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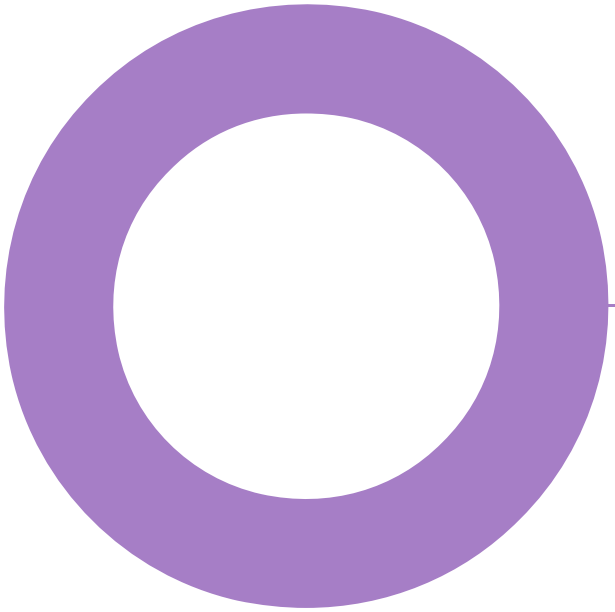
SUSTAINABILITY
DAYLIGHTING ANALYSIS REPORT

REVISION 03 – 08 OCTOBER 2019



Audit Sheet.

Rev.	Date	Description	Prepared	Verified
01	11/03/2019	BREEAM evidence submission	JT	RG
02	28/05/2019	Updated following client comments	JT	JF
03	08/10/2019	Updated for phased development	JT	RG

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Contents.

Executive Summary.

This report has been produced in support of the planning application for the development of a new Local Centre located in Elmsbrook. Full permission is sought for Local Centre Community floorspace (Use Class D1 with ancillary A1/A3), with a total GIA of 552 sqm, and 16 residential units (use class C3) with associated access, servicing, landscaping and parking. Outline consent is sought for Local Centre Retail, Community or Commercial Floorspace (flexible Use Class A1/A2/A3/A4/A5/B1/D1).

For the purpose of developing this daylight strategy, assumptions have been made on the predicted usage of these spaces. This has been performed to allow estimation of predicted usage of various spaces so it can be evaluated against relevant BREEAM criteria. The reference scheme is as follows:

1. Community Centre: A mix of floorspace to be used as a community hall (Use Class D1) and of floorspace to be used as a retail (Use Class A3), to be located adjacent to the community hall;

The aim of the daylighting analysis study is to demonstrate the development's performance in achieving the Daylighting credit of the Hea 01 -Visual Comfort issue associated with the BREEAM UK New Construction 2018 scheme.

The area analysis shows that 87.9% of the occupied spaces in the Community Centre achieve compliance with the average daylight factor limit of 2% Additionally all spaces comply with Criterion (b) and Criteria (c), therefore 2 credits may be awarded under Hea 01

1. Introduction.

Daylight is a free and natural source of illumination and should be utilised, where possible, as a way of reducing the use of artificial lighting within internal spaces. However, the external openings of a building can typically require the greatest compromise of any of the building's design elements when considered from energy, carbon and comfort perspectives.

Reducing glazed areas in a building will limit heat loss in the winter and heat gain in the summer. However, increasing glazing provision will improve daylight levels entering occupied spaces (reducing the requirement of artificial lighting). Various internal and external shading devices together with various glass specifications such as the U-value (heat transmittance), g-value (solar energy transmittance) and visible light normal transmittance can be used to reach a suitable compromise between the many criteria. However, it is important to note that a holistic approach must be taken in facade design, where daylighting and thermal performance are all considered.

In parallel with the results of a day-lighting assessment, shading and glare reduction should also be considered, especially in areas where computer screen or display equipment are likely to be used. A user operable system such as blinds should be installed in all occupied areas to enable the users to create a comfortable lighting level within the space.

2. Verification & Measurement.

The uniformity ratio defines the ratio between the minimum illuminance and average illuminance on a defined working plane. A higher uniformity ratio indicates that light levels on the working plane will not vary considerably, and if a good daylight factor is achieved, this can be assumed to be consistent throughout the space. An alternative method of showing adequate natural light can be achieved throughout the room is demonstrating a view of sky can be achieved from desk height and a room depth criterion is satisfied.

2.1 BREEAM Assessment & Measurement

This report has been produced for the BREEAM assessment of the Elmsbrook Community Centre which will be assessed as an "Other Non-residential institution" development.

The requirements for each space according to the BREEAM UK New Construction 2018 manual are as follow:

2 credits: 80% of the occupied areas achieve an average daylight factor of 2%.

The occupied areas are required to comply with either criterion a) or b) and c):

a) 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 value in Table 5.1 of the BREEAM UK New Construction 2018 manual. Spaces with glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7 or a minimum point daylight factor of at least 0.7 times the relevant daylight factor value in Table 5.1.

b) At least 80% of the room has a view of sky from desk or table top height (i.e. 0.7m).

c) The 'room depth criterion' is satisfied. The room depth criterion is defined as d/w +d/HW < 2/(1-RB) where:

- d = room depth,
- w = room width,
- HW = window head height from floor level,
- RB = average reflectance of surfaces in the rear half of the room,

Table 1 below, taken from BREEAM UK New Construction 2018, gives maximum room depths in meters for different room widths and window head heights of side-lit rooms.

Table 1 Reflectance for maximum room depths & window head heights; Source: BREEAM UK New Construction 2014 Technical manual

Reflectance (RB)	0.4		0.5		0.6	
Room width (m)	3	10	3	10	3	10
Window head height (m)						
2.5	4.5	6.7	5.4	8.0	6.8	10.0
3.0	5.0	7.7	6.0	9.2	7.5	11.5
3.5	5.4	8.6	6.5	10.4	8.1	13.0

3. Thermal Modelling Process.

IES Virtual Environment thermal modelling software has been used to carry out the daylighting assessment of Elmsbrook Local Centre. This software is approved by Building Regulations and is also compliant with CIBSE AM11 requirements. The software uses the FlucsDL module to carry out the simulations and model the effect of daylighting on the building. FlucsDL has been also used to assess the uniformity ratio within each of the assessed occupied spaces.

A thermal model was constructed using IES VE 2018. The model includes the relevant adjacent building. Only the occupied building spaces have been assessed for compliance against the daylighting criteria.

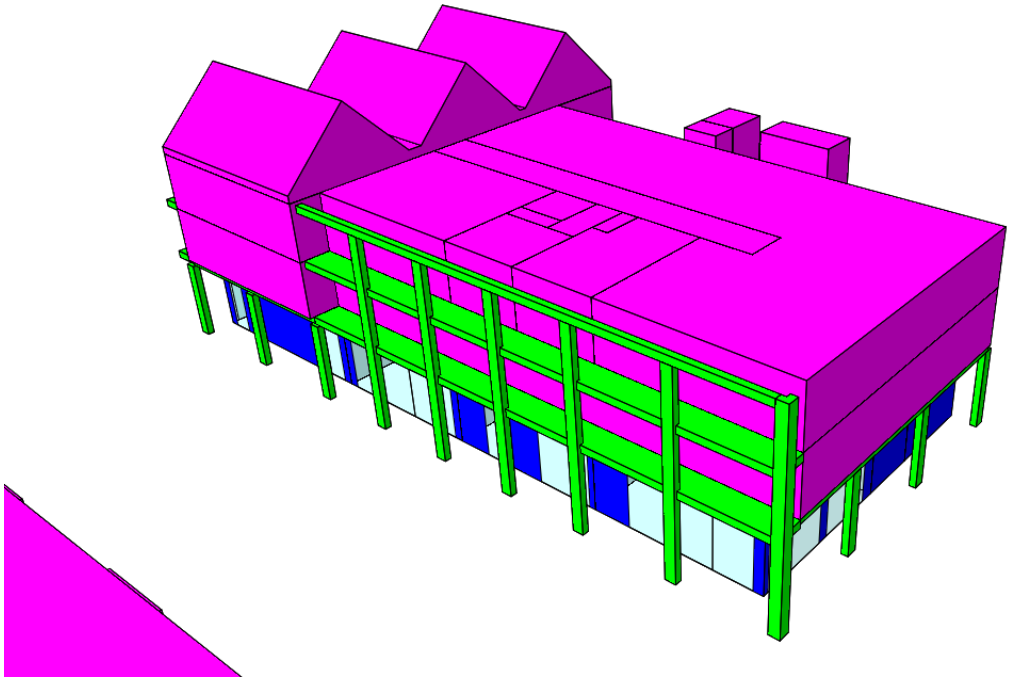

Figure 1: Elmsbrook Local Centre – South East View

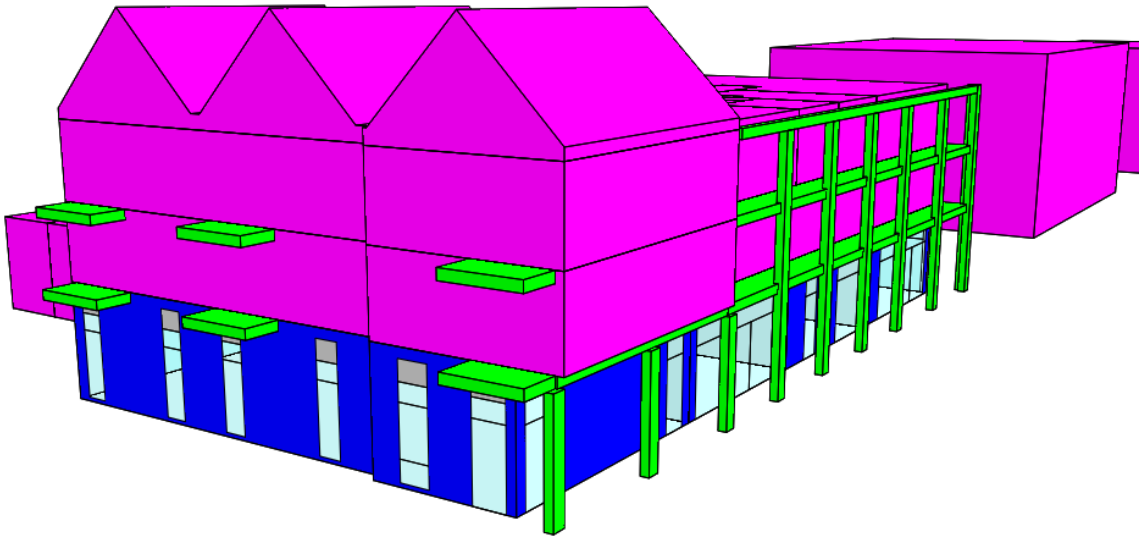

Figure 2: Elmsbrook Local Centre – South West View

3.1 Surface Properties

The following internal surfaces properties have been included in the model, these are based on the IES VE default values:

Table 2: Internal surfaces properties

Building element	Light reflectance value	
	Inside	Outside
External wall	50	10
Internal partition	50	50
Roof	25	10
Internal floor, ceiling	70	20
Ground / Exposed floor	20	-
External Glazing	7 (@65% transmittance)	7 (@65% transmittance)

3.2 Applicable Spaces for Assessment

According to the BREEAM UK New Construction 2018 technical manual, areas occupied continuously for 30 minutes or more should be included in the daylighting assessment. Areas such as WCs, showers, storage areas, stairs, lobby areas, corridors, risers, plant rooms, etc, are not expected to be occupied continuously for 30 minutes or more and therefore have been omitted.

4. Results.

4.1 Resultant Images from the Daylighting Analysis Software

Images from the daylighting analysis in the IES software are shown in the figures below. Each image shows the assessed areas for each evaluated area.

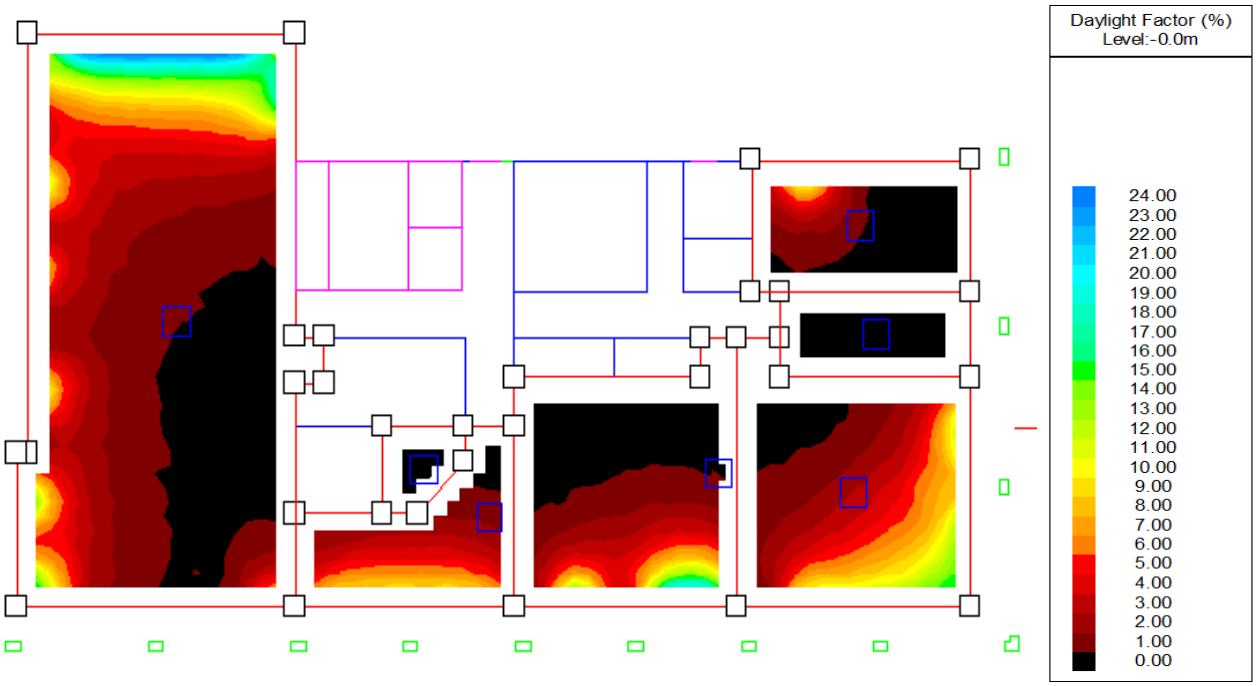

Figure 3: Elmsbrook Community Centre - Occupied Spaces

4.2 Results assessed against BREEAM Criteria (a) – (c)

Table 3-5 summarises the results from all the occupied spaces assessed for Criteria (a) to (c). The spaces which do not achieve a minimum average daylight factor of 2% or greater are classified as 'failed' for Criterion (a). The failed spaces were then assessed further for compliance against Criteria (b) & (c).

Uniformity values have been calculated in the IES Virtual Environmental Modelling software and the spaces that met the minimum uniformity of 0.3 have then been assessed against Criterion (c), the Room Depth Criterion. The calculations for assessing compliance against Criterion (c) are included in Appendix A.

Table 3 shows that 87.9% of the occupied spaces in the Community Centre achieve compliance with the average daylight factor limit of 2% Additionally all spaces comply with Criterion (b) and Criteria (c), therefore 2 credits may be awarded under Hea 01.

Room Name	Area (m²)	Ave. Daylight Factor	Uniformity ratio	Ave. Sky view	Min. Daylight Factor	Criterion a)	Criterion b) Sky view	Criterion c) Room depth	Overall compliance
Main Hall	180.50	3.90%	0.12	1.00	0.5%	No	Yes	Yes	Yes
Office/Reception	3.73	0.40%	0.40	1.00	20.0%	Yes	Yes	N/A	No
Main Reception	22.13	4.10%	0.09	1.00	0.4%	No	Yes	Yes	Yes
Small Hall	54.20	2.70%	0.03	0.90	0.0%	No	Yes	Yes	Yes
café bar	57.43	4.60%	0.06	1.00	0.2%	No	Yes	Yes	Yes
Servery bar	12.71	0.40%	0.21	1.00	0.1%	No	Yes	N/A	No
Kitchen	27.01	1.40%	0.09	0.98	0.1%	No	Yes	N/A	No

Total Area Compliant	314.26	87.9%
Total Area Non-compliant	43.45	12.15%

Table 3:Elmsbrook Community Centre - Summary of compliance for each occupied space

Appendix A - Room Depth Criterion Analysis Results.

Floor	Room Name	Depth - d (m)	Width - w (m)	Window head height - HW (m)	Ceiling reflectance	Floor reflectance	Wall reflectance	RB	d/w +d/HW < 2/(1-RB)?
Community	Main Hall	10.0	20.0	3.3	0.7	0.2	0.5	0.48	Yes
Community	Main Reception	3.3	8.0	3.3	0.7	0.2	0.5	0.49	Yes
Community	Small Hall	8.1	8.1	3.3	0.7	0.2	0.5	0.48	Yes
Community	café bar	8.1	8.4	3.3	0.7	0.2	0.5	0.48	Yes
Community	Servery bar	2.9	6.1	3.3	0.7	0.2	0.5	0.48	Yes
Community	Kitchen	4.6	7.4	3.3	0.7	0.2	0.5	0.48	Yes

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