

J1111 // HEATHFIELD YOUTH CENTRE DAYLIGHT MODELLING REPORT

DECEMBER 2023

J1111-TGL-HY-XX-RP-BP-4801

Consultants

Ben Campbell Principal Engineer Project Lead

Chris Wines Building Performance Engineer Report Author

Report History

Issue number	Suitability	Date	Details
P01	S1	28/11/2023	For Comment
P02	S2	15/12/2023	For Comment



Tournay-Godfrey Ltd Suite A, 45 Church Road, Hove, BN3 2BE. Registered in England Company number 09511519 www.tournay-godfrey.com

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1. EXECUTIVE SUMMARY

Tournay-Godfrey Itd have conducted a daylight modelling assessment for the proposed Stage 4 Heathfield Youth Centre development.

In order to give context to the result of the assessment, design criteria have been established by referring to the relevant BREEAM criteria for 'visual comfort' (section 2).

The building has been modelled using IES-VE (2023) and simulated using the Radiance component within the software. The geometry of the building has been updated to reflect the latest Revit model provided by LRA-retinue (section 3).

The results have been presented (section 4) with mitigation techniques suggested for the spaces which fail to meet the design criteria.

The main results show that:

- All spaces provide a sufficient level of daylight (measured by average daylight factor)
- The majority of spaces do not meet the requirements for % area compliant and uniformity ratio, which means that the natural light distribution within most spaces is not at a desirable level. Window size and/or positioning may be reconfigured to improve this result.

2. DESIGN CRITERIA

In lieu of any specific targets for the scheme, **BREEAM** credit *Hea 01 - Visual Comfort* has been utilised as a point of reference for the daylight modelling assessment.

The aim of Hea 01 is to encourage best practice in visual performance and comfort by ensuring daylighting, artificial lighting and occupant controls are considered.

With respect to this assessment, the focus is only on the **daylighting criteria** of the credit. Maximising exposure to natural daylight and providing an external view out provides users with a connection to nature. This can in turn support mental wellbeing, for example by improving people's mood and reducing the symptoms of depression. Increasing the level of daylight within the building also reduces the need for artificial lighting, which can reduce operational costs and environmental impacts of the building. Further to this, naturally lit environments increase occupant productivity and support the regulation of circadian rhythms.

With regards to daylighting, the BREEAM credit Hea 01 – Visual Comfort criteria are as follows:

Building Type	Average Daylight Factor	Minimum % Area to Comply	Other Criteria
Educational Buildings	2%	80%	A uniformity ratio of at least 0.3 or a minimum point daylight factor of at least 0.3 times the relevant average daylight factor

The **average daylight factor** is the average indoor illuminance (from daylight) on the working plane within a room. This is expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane under an unobstructed 'CIE Standard Overcast Sky'.

3. MODELLING

Daylight Modelling has been carried out using the **Radiance component of IES-VE modelling software** (2023).

3.1. GEOMETRY

The thermal model geometry which has been created as part of the project has been updated as per plans, sections and elevations taken from the latest Revit model and utilised for this assessment.

Model File Number	Issued
231103_2141-LRA-AB-ZZ-M3-A-001-HEATHFIELD YOUTH CENTRE -2023	03 / 11 / 2023

Note: The external shading devices (except canopies) and window recesses have <u>not</u> been modelled for the simulation of this assessment and should only be included if deemed necessary by the overheating assessment.

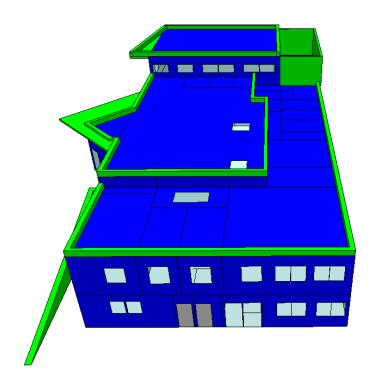


Figure 1: IES-VE Model North View

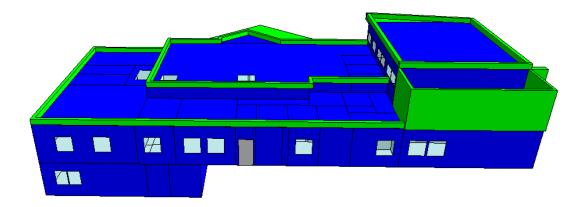


Figure 2: IES Model West View

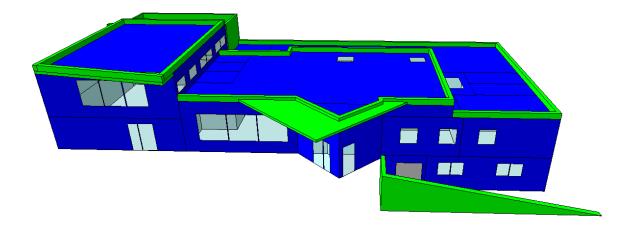


Figure 3: IES Model East View

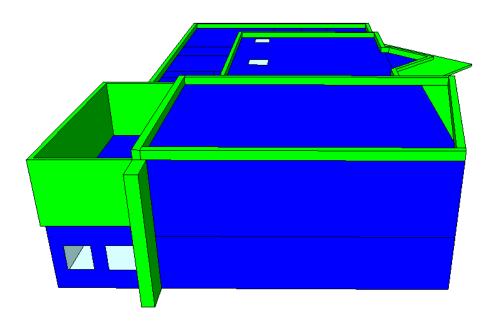


Figure 4: IES Model South View

3.2. INTERNAL BUILDING SURFACES

As the proposed internal building surfaces are as yet undefined, the following default reflectance values have been used for the relevant surfaces in the assessment.

Building Element	Reflectance Value
Internal Walls	0.50
Ceilings	0.70
Floors	0.20

The glazing specification is also as yet unconfirmed and there fore a nominal value has been used for the visible light transmittance from the external windows.

Building Element	Visible Light Transmittance
External Glazing	0.60

Visible light transmittance of the glazing would need to be confirmed during the Stage 4, as this could change the results. The value of 0.6 is a conservative approach and it is expected this would be approved once the final glazing system is confirmed and therefore should improve the results.

3.3. EXTERNAL CONDITIONS

The standard design day for daylight factor calculations is based on the standard *CIE overcast Sky for 21 September at 12:00pm, with a Ground Ambient light level of 11921 Lux.

*CIE being the Commission Internationale de l'Eclairage, or International Commission on Illumination.

4. RESULTS

Design Criteria:	Average Daylight Factor (%)	% Area Compliant	Uniformity Ratio	Result Comments					
	> 2%	> 80%	> 0.30						
GF.04 Multi Use Suite	2.1	90.9	0.26	All spaces achieves a greater than 2% daylight factor, demonstrating good levels of daylight. Uniformity is generally low and could be improved by repositioning the					
GF.05 Fitness Suite	3.2	94.4	0.23	windows to provide greater spread of light.					
GF.11 Hot Desk Office	2.6	65.3	0.19						
GF.12 Coffee Bar	2.4	97.5	0.18						
GF.16 1-2-1 Meeting	2.3	58.3	0.18						
GF.15 1-2-1 Meeting	2.4	58.9	0.19						
GF.02 Foyer	2.6	74.7	0.07						
GF.03 Admin Office	2.5	80.6	0.11						
GF.17 Sensory Room	2.0	70.4	0.12						
LFL.03 Music Room	3.6	67.8	0.09						
LFL.02 Art Room	2.0	59.1	0.07						
GF.13 Kitchen	3.3	84.2	0.18						

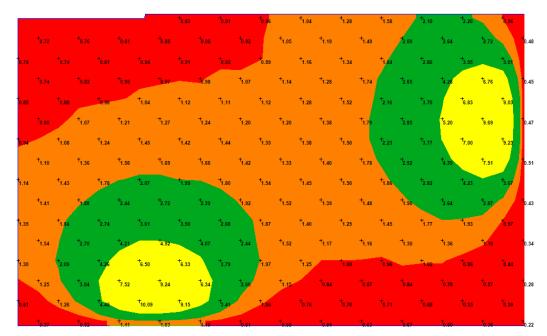
5. CONCLUSION

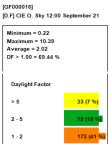
The results show that for 100% of spaces in the building, the average daylight factor (DF), is at a sufficient level above 2%. This means that these spaces will receive good levels on natural daylight to the space, minimising the need for artificial lighting (reducing operational energy) and promoting visual comfort and the associated benefits this brings.

The majority of spaces do not meet the BREEAM Hea 01 credit requirements for % area compliant and uniformity ratio, which means that the natural light distribution within most spaces is not at a desirable level. Window size and/or positioning may be reconfigured to improve this result.

6. APPENDIX: Detailed Results

GF.17 Sensory Room



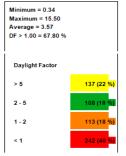


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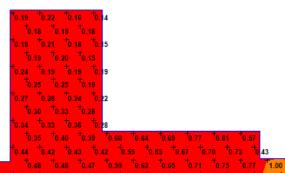
LFL.01 Music Room

+0.43 +0.40 + 0.98 + 10.81 +11.54 +13.02 +0.63 +0.75 ⁺9.54 +8.25 4.68 +1.17 +13.63 +12.03 +6.9 +14.94 + +14.41 +6.17 +10.25 +12.3 +14.8 1 41 6 79 + 9 23 44 00 1.12 + 6.51 +15.4 † 1.45 ⁺6.03 1.04 13.25 9.5/ +12.85 1.2 1.43 1.03 9.72 62 1.23 +1.31 6.84 ⁺8.54 1.04 1 74 + 8.43 +10.85 4 40 [†]1 45 T_ 72 +1.03 ⁺11.14 ⁺1.23 ⁺7.00 ⁺9 21 + 13.76 5 60



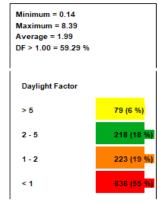


LFL.07 Art Room



43 0.93 ⁺0.81 ⁺0.91 ⁺1.02 ⁺1.01 ⁺0. 15 ⁺0.94 ⁺1.05 ⁺1.15 ⁺1.11 +0.51 +0.59 +0.55 +0.50 +0.5 +0.53 +0.56 +0.55 +0.52 +0.55 +0.49 +0.59 +0.62 +0.69 +0.83 0.71 +0.83 +0.55 +0.58 +0.64 0.70 ⁺0.74 0.83 +0.85 59 ⁺0.57 ⁺0.59 ⁺1.20 +0.56 +0.56 +1.36 +0.57 +1.14 ⁺0.60 ⁺0 70 + 0 90 0.71 0.83 0.98 +0.63 +0.55 +0.57 +0.57 +0.63 +0.72 +0.82 +0.84 +0.94 +1.38 +1.59 0.97 1.16 64 0.59 + 0.65 + 0.63 + 0.64 + 0.63 +0.71 ⁺0.85 +0.76 + 0.83 ⁺0.98 ⁺1.03 +1.20 ⁺1.37 +0.78 +0.83 +0.90 ⁺0.97 ⁺1.03 +1.25 +0.72 +0.76 +0.85 +0.67 1 42 0.69 70 + 0.70 +0.79 +0.80 +0.78 +0.95 ⁺0.97 ⁺1.03 ⁺1.13 +1.25 ⁺0.69 +1.36 0.72 +0.79 +1.30 +1.08 0.74 ⁺0.88 ⁺0.92 0.95 1.00 0.95 ⁺1.16 1.46 .45 +1.06 +1.14 +0.94 +0.99 +1.01 +1.06 +1.13 +1.34 +1.49 0.88 +6.20 **+**0.94 **+**1.06 **+**1.14 **+**1.14 **+**1.20 +1.21 +1.19 +1.27 1.35 + .86 1.50 t 7.69 +1.33 +1.46 +1.19 +1.25 +1.36 +1.31 +1.32 +1 33 +1.51 +7.32 [†]1.02 74 ⁺1.41 ⁺1.48 ⁺1.58 ⁺1.54 ⁺1.51 +1.43 +1.42 ⁺6.00 + 8.39 1 29 1.66 .84 1.60 4 50 2.25 81 5 27 19 4.97 2.07 +5.86 +5.79 +5 77 5 54 6 39 15 82 +6.20 +7.57 +7.44 +7.07 +6.69 +5. .09 +6.05 ⁺7.98 ⁺7.92 ⁺8.31 +, ⁺7.72 . 1.34 13 2.08 .53 +1.09 to 84 86 .06 0.28 0.61 0.73 0.83 0.95 1.13 1.12

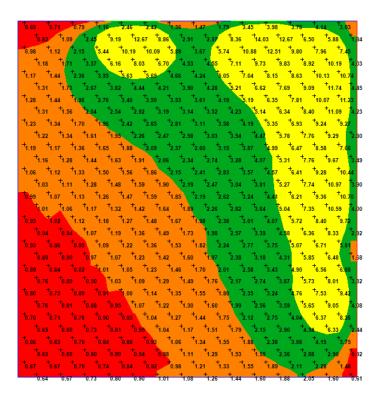




GF.12 Coffee Bar

.43 + 6.75 ⁺12.18 + 10.35 ⁺2.9 + 8.83 +10.13 ⁺6 1 +7.53 +6.34 t_{a e} 2 67 18 4 08 +3.51 t3 25 +3.75 +2.65 2 1.4 +1.62 +2.77 +2.44 وہ د +1.65 +1.83 t, 90 +1.40 + 1.59 ⁺1.76 +1.77 ⁺1.68 [GF000014] +1.37 +1.55 +1.43 +1.60 +1.40 [D.F] CIE O. Sky 12:00 September 21 +1.16 +1.28 +1.37 +1.35 ⁺1.36 Minimum = 0.43 Maximum = 12.18 ⁺1.14 +1.26 +1.23 +1.30 +1.29 Average = 2.41 +1.26 DF > 1.00 = 97.50 % +1.09 ⁺1.16 +1.29 +1.26 +1.19 +1.28 +1.22 +1.27 ⁺1.14 Daylight Factor +1.26 +1.30 +1.18 +1.36 +1.34 > 5 +1.31 +1.31 + 1.41 +1.45 +1.36 2 - 5 ⁺1.39 ⁺1.44 + 1.55 + 1.54 ⁺1.42 1 - 2 +1.52 ⁺1.78 ⁺1.79 +1.67 ⁺1.58 +1.82 < 1 +1.73

GF.13 Kitchen



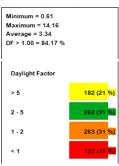
[GF000002] [D.F] CIE O. Sky 12:00 September 21

20 (10 %)

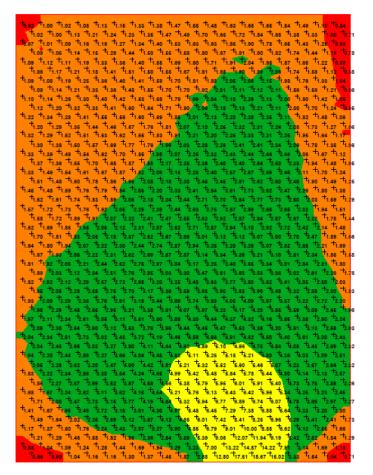
47 (23 9

128 (64 %

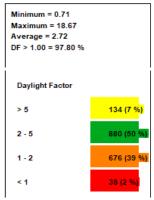
5 (2 %)



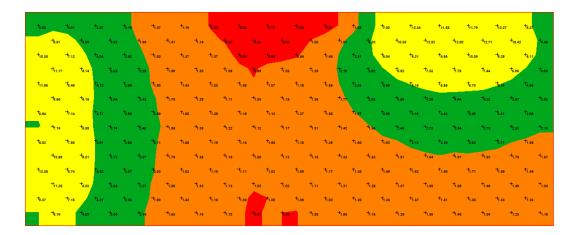
GF.04 Multipurpose Space





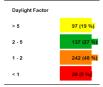


GF.05 Fitness Suite



[GF000000] [D.F] CIE O. Sky 12:00 September 21

Minimum = 0.75 Maximum = 12.99 Average = 3.23 DF > 1.00 = 94.44 %



GF.11 Hot Desk

+0.48	-	+ <mark>0:97</mark>		+1.56		+ 1.34		0.67		+1.50		+1.36		0.75	_
	⁺ 2.68		⁺ 10.34		+12.57		⁺ 7.80		+ 9.28		+ _{12.23}	3	+ 8.83		+ 2.22
⁺ 2.31		+ _{6.24}		+ 10.54	L	+ _{10.09}	,	+ 8.28		+10.62	2	+ _{10.13}		+5.39	
	+ 3.76		+ 6.85		+ 8.10		+ _{7.59}		+ 7.92		+ 8.40		+6.25		+ 3.43
+2.61		+4.23		⁺ 5.73		+ 6.13		⁺ 5.97		+ 6.08		+5.58		+3.86	
					_						_		+ 3.74		
													+ _{2.32}		
													<		
					· · · · ·								+ 1.66		
													+ 1.23		
													+ _{0.93}		
													0.00		
													+ _{0.76}		
													0.76		
													+0.69		
0.61	+	0.68	+	0.73							+	0.69	+	0.67	+
	+0.05		0.74		0.74		+0.00		+ 0.76		+0.73		0.71		0.01

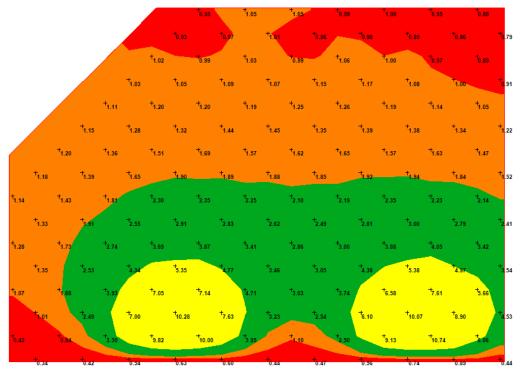
[GF000011] [D.F] CIE O. Sky 12:00 September 21

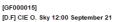
Minimum = 0.48 Maximum = 12.57 Average = 2.58 DF > 1.00 = 65.31 %

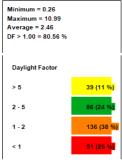
Daylight Factor

> 5	47 (14 %)
2 - 5	72 (22 %)
1 - 2	90 (28 %)
< 1	111 (34 %)

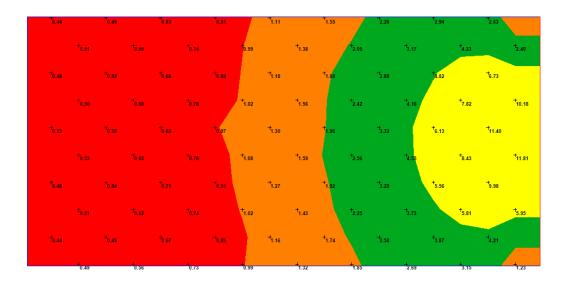
GF.03 Admin Office



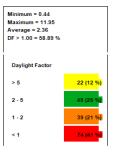




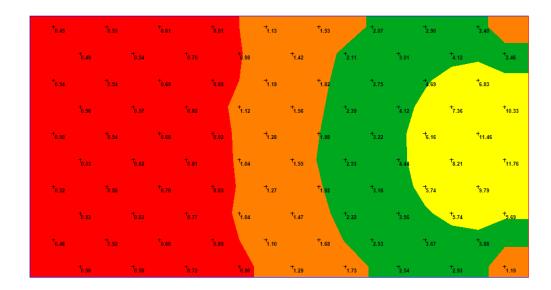
GF.15 1-2-1 Meeting



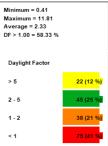
[GF00000B] [D.F] CIE O. Sky 12:00 September 21



GF.16 1-2-1 Meeting



[GF000001] [D.F] CIE O. Sky 12:00 September 21



GF.02 Foyer

