly naturally ventilated. The assessment considers three criteria; however Criterion 1 is the only mandatory requirement to demonstrate the requirement has been met.
- CIBSE Guide A: Environmental Design – Applied where the room is predominantly mechanically ventilated. This assessment considers thermal comfort it both winter and summer. For the purpose of this assessment, in line with the planning policy, only the summer months have been considered and presented.

For all iterations, the model has been assessed using DSY1\_2020 weather file.

A summary of the results for each assessment type is shown in Table 1 and Table 2 for naturally and mechanically ventilated spaces respectively.

### Naturally ventilated rooms

Table 1: Results summary – BB101.

Iteration	Assessment criteria	No. occupied rooms	No. rooms meet criteria	
Baseline	BB101 – Criterion 1	62	32	52%
Iteration 1			34	55%
Iteration 3			32	52%
Iteration 4			53	85%
Iteration 5			32	52%
Combination (1 & 4)			62	100%

As seen above, where rooms are naturally ventilated, we can see that with exception to Iteration 4, in isolation the proposed measures demonstrate little to no improvement compared to the baseline model. However, Iteration 4 (increased ventilation rate) demonstrates that 85% of the assessed rooms can demonstrate that overheating risk can be mitigated. To demonstrate compliance with BB101 in full, all relevant assessed spaced must meet the design criteria for Criterion 1.

An additional iteration was undertaken which **combined the measures proposed in Iteration 1 (reduced g-value) and Iteration 4 (increased ventilation rates)**. As shown above, this resulted in **all assessed rooms meeting Criterion 1 of BB101**. Furthermore, as these measures do not require fundamental changes to the aesthetic of the building, they should not trigger the need for material amendments for planning permission.

It is therefore recommended that the proposed combination of measures are reviewed by the project team to confirm they can be adopted into the detailed design.

### Mechanically ventilated rooms

Table 2: Results summary – CIBSE Guide A.

Iteration	Assessment criteria	No. occupied rooms	No. rooms meet criteria	
Baseline	CIBSE Guide A (Summer only)	37	3	8%
Iteration 2			3	8%
Iteration 6			37	100%

As seen above, the initial measure of increased ventilation rates by 50% did not demonstrate any further mitigation that the baseline proposed. However, when the **mechanical ventilation rate was increased further to 3ACH, all assessed rooms were able to meet the CIBSE Guide A criteria for the summer months**.

Please see Section 2 of this results for detail of inputs used within the model.

## 1. Introduction.

### 1.1 Background.

This report provides a summary of the BB101 (2018) assessment undertaken for the proposed School that will be developed as part of the Former Stag Brewery masterplan in London. A thermal model has been built in accordance with the information issued by the architect, Squire & Partners. Figure 1 shows the 3D model created within the assessment software, based on the proposed geometry.

It should be noted that whilst industry guidance has been followed, results in practice are likely to be dependent on factors which are highly user dependent, such as occupancy levels, internal gains from equipment and user behaviour such as operation of windows.

### 1.2 Scope of work.

Hoare Lea has been appointed to undertake an assessment to assess the risk of overheating for the teaching areas for the proposed development. This has been carried out in accordance with BB101 (2018) - Ventilation of School Buildings. A dedicated thermal model has been used to assess the proposed building against the standard criteria.

#### Site description

Application 22/0902/FULL submitted on 11<sup>th</sup> March 2022 seeks planning permission for the erection of a three-storey building to provide a new secondary school with sixth form; sports pitch with floodlighting, external MUGA and play space; and associated external works including landscaping, car and cycle parking, new access routes and other associated works

#### London Plan (2021) Policy S14 – Managing heat risk

This assessment seeks to respond to the adopted London Plan (2021) policy S14 – Mitigating heat risk:

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

*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:*

7. *Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure*
8. *Minimise internal heat generation through energy efficient design*
9. *Manage the heat within the building through exposed internal thermal mass and high ceilings*
10. *Provide passive ventilation*
11. *Provide mechanical ventilation*
12. *Provide active cooling systems.*

#### BB101 Comfort Criteria

BB101: 2018 version Comfort Criteria for classroom and teaching spaces has been used. BB101 thermal comfort requirements broadly follow the criteria defined by CIBSE TM52. This approach considers human adaptation to changing environmental conditions, instead of a fixed temperature limit the maximum acceptable temperature is based upon a running mean of previous weather. Therefore, the limiting comfort temperature is dependent upon the building location and the time of year. However, unlike TM52 which requires at least 2 of 3 overheating criteria to be achieved, BB101 requires Criterion 1 to be met, with the other two criteria reported for information. The three criteria are defined as follows:

#### Criterion 1: Total hours of exceedance ( $H_e$ )

For schools, the number of hours ( $H_e$ ) that  $\Delta T$  is greater than or equal to one degree (K) during the period 1<sup>st</sup> May – 30<sup>th</sup> September (ignoring school holidays) for the defined hours (09:00-16:00 with lunch break at 12:00-13:00 Monday to Friday) shall not exceed 40 hours.

Where sports halls are used for exam purposes, the duration for this activity shall be taken as weekdays 09:00-16:00 from 1<sup>st</sup> May – 8<sup>th</sup> July with a lunch break of 12:00-13:00. The criterion should be calculated for this period with the number of hours reduced from 40 to 18 hours.

#### Criterion 2: Daily weighted exceedance ( $W_e$ )

To allow for the severity of overheating, the weighed exceedance ( $W_e$ ) shall be less than or equal to 6 in any one day.

Where  $W_e = \sum h_e \times wf = (h_{e0} \times 0) + (h_{e1} \times 1) + (h_{e2} \times 2) + (h_{e3} \times 3)$

- $wf = 0$  if  $\Delta T < 0$ , otherwise  $wf = \Delta T$
- $h_{ey}$  = time in hours where  $wf=y$ .

#### Criterion 3: Upper limit temperature ( $T_{upp}$ )

To set an absolute maximum value for the indoor operative temperature the value of  $\Delta T$  shall not exceed 4°C.

#### Weather data

This assessment methodology prescribes the use of the appropriate CIBSE Design Summer Year 1 2020, 50th percentile weather file for the location. The most appropriate weather file for the location of the Former Stag Brewery by proximity to the site is London Heathrow and has been used throughout this analysis.

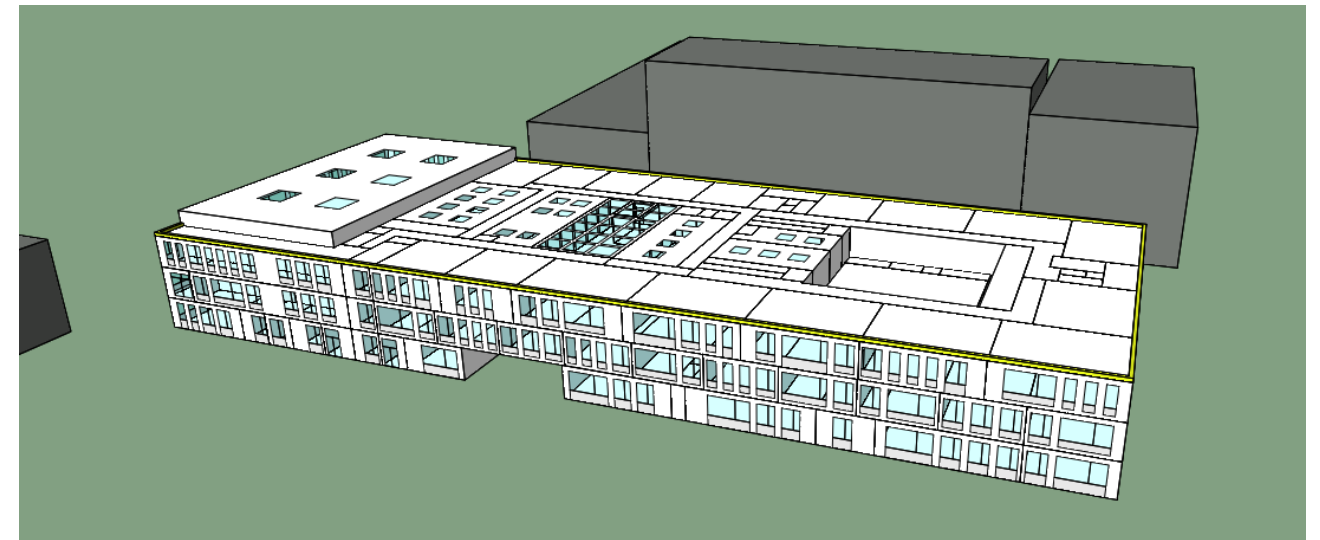


Figure 1: 3D model used within IES VE for analysis.

## 2. Geometry and modelling inputs.

### 2.1 Geometry modelling.

The geometry has been built based on drawings which have been issued by Squires & Partners.

### 2.2 Model inputs

The following tables summarise the parameters used in this initial overheating analysis.

Table 3: Model input parameters.

Model Parameter	Details
Exposed Floor U-value (W/m <sup>2</sup> K)	0.20
Spandrel panel U-value (W/m <sup>2</sup> K)	0.22
External Wall U-value (W/m <sup>2</sup> K)	0.20
Roof U-value (W/m <sup>2</sup> K)	0.20
Glazing U-value (W/m <sup>2</sup> K)	1.60
Glazing g-value	30%
Rooflight U-value* (W/m <sup>2</sup> K)	2.30 (g value: 55%)
Air Permeability (m <sup>3</sup> /h.m <sup>2</sup> ) @ 50Pa	5.00
Simulation Weather Data	CIBSE Design Summer Year (DSY) 1 (50 <sup>th</sup> percentile) 2020

Table 4: Summary of room heat gains – occupied zones.

Area	Max Occupancy	Lighting (W/m <sup>2</sup> )	Equipment (W/m <sup>2</sup> )	Ventilation
Teaching spaces - small	2	7.2	5	12 l/s/person
Teaching spaces - medium	8	7.2	5	12 l/s/person
Teaching spaces - large	20	7.2	5	12 l/s/person
Small group rooms	3	7.2	5	12 l/s/person
Main Hall	80	7.2	5	2.5 ach
6 <sup>th</sup> Form Social	20	7.2	5	12 l/s/person
Offices / admin	4.5 m <sup>2</sup> /person	7.2	15	12 l/s/person
Group rooms	3	7.2	5	12 l/s/person
Circulation	Transient	7.2	0	None
WCs, showers & hygiene rooms	Transient	7.2	0	Extract: 10 ach
Stores	Transient	7.2	0	10 ach (cleaners & medical)
Food preparation	5	7.2	25	12 l/s/person

Table 5: Occupancy gains as per BB101 2018 guidance.

Gain	Maximum sensible Gain (W/person)	Maximum Latent Gain (W/person)
Occupancy	70	55

### 3. Conclusion.

This report provides a summary of the overheating risk assessment undertaken for the proposed school being developed as part of the Former Stag Brewery masterplan.

A dedicated thermal model has been built in accordance with the information issued by the architect, Squire and Partners, and used to assess the proposed building against the overheating risk during occupied hours. The results discussed in the main body of this report respond to the 2018 criteria.

The analysis has been carried out in accordance with the respective standards and all the assumptions listed in this report and related appendices.

It should be noted that whilst industry guidance has been followed, results in practice are likely to be dependent on factors which are highly user dependent, such as occupancy levels, internal heat gains from equipment and user behaviour such as operation of windows.

#### Summary of findings

The assessment has been undertaken using approved IES software which is an approved AM11 software.

- Spaces within the proposed school were assessed against thermal comfort criteria: BB101 for adaptive thermal comfort (naturally ventilated spaces) and CIBSE Guide A for fixed thermal comfort (air conditioned or predominantly mechanically ventilated spaces)
- Existing design strategy have been re-modelled and tested with the internal blinds to assess the scale of the overheating issue and to determine its primary cause and frequency.
- Number of proposed solutions were added to thermal model to evaluate impact of particular changes on the efficiency of overheating mitigation strategy.
- Analysis of the dynamic thermal model determined that the school building is experiencing summer time overheating (with highest number of overheating hours concentrated in June and July), and primary factor for heat build up in the spaces is occupancy of the rooms and solar gains.
- From the results summary presented in this design note it is visible that mechanically ventilated spaces (assessed against Guide A), will likely overheat in summer, and due to the fixed predicted occupancy additional auxiliary ventilation or air-conditioning system should be incorporated to provide comfortable environment.
- Number of initial overheating mitigation strategies have been simulated and from the results for predominantly naturally ventilated spaces (BB101) it is visible that the best results have been achieved by Iteration 4 (incorporation of cross-vent and higher natural ventilation), followed by Iteration 1 (reduced glazing g-value). Although those options do not provide full compliance with criteria 1 of BB101, they proved to be more efficient than others.
- A combination of measures are required to meet compliance in all measures.
- For areas that are internal and mechanically ventilated, when the ventilation rate is increased to 3ACH, all assessed rooms can demonstrate that the criteria for CIBSE Guide A can be met for the summer months.

## Appendix A - Detailed results.

### Natural ventilation – BB101.

#### Baseline model

Table 6: Modelling Results – BB101 – Baseline.

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
1	00-Graphics	35	MET
2	00-Head Office	36	MET
3	00-General Office	96	-
4	00-Office-premises	5	MET
5	00-Conference	36	MET
6	00-Large GRP RM	15	MET
7	00-SEN CO	18	MET
8	00-Resistant MAT 1	10	MET
9	00-Textiles	12	MET
10	00-Head PA	18	MET
11	00-ART 2	11	MET
12	00-ART 3D	11	MET
13	00-ART 1 - SMALL	9	MET
14	00-Server	0	MET
15	00-Small GRP Rm 01	21	MET
16	00-Small GRP Rm 02	22	MET
17	00-Small GRP Rm 03	12	MET
18	00-ICT RICH 1	0	MET
19	00-ICT RICH 2	0	MET
20	00-Music 2	10	MET
21	00-Music 1	18	MET
22	00-Resistant MAT 2	12	MET
23	00-Staff Rm	32	MET
24	00-SEN Resource	15	MET
25	01-Humanities 5	57	-
26	01-Humanities 4	45	-
27	01-English SWR	31	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
28	01-Office / Meeting 02	56	-
29	01-ICT / Business 2	0	MET
30	01-ICT / Business 1	0	MET
31	01-Maths 6	76	-
32	01-Maths 7	121	-
33	01-Maths 8	102	-
34	01-Humanities 1	81	-
35	01-Humanities 2	63	-
36	02-MFL 5	69	-
37	02-6th Form Social	167	-
38	02-ICT / Business 5	0	MET
39	02-Seminar	78	-
40	01-Activity Studio	118	-
41	01-English 1	57	-
42	01-English 2	67	-
43	01-English 3	52	-
44	01-English 4	76	-
45	01-English 5	52	-
46	01-English 6	56	-
47	01-English 7	74	-
48	01-English 8	69	-
49	01-Maths 1	37	MET
50	01-Maths 2	29	MET
51	01-Maths 3	50	-
52	01-Maths 4	61	-
53	01-Maths 5	98	-
54	01-Humanities 3	36	MET
55	02-6th Form Study	78	-
56	02-MFL 1	77	-
57	02-MFL 2	77	-
58	02-MFL 3	111	-



ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ C$ )	
		Max: 40	
59	02-MFL 4	92	-
60	02-MFL SWR	129	-
61	02-ICT / Business 4	0	MET
62	02-ICT / Business 3	0	MET

**Iteration 1 - Reduced g-value to 0.20**

Table 7: Modelling Results - BB101 - Iteration 1.

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ C$ )	
		Max: 40	
1	00-Graphics	25	MET
2	00-Head Office	18	MET
3	00-General Office	69	-
4	00-Office-premises	5	MET
5	00-Conference	24	MET
6	00-Large GRP RM	12	MET
7	00-SEN CO	15	MET
8	00-Resistant MAT 1	7	MET
9	00-Textiles	9	MET
10	00-Head PA	8	MET
11	00-ART 2	8	MET
12	00-ART 3D	6	MET
13	00-ART 1 - SMALL	6	MET
14	00-Server	0	MET
15	00-Small GRP Rm 01	20	MET
16	00-Small GRP Rm 02	19	MET
17	00-Small GRP Rm 03	9	MET
18	00-ICT RICH 1	0	MET
19	00-ICT RICH 2	0	MET
20	00-Music 2	8	MET
21	00-Music 1	14	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ C$ )	
		Max: 40	
22	00-Resistant MAT 2	8	MET
23	00-Staff Rm	21	MET
24	00-SEN Resource	12	MET
25	01-Humanities 5	47	-
26	01-Humanities 4	37	MET
27	01-English SWR	25	MET
28	01-Office / Meeting 02	49	-
29	01-ICT / Business 2	0	MET
30	01-ICT / Business 1	0	MET
31	01-Maths 6	63	-
32	01-Maths 7	92	-
33	01-Maths 8	81	-
34	01-Humanities 1	64	-
35	01-Humanities 2	44	-
36	02-MFL 5	56	-
37	02-6th Form Social	163	-
38	02-ICT / Business 5	0	MET
39	02-Seminar	77	-
40	01-Activity Studio	110	-
41	01-English 1	53	-
42	01-English 2	53	-
43	01-English 3	45	-
44	01-English 4	59	-
45	01-English 5	46	-
46	01-English 6	46	-
47	01-English 7	58	-
48	01-English 8	55	-
49	01-Maths 1	27	MET
50	01-Maths 2	24	MET
51	01-Maths 3	39	MET
52	01-Maths 4	53	-

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
53	01-Maths 5	80	-
54	01-Humanities 3	32	MET
55	02-6th Form Study	71	-
56	02-MFL 1	69	-
57	02-MFL 2	69	-
58	02-MFL 3	87	-
59	02-MFL 4	80	-
60	02-MFL SWR	116	-
61	02-ICT / Business 4	0	MET
62	02-ICT / Business 3	0	MET

**Iteration 3 - Introduction of external shading**

Table 8: Modelling Results - BB101 - Iteration 3.

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
1	00-Graphics	35	MET
2	00-Head Office	24	MET
3	00-General Office	86	-
4	00-Office-premises	5	MET
5	00-Conference	33	MET
6	00-Large GRP RM	14	MET
7	00-SEN CO	18	MET
8	00-Resistant MAT 1	8	MET
9	00-Textiles	12	MET
10	00-Head PA	14	MET
11	00-ART 2	11	MET
12	00-ART 3D	9	MET
13	00-ART 1 - SMALL	9	MET
14	00-Server	0	MET
15	00-Small GRP Rm 01	19	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
16	00-Small GRP Rm 02	17	MET
17	00-Small GRP Rm 03	10	MET
18	00-ICT RICH 1	0	MET
19	00-ICT RICH 2	0	MET
20	00-Music 2	9	MET
21	00-Music 1	18	MET
22	00-Resistant MAT 2	11	MET
23	00-Staff Rm	28	MET
24	00-SEN Resource	13	MET
25	01-Humanities 5	54	-
26	01-Humanities 4	42	-
27	01-English SWR	28	MET
28	01-Office / Meeting 02	45	-
29	01-ICT / Business 2	0	MET
30	01-ICT / Business 1	0	MET
31	01-Maths 6	72	-
32	01-Maths 7	110	-
33	01-Maths 8	89	-
34	01-Humanities 1	75	-
35	01-Humanities 2	58	-
36	02-MFL 5	65	-
37	02-6th Form Social	162	-
38	02-ICT / Business 5	0	MET
39	02-Seminar	59	-
40	01-Activity Studio	87	-
41	01-English 1	55	-
42	01-English 2	61	-
43	01-English 3	51	-
44	01-English 4	69	-
45	01-English 5	52	-
46	01-English 6	51	-

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ C$ )	
		Max: 40	
47	01-English 7	72	-
48	01-English 8	65	-
49	01-Maths 1	33	MET
50	01-Maths 2	27	MET
51	01-Maths 3	49	-
52	01-Maths 4	56	-
53	01-Maths 5	89	-
54	01-Humanities 3	34	MET
55	02-6th Form Study	75	-
56	02-MFL 1	72	-
57	02-MFL 2	73	-
58	02-MFL 3	99	-
59	02-MFL 4	86	-
60	02-MFL SWR	110	-
61	02-ICT / Business 4	0	MET
62	02-ICT / Business 3	0	MET

**Iteration 4 - Increased ventilation rate**

Table 9: Modelling Results - BB101 - Iteration 4.

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ C$ )	
		Max: 40	
1	00-Graphics	34	MET
2	00-Head Office	25	MET
3	00-General Office	88	-
4	00-Office-premises	5	MET
5	00-Conference	33	MET
6	00-Large GRP RM	14	MET
7	00-SEN CO	18	MET
8	00-Resistant MAT 1	9	MET
9	00-Textiles	11	MET
10	00-Head PA	14	MET
11	00-ART 2	11	MET
12	00-ART 3D	9	MET
13	00-ART 1 - SMALL	9	MET
14	00-Server	0	MET
15	00-Small GRP Rm 01	20	MET
16	00-Small GRP Rm 02	22	MET
17	00-Small GRP Rm 03	12	MET
18	00-ICT RICH 1	0	MET
19	00-ICT RICH 2	0	MET
20	00-Music 2	10	MET
21	00-Music 1	17	MET
22	00-Resistant MAT 2	11	MET
23	00-Staff Rm	27	MET
24	00-SEN Resource	13	MET
25	01-Humanities 5	54	-
26	01-Humanities 4	42	-
27	01-English SWR	31	MET
28	01-Office / Meeting 02	54	-
29	01-ICT / Business 2	0	MET
30	01-ICT / Business 1	0	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
31	01-Maths 6	74	-
32	01-Maths 7	116	-
33	01-Maths 8	94	-
34	01-Humanities 1	78	-
35	01-Humanities 2	60	-
36	02-MFL 5	65	-
37	02-6th Form Social	167	-
38	02-ICT / Business 5	0	MET
39	02-Seminar	78	-
40	01-Activity Studio	117	-
41	01-English 1	57	-
42	01-English 2	63	-
43	01-English 3	52	-
44	01-English 4	70	-
45	01-English 5	52	-
46	01-English 6	53	-
47	01-English 7	73	-
48	01-English 8	65	-
49	01-Maths 1	33	MET
50	01-Maths 2	26	MET
51	01-Maths 3	49	-
52	01-Maths 4	57	-
53	01-Maths 5	92	-
54	01-Humanities 3	36	MET
55	02-6th Form Study	75	-
56	02-MFL 1	73	-
57	02-MFL 2	73	-
58	02-MFL 3	104	-
59	02-MFL 4	88	-
60	02-MFL SWR	123	-
61	02-ICT / Business 4	0	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
62	02-ICT / Business 3	0	MET

**Iteration 5 - Reduced glazing area by 30%**

Table 10: Modelling Results - BB101 - Iteration 5.

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
1	00-Graphics	17	MET
2	00-Head Office	6	MET
3	00-General Office	29	MET
4	00-Office-premises	4	MET
5	00-Conference	10	MET
6	00-Large GRP RM	14	MET
7	00-SEN CO	14	MET
8	00-Resistant MAT 1	9	MET
9	00-Textiles	11	MET
10	00-Head PA	5	MET
11	00-ART 2	7	MET
12	00-ART 3D	7	MET
13	00-ART 1 - SMALL	10	MET
14	00-Server	0	MET
15	00-Small GRP Rm 01	14	MET
16	00-Small GRP Rm 02	14	MET
17	00-Small GRP Rm 03	7	MET
18	00-ICT RICH 1	0	MET
19	00-ICT RICH 2	0	MET
20	00-Music 2	9	MET
21	00-Music 1	12	MET
22	00-Resistant MAT 2	11	MET
23	00-Staff Rm	16	MET
24	00-SEN Resource	14	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
25	01-Humanities 5	28	MET
26	01-Humanities 4	15	MET
27	01-English SWR	14	MET
28	01-Office / Meeting 02	40	MET
29	01-ICT / Business 2	0	MET
30	01-ICT / Business 1	0	MET
31	01-Maths 6	21	MET
32	01-Maths 7	27	MET
33	01-Maths 8	25	MET
34	01-Humanities 1	20	MET
35	01-Humanities 2	18	MET
36	02-MFL 5	29	MET
37	02-6th Form Social	130	-
38	02-ICT / Business 5	0	MET
39	02-Seminar	70	-
40	01-Activity Studio	88	-
41	01-English 1	35	MET
42	01-English 2	34	MET
43	01-English 3	31	MET
44	01-English 4	33	MET
45	01-English 5	32	MET
46	01-English 6	28	MET
47	01-English 7	29	MET
48	01-English 8	29	MET
49	01-Maths 1	18	MET
50	01-Maths 2	18	MET
51	01-Maths 3	19	MET
52	01-Maths 4	22	MET
53	01-Maths 5	25	MET
54	01-Humanities 3	15	MET
55	02-6th Form Study	41	-

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
56	02-MFL 1	41	-
57	02-MFL 2	41	-
58	02-MFL 3	42	-
59	02-MFL 4	44	-
60	02-MFL SWR	81	-
61	02-ICT / Business 4	0	MET
62	02-ICT / Business 3	0	MET

**Combination of Iteration 1 and 4**

Table 11: Modelling Results - BB101 - Combination.

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
1	00-Graphics	35	MET
2	00-Head Office	36	MET
3	00-General Office	36	MET
4	00-Office-premises	5	MET
5	00-Conference	36	MET
6	00-Large GRP RM	15	MET
7	00-SEN CO	18	MET
8	00-Resistant MAT 1	10	MET
9	00-Textiles	12	MET
10	00-Head PA	18	MET
11	00-ART 2	11	MET
12	00-ART 3D	11	MET
13	00-ART 1 - SMALL	9	MET
14	00-Server	0	MET
15	00-Small GRP Rm 01	21	MET
16	00-Small GRP Rm 02	22	MET
17	00-Small GRP Rm 03	12	MET
18	00-ICT RICH 1	0	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
19	00-ICT RICH 2	0	MET
20	00-Music 2	10	MET
21	00-Music 1	18	MET
22	00-Resistant MAT 2	12	MET
23	00-Staff Rm	32	MET
24	00-SEN Resource	15	MET
25	01-Humanities 5	36	MET
26	01-Humanities 4	36	MET
27	01-English SWR	31	MET
28	01-Office / Meeting 02	32	MET
29	01-ICT / Business 2	0	MET
30	01-ICT / Business 1	0	MET
31	01-Maths 6	18	MET
32	01-Maths 7	10	MET
33	01-Maths 8	12	MET
34	01-Humanities 1	18	MET
35	01-Humanities 2	11	MET
36	02-MFL 5	11	MET
37	02-6th Form Social	18	MET
38	02-ICT / Business 5	0	MET
39	02-Seminar	15	MET
40	01-Activity Studio	36	MET
41	01-English 1	36	MET
42	01-English 2	31	MET
43	01-English 3	32	MET
44	01-English 4	36	MET
45	01-English 5	35	MET
46	01-English 6	18	MET
47	01-English 7	10	MET
48	01-English 8	12	MET
49	01-Maths 1	37	MET

ID	Room Name	BB101 Crit. 1	Overall BB101 Compliance
		(Hrs $\Delta T \geq 1^\circ\text{C}$ )	
		Max: 40	
50	01-Maths 2	29	MET
51	01-Maths 3	15	MET
52	01-Maths 4	36	MET
53	01-Maths 5	36	MET
54	01-Humanities 3	36	MET
55	02-6th Form Study	18	MET
56	02-MFL 1	10	MET
57	02-MFL 2	12	MET
58	02-MFL 3	18	MET
59	02-MFL 4	11	MET
60	02-MFL SWR	11	MET
61	02-ICT / Business 4	0	MET
62	02-ICT / Business 3	0	MET

**Mechanical ventilation – CIBSE Guide A.**

**Baseline**

Table 12: Modelling Results – CIBSE Guide A – Baseline.

Room	Operative temperature (TM 52/CIBSE) (°C) - % hours in range	Pass/Fail
	> 25.00	
Guide A-00-Art SWR	43.5	Fail
Guide A-00-Drama	46.9	Fail
Guide A-00-DT SWR	46.7	Fail
Guide A-00-Group Practice	10.1	Fail
Guide A-00-Hygiene Rm	35.8	Fail
Guide A-00-Int Rm	0	Pass
Guide A-00-IT Tech	0	Pass
Guide A-00-Kitchen	60.2	Fail
Guide A-00-MI Room	35.3	Fail
Guide A-00-Music Practice 01	12.8	Fail
Guide A-00-Music Practice 02	12.7	Fail
Guide A-00-Music Practice 03	12.7	Fail
Guide A-00-Music Practice 04	13.5	Fail
Guide A-00-Music Practice 05	12.7	Fail
Guide A-00-Office 01	32.8	Fail
Guide A-00-Office 02	31.8	Fail
Guide A-00-Office/ MTG	33.3	Fail
Guide A-00-Reception	33	Fail
Guide A-00-Reprographics	42.5	Fail
Guide A-00-Seminar 01	32.8	Fail
Guide A-00-Seminar 02	31.1	Fail
Guide A-00-Small GRP RM	27.9	Fail
Guide A-01-Humanities SWR	18.9	Fail
Guide A-01-Learning Resources Centre	0	Pass
Guide A-01-Maths SWR	39.6	Fail
Guide A-01-Office	27	Fail
Guide A-01-Office	23.6	Fail
Guide A-01-Office	30.3	Fail

Guide A-01-Office / Meeting 01	27	Fail
Guide A-01-Office / Meeting 02	41.9	Fail
Guide A-01-Office / Meeting 03	24.6	Fail
Guide A-01-Office / Meeting 04	24.5	Fail
Guide A-01-Office / Meeting 05	31.2	Fail
Guide A-01-Office / Meeting 06	40.9	Fail
Guide A-02-Office	33.2	Fail
Guide A-02-Office / Meeting	39.6	Fail
Guide A-02-Science SWR	80.2	Fail

**Iteration 2 – Increased ventilation rate by 50%**

Table 13: Modelling Results – CIBSE Guide A – Baseline.

Room	Operative temperature (TM 52/CIBSE) (°C) - % hours in range	Pass/Fail
	> 25.00	
Guide A-00-Art SWR	39.3	Fail
Guide A-00-Drama	43.5	Fail
Guide A-00-DT SWR	43.3	Fail
Guide A-00-Group Practice	9.4	Fail
Guide A-00-Hygiene Rm	32.5	Fail
Guide A-00-Int Rm	0	Pass
Guide A-00-IT Tech	0	Pass
Guide A-00-Kitchen	56.5	Fail
Guide A-00-MI Room	32.9	Fail
Guide A-00-Music Practice 01	11.7	Fail
Guide A-00-Music Practice 02	11.7	Fail
Guide A-00-Music Practice 03	11.3	Fail
Guide A-00-Music Practice 04	12.1	Fail
Guide A-00-Music Practice 05	11.4	Fail
Guide A-00-Office 01	27	Fail
Guide A-00-Office 02	28.3	Fail

Guide A-00-Office/ MTG	30	Fail
Guide A-00-Reception	30	Fail
Guide A-00-Reprographics	38.9	Fail
Guide A-00-Seminar 01	24.5	Fail
Guide A-00-Seminar 02	24.1	Fail
Guide A-00-Small GRP RM	25	Fail
Guide A-01-Humanities SWR	16.1	Fail
Guide A-01-Learning Resources Centre	0	Pass
Guide A-01-Maths SWR	36.7	Fail
Guide A-01-Office	24.2	Fail
Guide A-01-Office	20.6	Fail
Guide A-01-Office	26.2	Fail
Guide A-01-Office / Meeting 01	24.2	Fail
Guide A-01-Office / Meeting 02	37.5	Fail
Guide A-01-Office / Meeting 03	23.1	Fail
Guide A-01-Office / Meeting 04	22.3	Fail
Guide A-01-Office / Meeting 05	28.2	Fail
Guide A-01-Office / Meeting 06	36.3	Fail
Guide A-02-Office	29.2	Fail
Guide A-02-Office / Meeting	36.4	Fail
Guide A-02-Science SWR	75.2	Fail

**Iteration 6 - Increased ventilation rate to 3ACH.**

Table 14: Modelling Results - CIBSE Guide A - Iteration 3.

Room	Operative temperature (TM 52/CIBSE) (°C) - % hours in range	Pass/Fail
	> 25.00	
Guide A-00-Art SWR	20	Pass
Guide A-00-Drama	0	Pass
Guide A-00-DT SWR	0	Pass
Guide A-00-Group Practice	10	Pass
Guide A-00-Hygiene Rm	4	Pass
Guide A-00-Int Rm	0	Pass
Guide A-00-IT Tech	0	Pass
Guide A-00-Kitchen	19	Pass
Guide A-00-MI Room	23	Pass
Guide A-00-Music Practice 01	20	Pass
Guide A-00-Music Practice 02	21	Pass
Guide A-00-Music Practice 03	12	Pass
Guide A-00-Music Practice 04	17	Pass
Guide A-00-Music Practice 05	9	Pass
Guide A-00-Office 01	10	Pass
Guide A-00-Office 02	8	Pass
Guide A-00-Office/ MTG	7	Pass
Guide A-00-Reception	12	Pass
Guide A-00-Reprographics	20	Pass
Guide A-00-Seminar 01	17	Pass
Guide A-00-Seminar 02	3	Pass
Guide A-00-Small GRP RM	24	Pass
Guide A-01-Humanities SWR	17	Pass
Guide A-01-Learning Resources Centre	0	Pass
Guide A-01-Maths SWR	15	Pass
Guide A-01-Office	17	Pass
Guide A-01-Office	21	Pass
Guide A-01-Office	2	Pass
Guide A-01-Office / Meeting 01	2	Pass



Guide A-01-Office / Meeting 02	11	Pass
Guide A-01-Office / Meeting 03	13	Pass
Guide A-01-Office / Meeting 04	11	Pass
Guide A-01-Office / Meeting 05	21	Pass
Guide A-01-Office / Meeting 06	2	Pass
Guide A-02-Office	7	Pass
Guide A-02-Office / Meeting	19	Pass
Guide A-02-Science SWR	6	Pass



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