

# TM52 Overheating Analysis and BB101 Criteria 1 Check

Data Summary Report

For

Kestrel Way

SEN School



## Contents

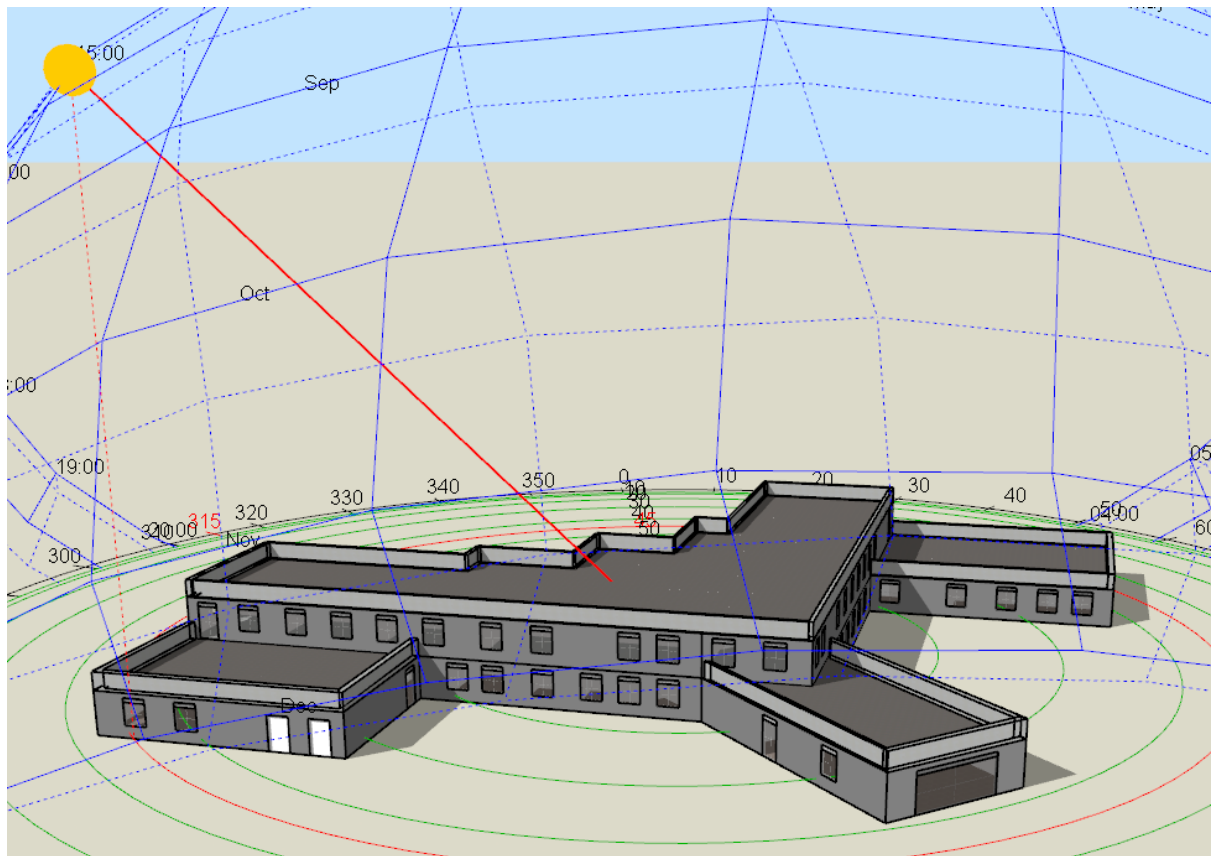
1. Executive Summary .....	3
2. TM52 Criteria (Criteria not met).....	4
3. BB101 (2018) Criteria - Schools (Criteria not met) .....	4
4. Data Results .....	5
4.1. TM52 Results.....	5
4.2. BB101 2018 Results .....	6
5. Conclusion .....	13
Appendix A – Floor zone layouts.....	14

## 1. Executive Summary

TM52 and BB101 results indicate non-compliance for all relevant zones when using the initial design criteria as listed below.

- Glazing  $1.4\text{W/m}^2\cdot\text{K}$  With a Solar G Value of 0.4 and Transmittance value of 0.744
- 55% openable free area, with scheduled opening in line with TM52 occupancy
- Air Infiltration set to  $0.5\text{ac/h}$
- Natural ventilation to all zones is set to  $5\text{ac/h}$
- Internal doors are based on the currently provided design layouts and are set to be open 5% off the occupied time at a free area of 50%
- Ventilation also included with above window vents 'Small Grille light slats' and operation based on zone activity type.
- Simulation Weather file DSY1 2020 High 50% Location Luton/London

The model image below shows the building as presented for calculations.





## 2. TM52 Criteria (Criteria not met)

- **Criterion 1:** 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 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- **Criterion 2:** 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.
- **Criterion 3:** The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

## 3. BB101 (2018) Criteria - Schools (Criteria not met)

- **Criterion 1 - Hours of Exceedance ( $H_e$ ):** For schools, the number of hours ( $H_e$ ) that the difference in temperature ( $DT$ ) is greater than or equal to one degree (K) during the period 1 May to 30 September for the defined hours shall not be more than 40 hours.
- **Criterion 2 - Daily Weighted Exceedance ( $W_e$ ):** To allow for the severity of overheating, the weighted exceedance ( $W_e$ ) shall be less than or equal to 6 in any one day.
- **Criterion 3 - Upper Limit Temperature ( $T_{upp}$ ):** To set an absolute maximum value for the indoor operative temperature, the value of  $DT$  should not exceed 4K.

To show that the proposed school design will not suffer from overheating, Criterion 1 must be met. The second and third criteria are primarily used to show short-term discomfort and should be reported for information only.

If the dynamic simulation model (DSM) of the school indicates that it would not meet either of Criteria 2 or 3, steps should be taken to mitigate the risk of overheating through design changes or potentially mechanical ventilation and cooling if necessary.

## 4. Data Results

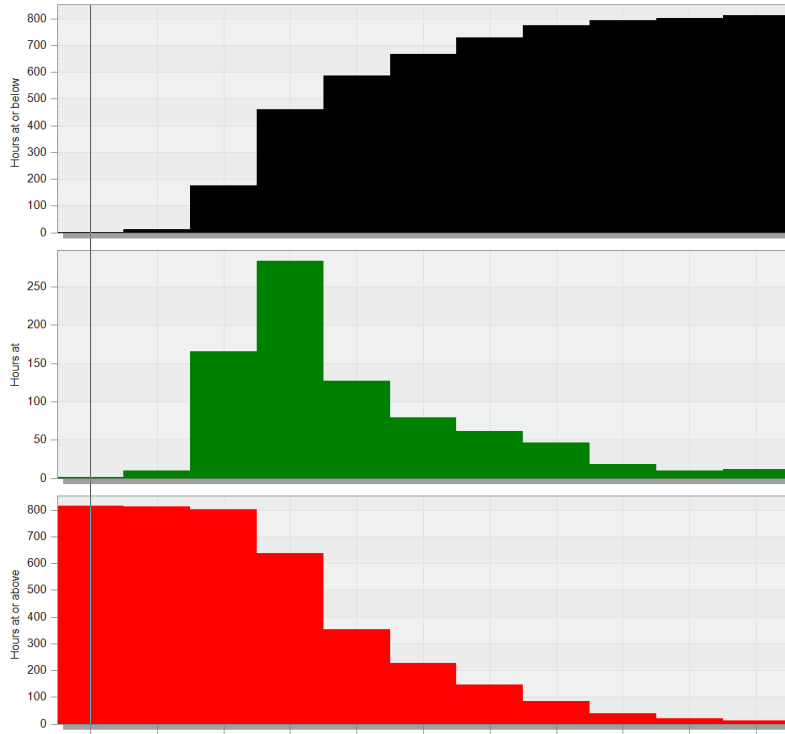
### 4.1. TM52 Results

CIBSE TM52 <span style="float: right;">Export CSV</span>					
Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
00XGROUND FLOOR	ZN52XSXTHFRMTCHNGRM	9.28	18.00	0.00	Fail
00XGROUND FLOOR	ZN58XSXTHFRMTCHNGRM1	9.90	18.00	0.00	Fail
00XGROUND FLOOR	ZONE4XPMLDCLASSROOM2	3.55	12.50	0.00	Fail
00XGROUND FLOOR	ZONE6XPMLDCLASSROOM1	6.35	14.00	0.00	Fail
01XFIRST FLOOR	ZONE12XTEACHINGRM8	12.58	22.00	0.00	Fail
01XFIRST FLOOR	ZONE15XTEACHINGRM4	20.98	23.00	0.00	Fail
01XFIRST FLOOR	ZONE19XTEACHINGRM9	11.83	23.00	0.00	Fail
01XFIRST FLOOR	ZONE1XTEACHINGRM10	5.85	21.50	0.00	Fail
01XFIRST FLOOR	ZONE21XTEACHINGRM5	13.76	27.50	2.50	Fail
01XFIRST FLOOR	ZONE22XTEACHINGRM3	14.20	27.50	2.50	Fail
01XFIRST FLOOR	ZONE27XTEACHINGRM6	7.41	24.50	1.00	Fail
01XFIRST FLOOR	ZONE29XTEACHINGRM1	12.95	23.00	0.50	Fail
01XFIRST FLOOR	ZONE32XTEACHINGRM2	13.82	27.50	2.50	Fail
01XFIRST FLOOR	ZONE33XTEACHINGRM7	12.27	22.50	0.00	Fail

### 4.2. BB101 2018 Results

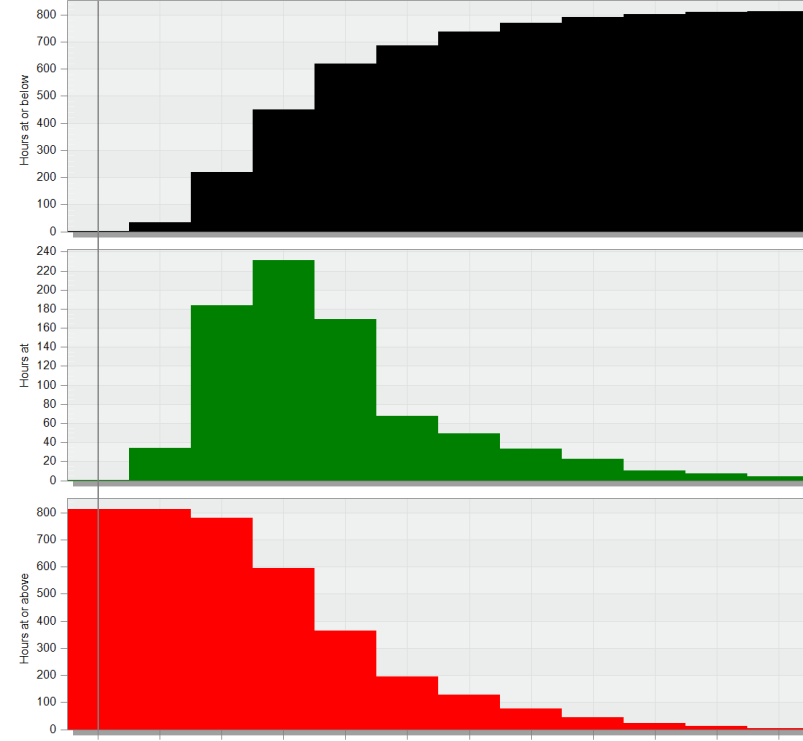
The red bar chart shows temperatures of 28°C reaching consistently over the allowable 40hrs during 1 May – 30 September for all relevant zones.

Temperature Distribution for Untitled, Kestral Way School reduced windows, 00\_Ground Floor, Zone 52\_Sixth Form Teaching Rm  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



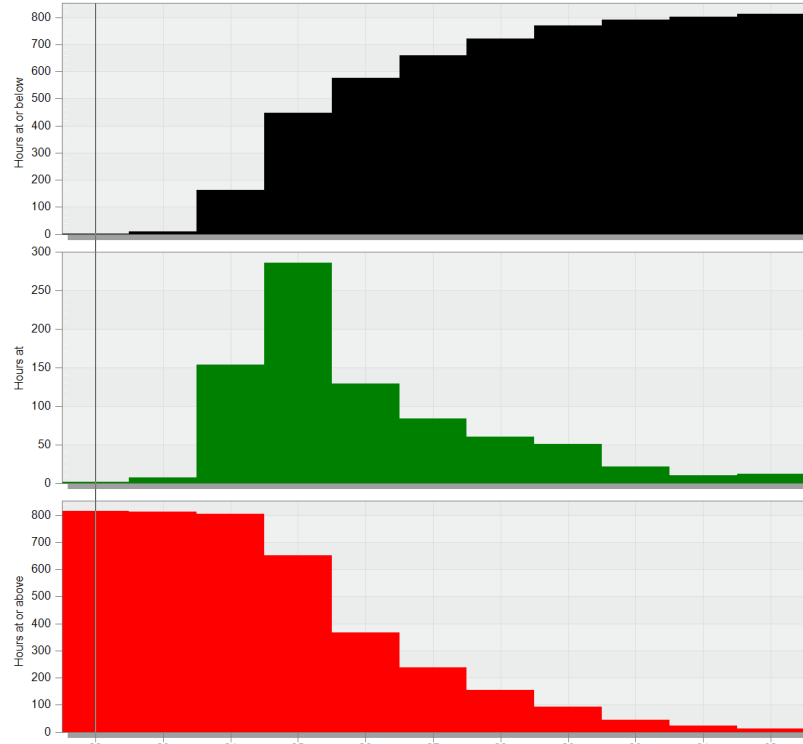
Hours at or below	1.0	11.0	176.5	460.5	588.0	667.5	729.0	775.0	793.0	802.5	814.0
Hours at	1.0	10.0	165.5	284.0	127.5	79.5	61.5	46.0	18.0	9.5	11.5
Hours at or above	814.0	813.0	803.0	637.5	353.5	226.0	146.5	85.0	39.0	21.0	11.5
	Temperature bins (°C)										

Temperature Distribution for Untitled, Kestral Way School reduced windows, 00\_Ground Floor, Zone 4\_PMLD Classroom 2  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	0.5	34.5	218.5	450.0	619.0	687.0	736.5	769.5	792.0	802.0	809.5	814.0
Hours at	0.5	34.0	184.0	231.5	169.0	68.0	49.5	33.0	22.5	10.0	7.5	4.5
Hours at or above	814.0	813.5	779.5	595.5	364.0	195.0	127.0	77.5	44.5	22.0	12.0	4.5
	Temperature bins (°C)											

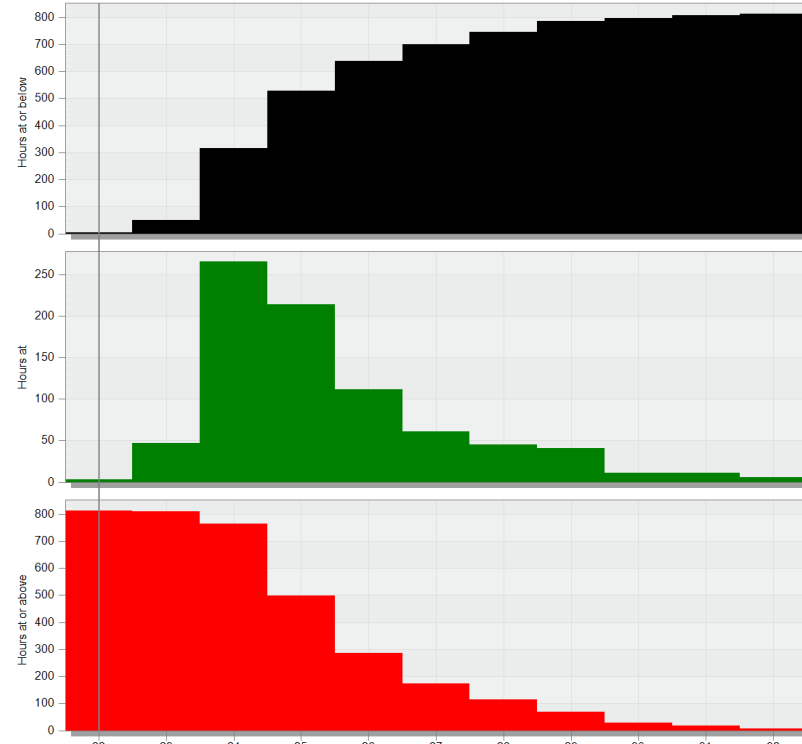
Temperature Distribution for Untitled, Kestral Way School reduced windows, 00\_Ground Floor, Zone 58\_Sixth Form Teaching Rm 1  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	1.0	8.5	162.0	448.0	577.0	660.5	720.5	771.0	792.5	802.0	814.0
Hours at	1.0	7.5	153.5	286.0	129.0	83.5	60.0	50.5	21.5	9.5	12.0
Hours at or above	814.0	813.0	805.5	652.0	366.0	237.0	153.5	93.5	43.0	21.5	12.0

Temperature bins (°C)

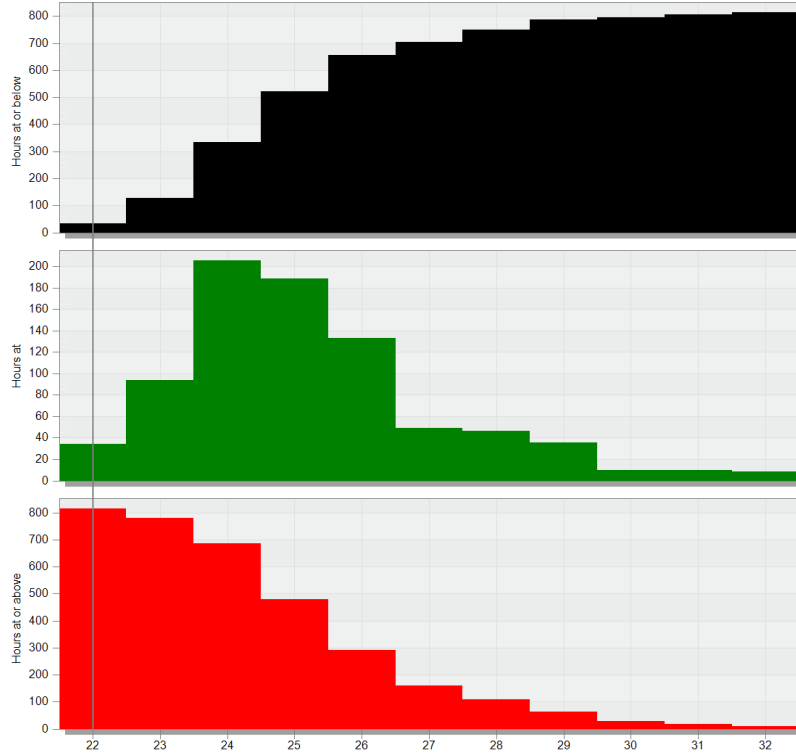
Temperature Distribution for Untitled, Kestral Way School reduced windows, 00\_Ground Floor, Zone 6\_PMLD Classroom 1  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	3.0	49.5	314.5	528.0	639.5	700.5	745.5	786.5	797.5	808.0	814.0
Hours at	3.0	46.5	265.0	213.5	111.5	61.0	45.0	41.0	11.0	10.5	6.0
Hours at or above	814.0	811.0	764.5	499.5	286.0	174.5	113.5	68.5	27.5	16.5	6.0

Temperature bins (°C)

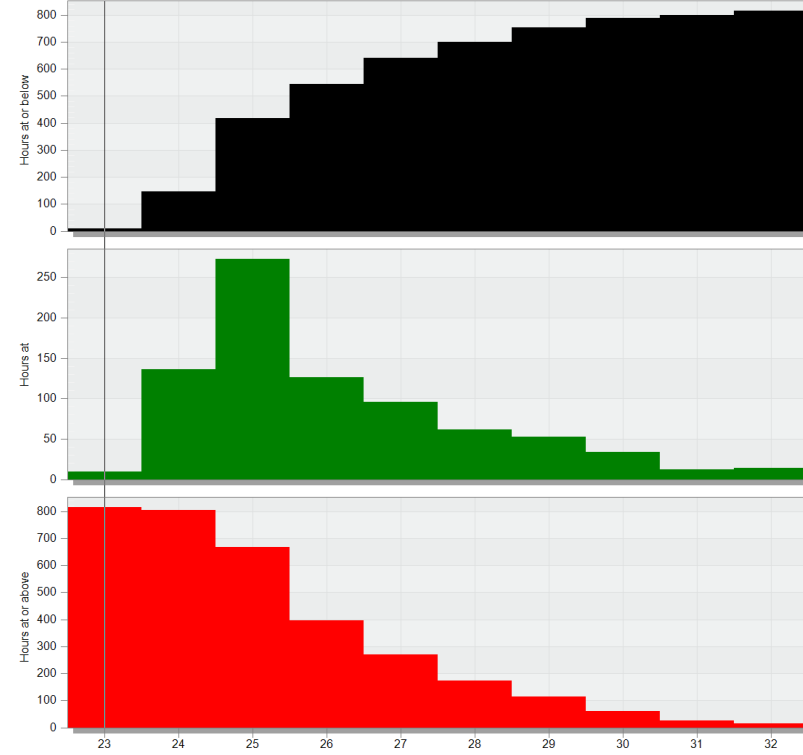
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 1\_Teaching rm 10  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	34.5	128.5	334.0	522.5	655.5	704.5	751.0	786.5	796.0	805.5	814.0
Hours at	34.5	94.0	205.5	188.5	133.0	49.0	46.5	35.5	9.5	9.5	8.5
Hours at or above	814.0	779.5	685.5	480.0	291.5	158.5	109.5	63.0	27.5	18.0	8.5

Temperature bins (°C)

Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 12\_Teaching Rm 8  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ

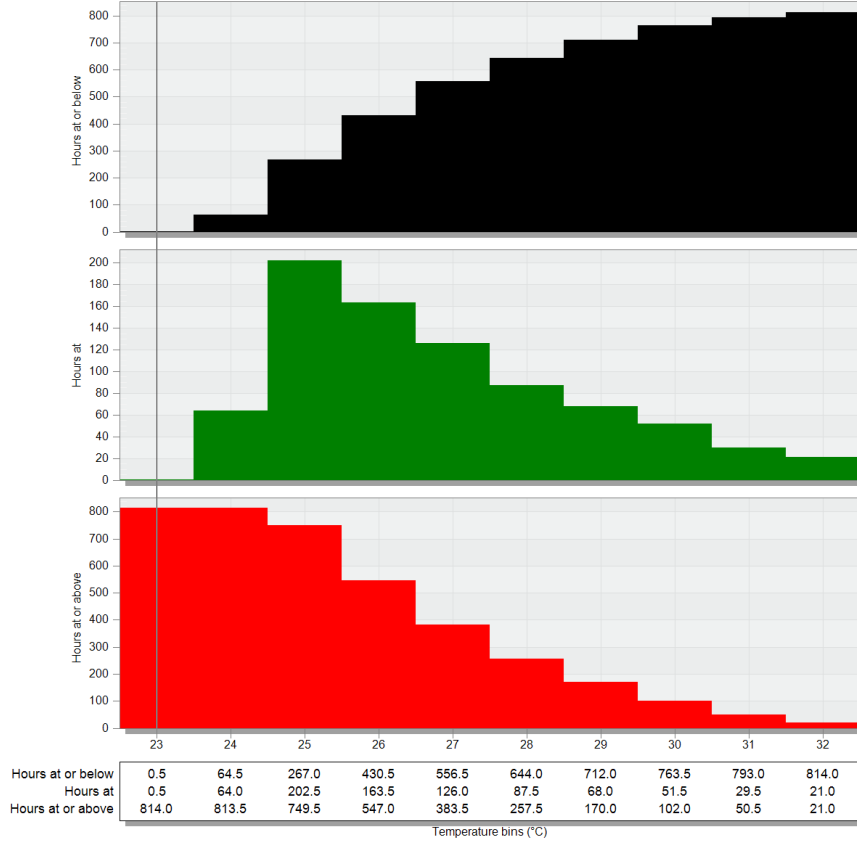


Hours at or below	9.0	145.5	418.0	544.0	639.5	701.0	753.5	787.5	800.0	814.0
Hours at	9.0	136.5	272.5	126.0	95.5	61.5	52.5	34.0	12.5	14.0
Hours at or above	814.0	805.0	668.5	396.0	270.0	174.5	113.0	60.5	26.5	14.0

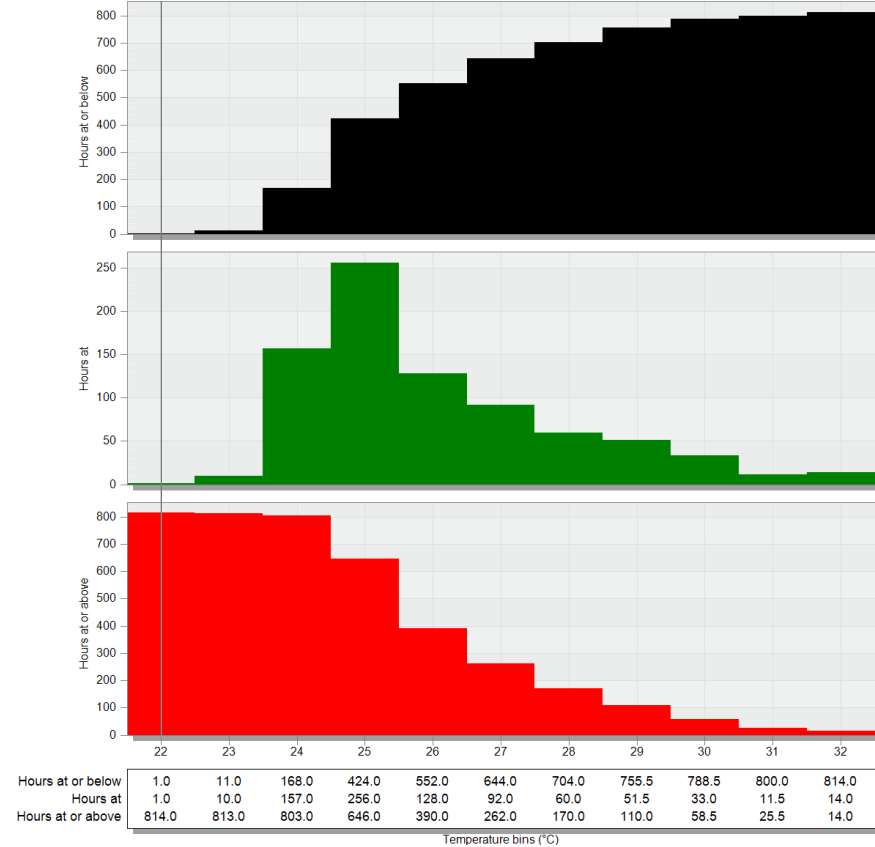
Temperature bins (°C)



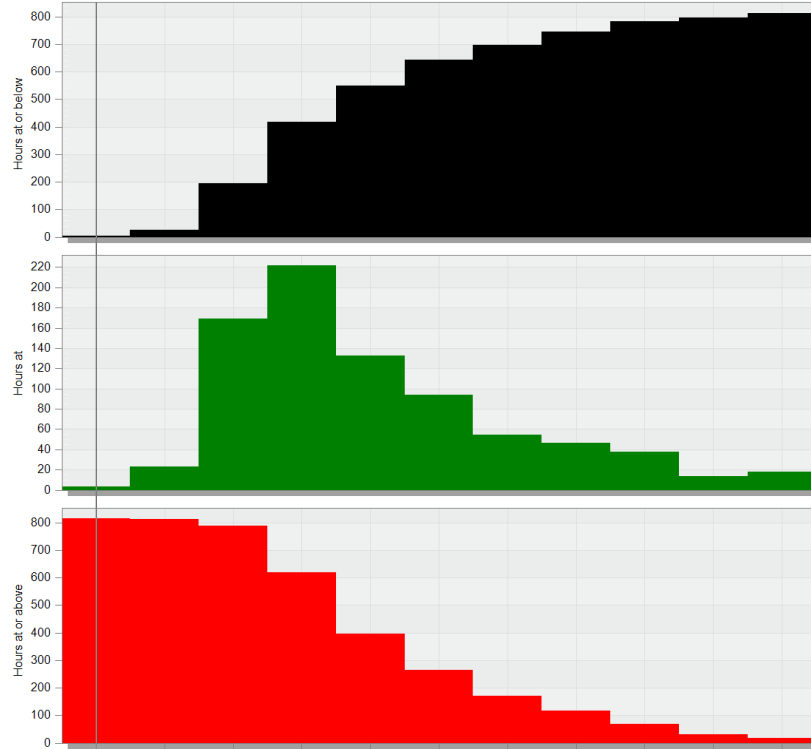
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 15\_Teaching Rm 4  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 19\_Teaching Rm 9  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



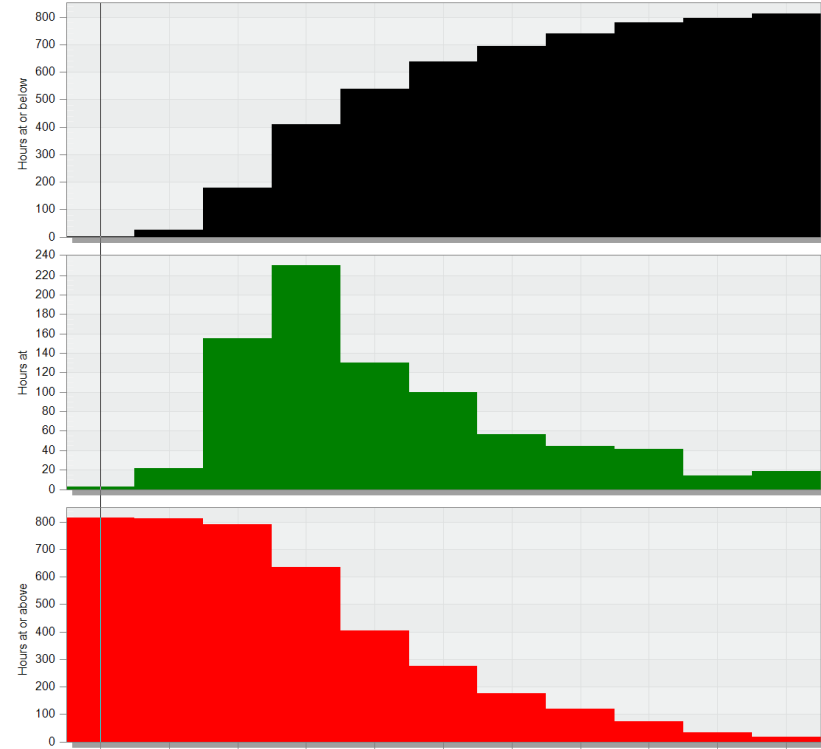
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 21\_Teaching Rm 5  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	3.0	26.0	195.5	417.0	550.0	644.0	698.5	745.0	782.5	796.0	814.0
Hours at	3.0	23.0	169.5	221.5	133.0	94.0	54.5	46.5	37.5	13.5	18.0
Hours at or above	814.0	811.0	788.0	618.5	397.0	264.0	170.0	115.5	69.0	31.5	18.0

Temperature bins (°C)

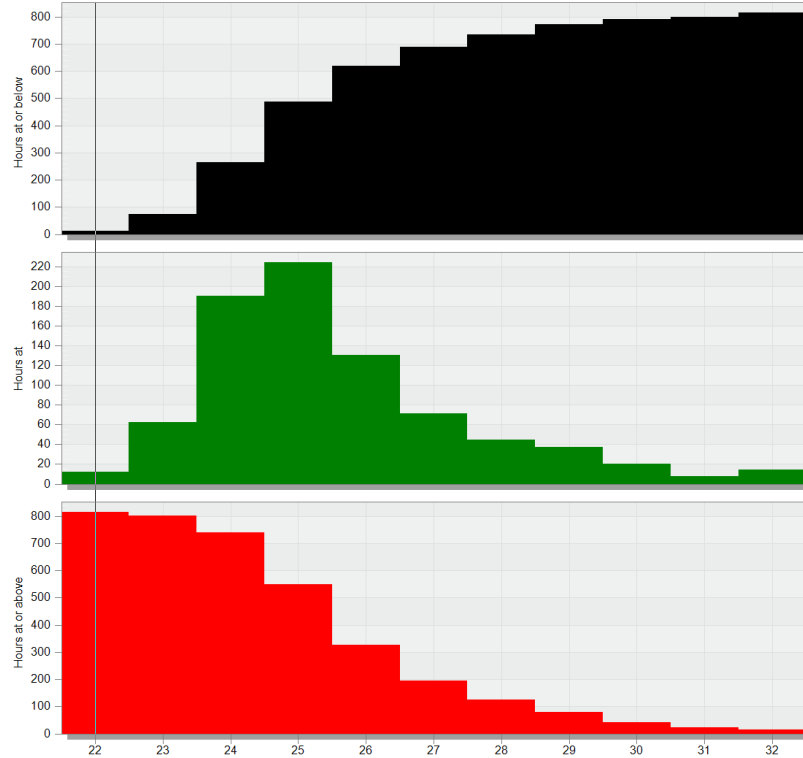
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 22\_Teaching Rm 3  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	2.5	24.5	179.5	409.5	539.5	639.0	695.5	740.0	781.5	795.5	814.0
Hours at	2.5	22.0	155.0	230.0	130.0	99.5	56.5	44.5	41.5	14.0	18.5
Hours at or above	814.0	811.5	789.5	634.5	404.5	274.5	175.0	118.5	74.0	32.5	18.5

Temperature bins (°C)

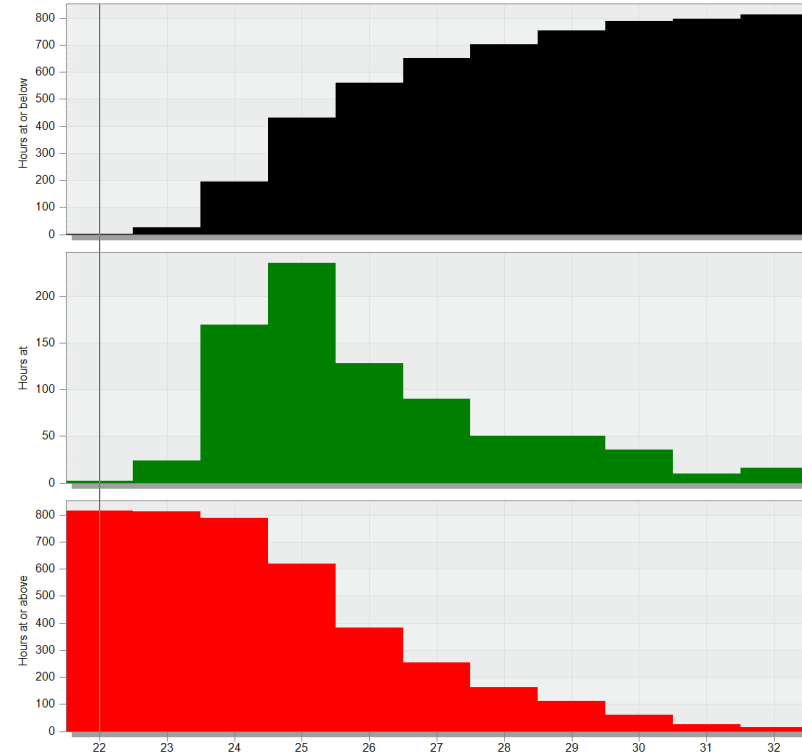
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 27\_Teaching Rm 6  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	12.0	74.5	264.5	488.5	618.5	689.5	734.5	772.0	792.0	799.5	814.0
Hours at	12.0	62.5	190.0	224.0	130.0	71.0	45.0	37.5	20.0	7.5	14.5
Hours at or above	814.0	802.0	739.5	549.5	325.5	195.5	124.5	79.5	42.0	22.0	14.5

Temperature bins (°C)

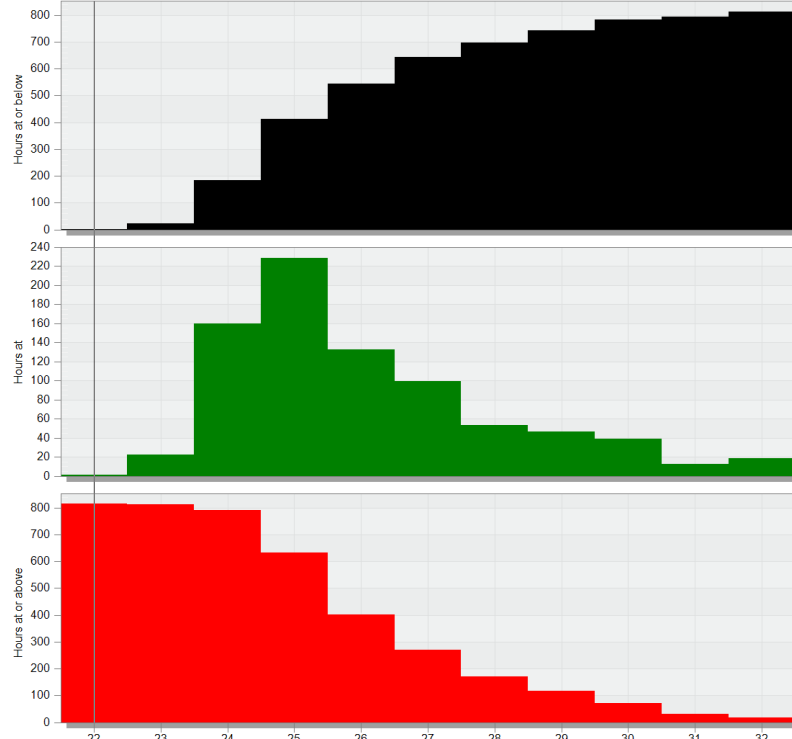
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 29\_Teaching Rm 1  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	2.0	26.0	196.0	432.5	561.0	651.5	702.0	752.5	788.0	798.0	814.0
Hours at	2.0	24.0	170.0	236.5	128.5	90.5	50.5	50.5	35.5	10.0	16.0
Hours at or above	814.0	812.0	788.0	618.0	381.5	253.0	162.5	112.0	61.5	26.0	16.0

Temperature bins (°C)

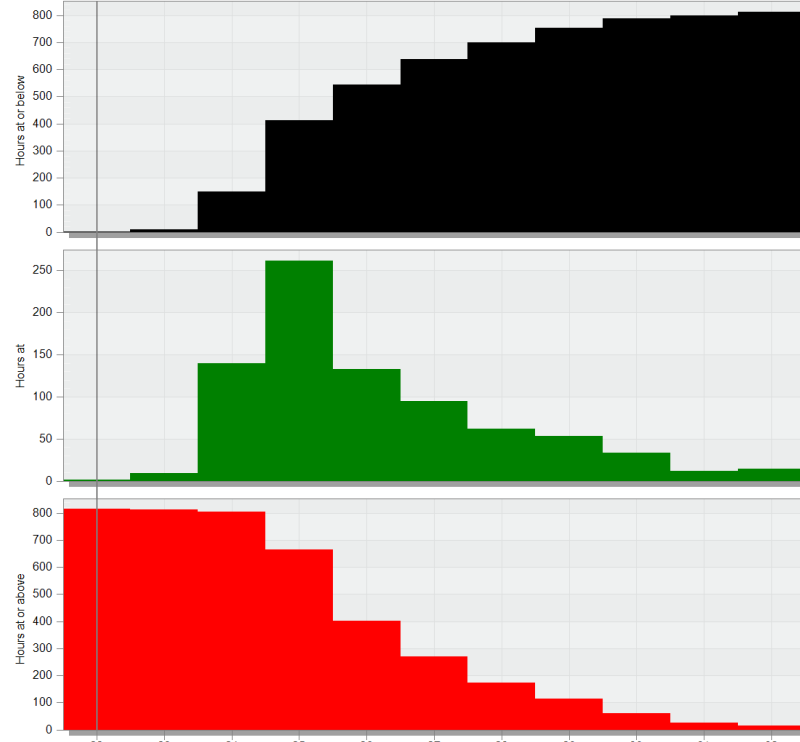
Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 32\_Teaching Rm 2  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	1.0	23.0	183.0	412.0	544.5	644.0	697.5	744.0	783.0	795.5	814.0
Hours at	1.0	22.0	160.0	229.0	132.5	99.5	53.5	46.5	39.0	12.5	18.5
Hours at or above	814.0	813.0	791.0	631.0	402.0	269.5	170.0	116.5	70.0	31.0	18.5

Temperature bins (°C)

Temperature Distribution for Untitled, Kestral Way School reduced windows, 01\_First Floor, Zone 33\_Teaching Rm 7  
1 May - 30 Sep - Zone conditions reported for occupied periods, defined by schedule: D1\_Edu\_ClassRm\_Occ



Hours at or below	1.0	10.0	150.0	412.0	544.5	639.5	701.0	754.0	787.5	799.5	814.0
Hours at	1.0	9.0	140.0	262.0	132.5	95.0	61.5	53.0	33.5	12.0	14.5
Hours at or above	814.0	813.0	804.0	664.0	402.0	269.5	174.5	113.0	60.0	26.5	14.5

Temperature bins (°C)



## 5. Conclusion

The results of the compliance analysis show that should the design remain as presented it does not meet overheating risk compliance checks. Several alternative scenarios have also been reviewed with:

- Less glazing;
- Increased insulation;
- Additional natural ventilation; and
- External shading, louvres, and overhangs.

From these additional calculation checks, the reduction of glazing has made the greatest impact in reducing overheating, and when combined with external shading a compliant free running building is almost achieved. However, many rooms still fall short of the criteria check levels and so it is suggested that alternative measures should be sought for managing the risk of overheating with the current design.



## Appendix A – Floor zone layouts

Reference only. If larger detailed layouts are required, they can be provided separately.

