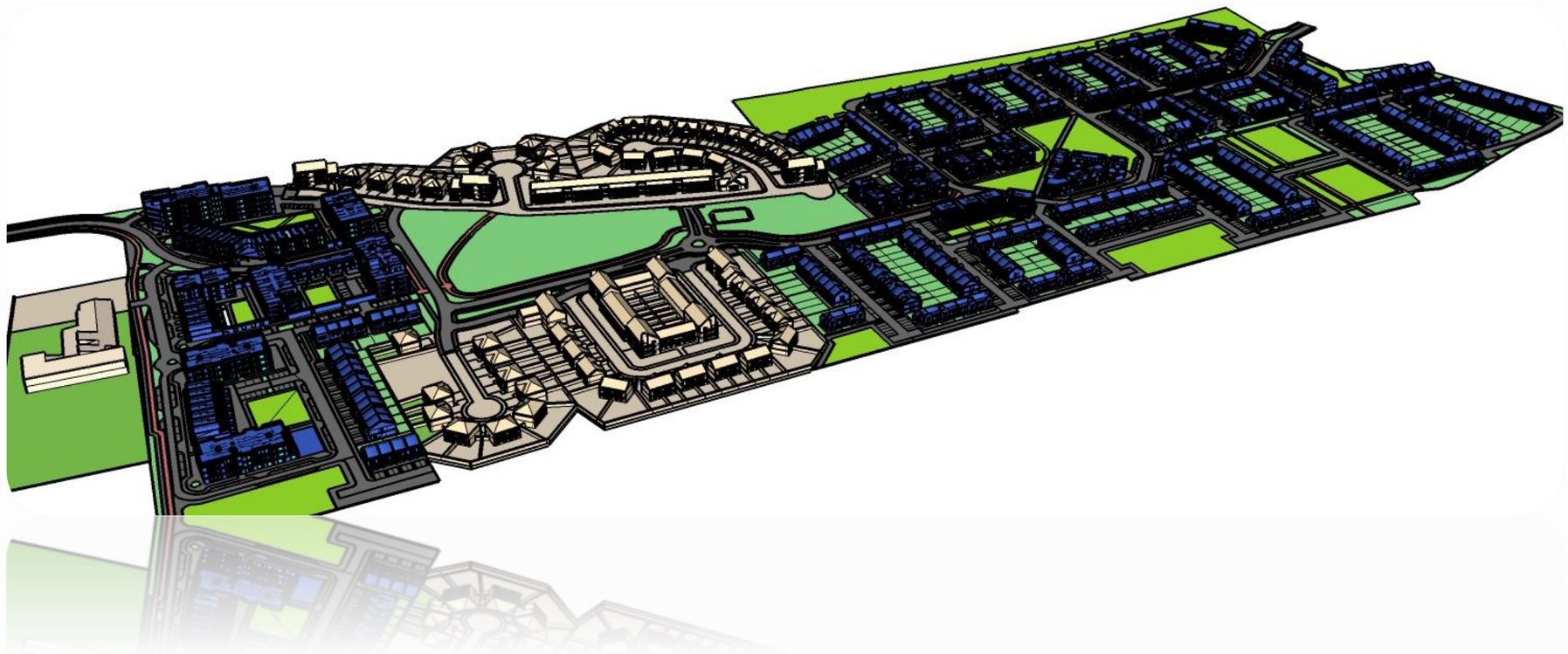
LISSWOLLEN SHD, ATHLONE

Sunlight, Daylight & Shadow Assessment (impact Neighbours and Development Performance)

V2



CSC | Chris Shackleton Consulting

http://www.shackleton.ie info@shackleton.ie

Chris Shackleton Consulting
19 Waterside Crescent
Swords Road, Malahide,
Co Dublin, K36 DF74
email: info@shackleton.ie
Tel: +353-1-5653239
Mob: +353-86-8206374

Executive Summary

This report examines the impact the proposed development will have on neighbours in terms of daylight, sunlight & shadow. We will also examine how the proposed development performs in terms of light. The report is, in accordance with "Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice" and BS 8206 Lighting for Buildings, Part 2: Code of Practice for Daylighting.

It should be noted at the outset that the BRE document sets out in its introduction that:

> *"Summary Page . . . It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."*
>
> *" 1.6 . . . The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design. . . . "*

Change/Impact to existing buildings in the adjoining residential areas

- **Skylight- VSC**– All tested windows pass the relevant VSC checks.
  - The VSC average change ratio is **0.86**
- **Sunlight APSH & WPSH –** All tested windows pass the relevant Annual and WPSH checks.
  - The average change ratio for annual sunlight APSH is **0.91** and for winter WPSH is **0.84**
- **Shadow –** All tested amenity spaces pass the 2-hour test requirements for the 21st March.
  - The average change ratio for the tested amenity spaces is **0.99**

Performance of the proposed design

- **Light Distribution ADF -** ADF (average daylight factors) for all tested rooms blocks: **B, C, D, E, L, M, O, S & T** at GFL (Ground Floor Level) comply with the relevant requirements.
  - The development shows excellent ADF results.
  - Average ADF for all tested Living Rooms: **3.3%**, Bedrooms: **2.3%** & Kitchens: **2.6%**
  - Only one room a kitchen D01-K which is in a corner is marginal at 1.7%
- **Sunlight to Living rooms:** All Living rooms receive some sunlight over the course of the year.
  - **78%** achieve the BRE Annual APSH and **76%** the Winter WPSH requirements.
  - This is in generally in accordance with what the guidelines define as "careful" design **80%**.
  - These results should be considered in conjunction with the high daylight ADF results achieved throughout.
- **Shadow:** All relevant new provided shared and public amenity spaces pass the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.
  - The communal core space **AC04** is fully enclosed and the design is cognisant of the lack of sunlight to this space.

The application generally complies with the recommendations and guidelines of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE 2011) and BS 8206 Lighting for Buildings and Part 2: Code of Practice for Daylighting.

This development has been successfully designed to maximise the occupant's access to light and reduce the impact on "existing" buildings. As such the design has used the guidelines in the spirit they have been written and balanced the requirements of this report with other constraints to arrive at this design.

Introduction

Chris Shackleton Consulting (CSC) have been asked to examine the impact that the proposed development will have on the existing neighbouring properties in terms of sunlight, daylight & shadow. We have also been asked to examine how the proposed development performs in terms of light.

This analysis has been carried out in accordance with the recommendations of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE 2011) and BS 8206 Lighting for Buildings and Part 2: Code of Practice for Daylighting.

> ***All references quoted in this report are from BRE document "Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice – Second Edition – 2011 (BR 209) by Paul Littlefair" unless specifically noted otherwise.***

Preliminary Overview

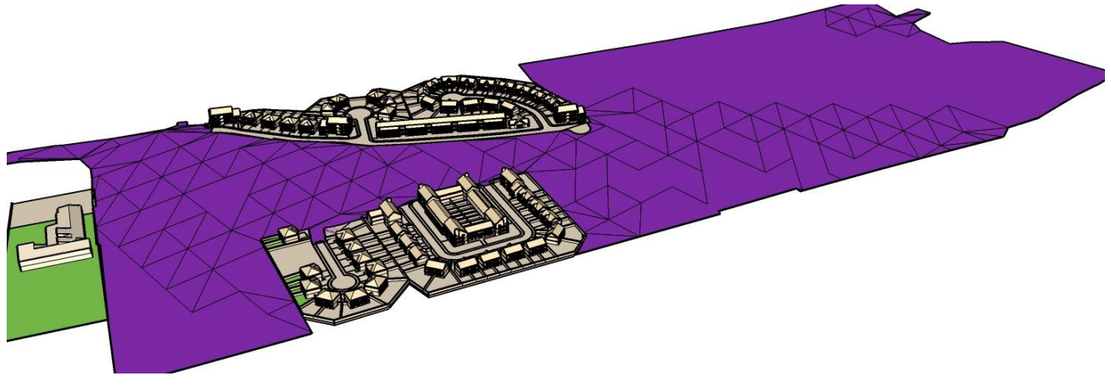
The aerial view shows the context for the site and the closest neighbouring window groups.

Google Earth extract © Google 2020

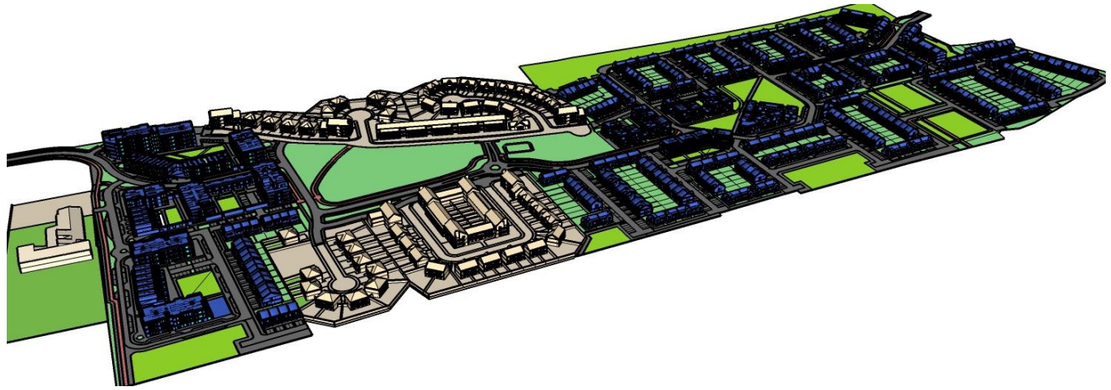
Design Model

A 3D model of the proposed development and the surrounding neighbouring properties was provided by the Architect. These had been modelled from survey information and drawings provided in plan, elevation, and section formats. The model was geo-referenced to its correct location and an accurate solar daylight system was introduced. Here “Cream” indicates surrounding environment, “Purple” the existing site, “Blue” this proposal.

The analysis is based on the information provided.



Existing Model



Proposed Model

Scope of this Report

We have been asked to address the following specific items in this report and our scope is limited to the same:

Impact on Existing Neighbours

In this document we will assess the potential impact of the proposed development on the neighbouring residential houses. We will test for the following in relation to impact:

- Existing facing windows for:
  - Impact/Change for Skylight – **V**ertical **S**ky **C**omponent - VSC
  - Impact/Change for **P**robable **S**unlight **H**ours – Annual APSH and Winter WPSH
- Existing amenity spaces for impact/change on Sunlight/Shadow

Development Performance

For the proposed development we will examine the performance of the development under the following headings:

- Light distribution Average Daylight Factor – ADF – All habitable rooms
- Sunlight availability - Living room spaces APSH/WPSH.
- Shadow performance proposed shared and public amenity spaces

When examining the internal performance of the development we note that the layout and rooms follow similar design principles floor to floor. When testing the blocks performance, we have chosen to test the entire floor at GFL - ground floor level which provides a good representative indication of the overall building performance.

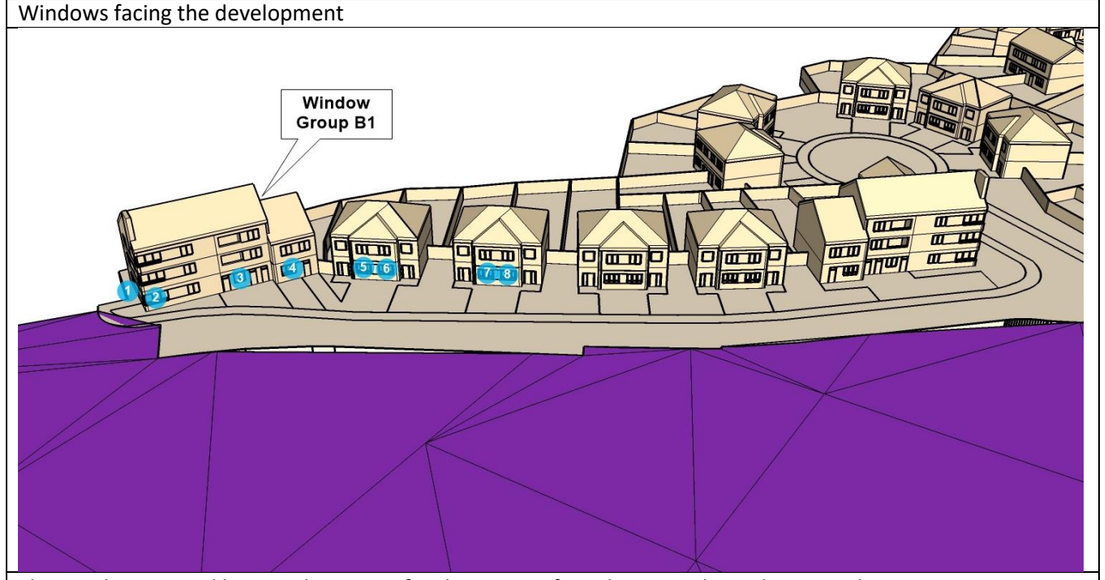
Adjacent Properties Details

The numbering used later for windows in each of the blocks is detailed below.

Neighbours – North (Window Group B1)

Oblique imagery © Google 2020

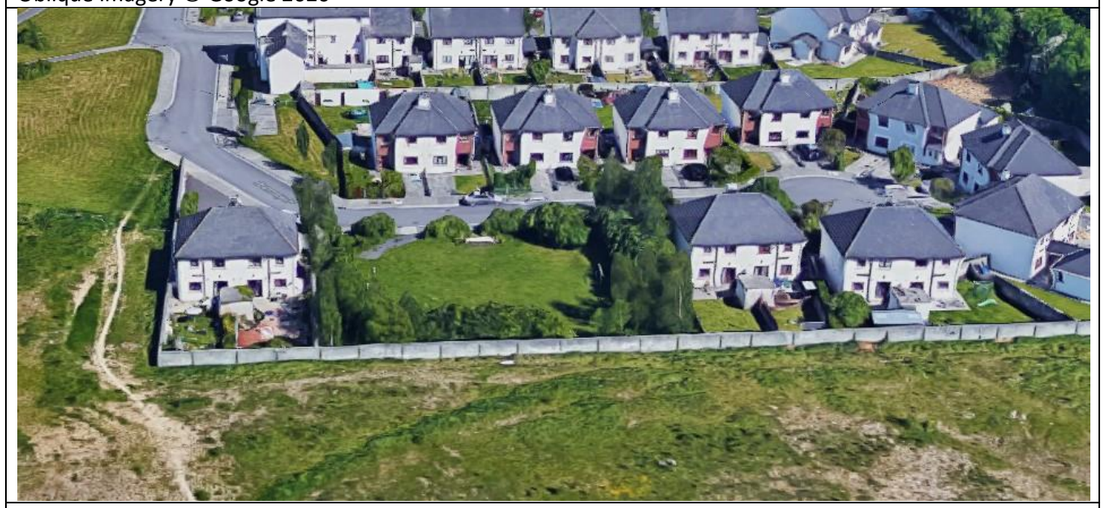
Windows facing the development



The numbering used later in this report for this group of windows is indicated in cyan above.

Neighbours– South (Window Group B2)

Oblique imagery © Google 2020



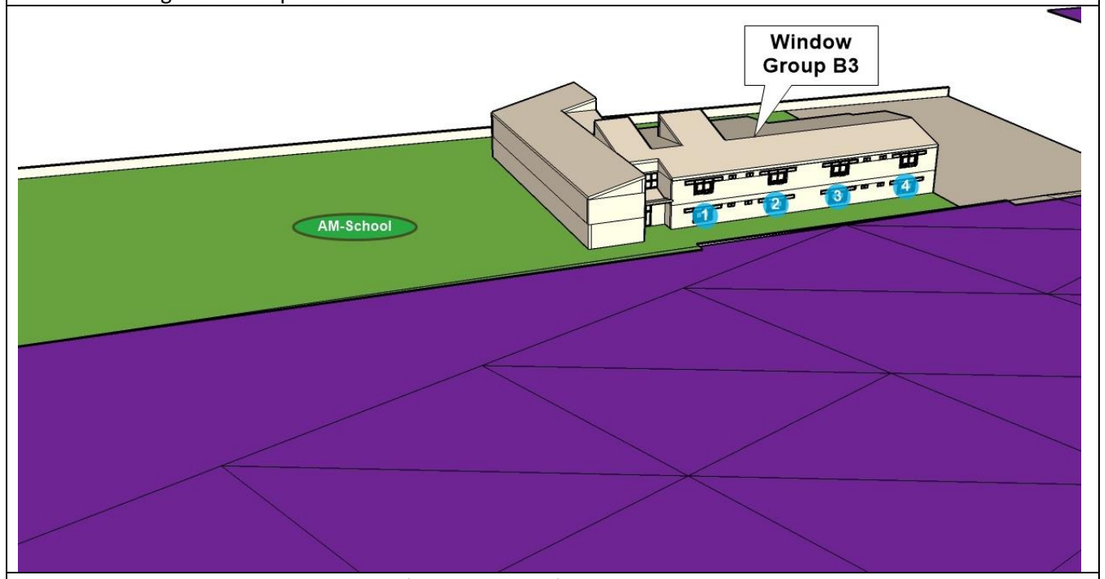
Windows facing the development

The numbering used later in this report for this group of windows is indicated in cyan above.
Amenity spaces (gardens) are noted in green

Neighbours – West (Window Group B3)

Oblique imagery © Google 2020

Windows facing the development



The numbering used later in this report for this group of windows is indicated in cyan above.
Amenity spaces (gardens) are noted in green

Impact on neighbours

Adjacent Properties - Light from the Sky impact on neighbouring properties

Tests were carried out to establish the quantity and quality of skylight (daylight) available to a room's windows. Locations tested are based on guideline recommendations for the closest facades which have windows with potential for impact.

We have investigated this impact under clause 2.2.7

> ***2.2.7 If this VSC is greater than 27% then enough skylight should still be reaching the window of the existing building. Any reduction below this level should be kept to a minimum. If the VSC, with the new development in place, is both less than 27% and less than 0.8 times its former value, occupants of the existing building will notice the reduction in the amount of skylight. The area lit by the window is likely to appear more gloomy, and electric lighting will be needed more of the time.***

> ***2.2.6 Any reduction in the total amount of skylight can be calculated by finding the VSC at the centre of each main window. In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground (or balcony level for an upper storey) on the centre line of the window may be used. For a bay window, the centre window facing directly outwards can be taken as the main window. If a room has two or more windows of equal size, the mean of their VSCs may be taken. The reference point is in the external plane of the window wall. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed. . . .***

Tabulated results

	Skylight to habitable rooms					
	VSC					
Report	*Check > 27% or ratio > 0.8*					
Ref	Floor	Window	Existing	Proposed	Ratio	Result
B1	00-GFL	W1	38.9	33.7	0.87	Pass
B1	00-GFL	W2	38.5	31.8	0.83	Pass
B1	00-GFL	W3	37.9	33.1	0.87	Pass
B1	00-GFL	W4	37.6	33.4	0.89	Pass
B1	00-GFL	W5	38.6	33.6	0.87	Pass
B1	00-GFL	W6	38.7	33.5	0.87	Pass
B1	00-GFL	W7	38.9	32.8	0.84	Pass
B1	00-GFL	W8	38.9	32.8	0.84	Pass
B2	00-GFL	W1	38.9	33.1	0.85	Pass
B2	00-GFL	W2	38.9	33.2	0.85	Pass
B2	00-GFL	W3	38.5	32.3	0.84	Pass
B2	00-GFL	W4	33.0	28.2	0.85	Pass
B2	00-GFL	W5	39.0	32.2	0.83	Pass
B2	00-GFL	W6	39.1	32.8	0.84	Pass
B3	00-GFL	W1	38.1	33.8	0.89	Pass
B3	00-GFL	W2	38.5	33.8	0.88	Pass
B3	00-GFL	W3	38.5	33.8	0.88	Pass
B3	00-GFL	W4	38.5	33.8	0.88	Pass

Note: When the proposed value exceeds the minimum requirement the ratio check is not required, and the result is coloured grey.

Conclusion

When tested with the new development in place, the VSC for all tested windows was greater than 27%, or not breaching the 0.8 times its former value limit for habitable rooms.

The VSC average change ratio is **0.86**

The proposed development complies with the requirements of the BRE guidelines in relation to maintaining skylight availability for neighbours.

Adjacent Properties - Sunlight into living spaces

Tests for the amount of sunlight that windows to living room and/or conservatory can receive over both annual and winter periods.

> ***3.2.3 To assess loss of sunlight to an existing building, it is suggested that all main living rooms of dwellings, and conservatories, should be checked if they have a window facing within 90˚of due south. . . .***
>
> ***3.2.11 . . . sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:***
> ***• receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and***
> ***• receives less than 0.8 times its former sunlight hours during either period and***
> ***• has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.***

While not all windows may relate to living rooms, we have for completeness tested all of them. Note only windows which face within 90˚of due South require testing and those that do not, are notionally labelled as "North" in the table below.

The results are tabulated below:

			Sunlight on windows to living room spaces check							
			Annual - 25% and Winter - 5%							
Design			*Check > 25% or ratio > 0.8*				*Check > 5% or ratio > 0.8*			
Ref	Floor	Window	Existing	Proposed	Ratio	Result	Existing	Proposed	Ratio	Result
B1	00-GFL	W1	North	North		Pass	North	North		Pass
B1	00-GFL	W2	75.7	69.8	0.92	Pass	33.4	31.2	0.94	Pass
B1	00-GFL	W3	69.2	65.0	0.94	Pass	29.7	27.3	0.92	Pass
B1	00-GFL	W4	68.6	65.4	0.95	Pass	26.9	23.9	0.89	Pass
B1	00-GFL	W5	59.1	54.8	0.93	Pass	24.7	20.6	0.83	Pass
B1	00-GFL	W6	59.1	54.4	0.92	Pass	24.7	20.1	0.81	Pass
B1	00-GFL	W7	59.1	53.9	0.91	Pass	24.7	20.8	0.84	Pass
B1	00-GFL	W8	59.1	54.6	0.92	Pass	24.7	21.9	0.88	Pass
B2	00-GFL	W1	North	North		Pass	North	North		Pass
B2	00-GFL	W2	North	North		Pass	North	North		Pass
B2	00-GFL	W3	North	North		Pass	North	North		Pass
B2	00-GFL	W4	North	North		Pass	North	North		Pass
B2	00-GFL	W5	North	North		Pass	North	North		Pass
B2	00-GFL	W6	North	North		Pass	North	North		Pass
B3	00-GFL	W1	62.3	55.1	0.88	Pass	24.5	19.2	0.78	Pass
B3	00-GFL	W2	65.0	58.5	0.90	Pass	27.3	22.5	0.83	Pass
B3	00-GFL	W3	65.0	56.2	0.87	Pass	27.2	21.2	0.78	Pass
B3	00-GFL	W4	64.8	56.7	0.88	Pass	27.1	21.3	0.79	Pass

Note: When the proposed value exceeds the minimum requirement the ratio check is not required, and the result is coloured grey.

Conclusion

When tested with the proposed development in place:
All tested windows comply with the annual APSH and winter WPSH requirements for sunlight.

The average change ratio for annual sunlight APSH is **0.91** and for winter WPSH is **0.84**

The proposed development complies with the requirements of the BRE guidelines in relation to both annual and winter sunlight availability to neighbours as it applies to living rooms and conservatories.

Adjacent Properties - Shadow/Sunlight - Gardens and Open spaces

Tests for the availability of sunlight in amenity areas.

Shadow/Sunlight - Clause 3.3.17

> ***It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March.***

> ***3.3.3 The availability of sunlight should be checked for all open spaces where it will be required. This would normally include:***
> ***• gardens, usually the main back garden of a house***
> ***• parks and playing fields***
> ***• children's playgrounds***
> ***• outdoor swimming pools and paddling pools***
> ***• sitting out areas such as those between non-domestic buildings and in public squares***
> ***• focal points for views such as a group of monuments or fountains.***

The amenities of the following properties were tested.

- Rear gardens Group B2 and the School Group B3

BRE 2-hour Shadow Plots

The graphic below indicates the areas which receive 2 hours of sunlight on the 21st March in accordance with the BRE guidelines.

- **Green** represents areas which exceed the 2-hour requirement - pass
- **Red** is less than the 2-hour requirement - fail
- **Orange** are marginal or borderline - just below the 2-hour requirement

Existing

Proposed

The results are tabulated below:

		Shadow to amenity spaces			
	Design	**2-hour Sunlight - 21st March**			
		Check > 50% or ratio > 0.8			
Zone	**Description**	**Existing**	**Proposed**	**Ratio**	**Result**
AM2-01	Rear Garden Group B2	54.3	54.3	1.00	Pass
AM2-02	Rear Garden Group B2	73.9	73.9	1.00	Pass
AM2-03	Rear Garden Group B2	61.9	61.9	1.00	Pass
AM2-04	Rear Garden Group B2	42.2	41.0	0.97	Pass
AM2-05	Rear Garden Group B2	55.5	55.5	1.00	Pass
AM2-06	Rear Garden Group B2	73.0	70.9	0.97	Pass
AM-School	School play space Group B3	95.0	95.0	1.00	Pass

Note: When the proposed value exceeds the minimum requirement the ratio check is not required, and the result is coloured grey.

Please note that passing the BRE requirements does not imply that shadows will not be cast over an amenity space at all. Shadows which are transient by nature may not impact on the percentage of the space which receives 2 hours of sunlight on the 21st of March.

Conclusion

All tested neighbouring amenity spaces pass the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50% or not breaching the 0.8 times its former value limit.

The average change ratio for the tested amenity spaces is **0.99**

The proposed development has no BRE impact on these areas at all and complies with the requirements of the BRE guidelines.

Summary - Adjacent Properties

Neighbouring properties will generally not be affected by the proposed development and the impacts on Skylight, Sunlight and Shadow have been tested in accordance with the best practice guidelines.

- **Change/Impact to existing buildings in the adjoining residential areas**
  - **Skylight- VSC**– All tested windows pass the relevant VSC checks.
    - The VSC average change ratio is **0.86**
  - **Sunlight APSH & WPSH –** All tested windows pass the relevant Annual and WPSH checks.
    - The average change ratio for annual sunlight APSH is **0.91** and for winter WPSH is **0.84**
  - **Shadow –** All tested amenity spaces pass the 2-hour test requirements for the 21st March.
    - The average change ratio for the tested amenity spaces is **0.99**

The potential impact of the proposed development on neighbours complies with the requirements of "Site layout planning for daylight and sunlight a guide to good practice Second Edition" - 2011 by Paul J Littlefair - BR209

Development Performance

Development Performance - Average Daylight Factor - ADF

Internal light distribution within a room is examined by testing ADF (Average Daylight Factor) against pre-defined parameters. Calculation of average daylight factor is based the BRE guidance document BR 209 and the referenced *BS 8206-2:2008 Lighting for buildings – Part 2: Code of practice for daylighting*.

This is defined under **Clause 2.11.3**

Daylight Factor

> ***Ratio of illuminance at a point on a given plane due to light received from a sky of known or assumed luminance distribution, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky [BS 6100-7:2008, 59011]***

Defined in the **BRE 209 Glossary (similarly in the BS code Clause 2.11.4 and 5.5)**

Average daylight factor:

> ***Ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% ADF would mean that the average indoor illuminance would be one hundredth the outdoor unobstructed illuminance***

The average daylight factor (see 2.11.4) is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%.

If the average daylight factor in a space is at least 5% then electric lighting is not normally needed during the daytime, provided the uniformity is satisfactory (see 5.7 BS or 2.1.8 BRE 209). If the average daylight factor in a space is between 2% and 5% supplementary electric lighting is usually required. Values greater than 6% might suggest that the room has too much daylight.

- For the purposes of the calculation of daylight factor in this standard, it is assumed that the sky has the luminance distribution of the standard overcast sky.
- Direct and reflected sunlight are excluded from all values of illuminance.

This Code also provides under **Clause 5.6** guidance for

Minimum values of average daylight factor in dwellings

> ***Even if a predominantly daylit appearance is not achievable in a dwelling, it is recommended that the average daylight factor should be at least the relevant value as given in Table 2 or clause 2.1.8 BRE 209***

Table 2 - Minimum average daylight factor

Room type	Minimum Average daylight factor %
Bedrooms	1
Living rooms	1.5
Kitchens	2

> ***Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%.***

In accordance with BRE 209 & BS 8206-2 computations are based on the standard CIE (Commission Internationale de l´Eclairage) overcast sky model. With the exclusion of direct and reflected sunlight from the computation of room average daylight factor it may be considered as worst-case scenario.

Light distribution was computed by modelling the internal configuration of rooms and windows placed within the existing topography and the adjacent buildings and then running a radiance analysis on the same. This analysis was based on a standard working plane for residential of 0.850m and results are provided in terms of Average Daylight Factor for selected rooms. See code for definitions.

The following reflectance/transmittance values were used for the analysis These are generally from BS 8206 Part 2 - tables A.1 & A.2

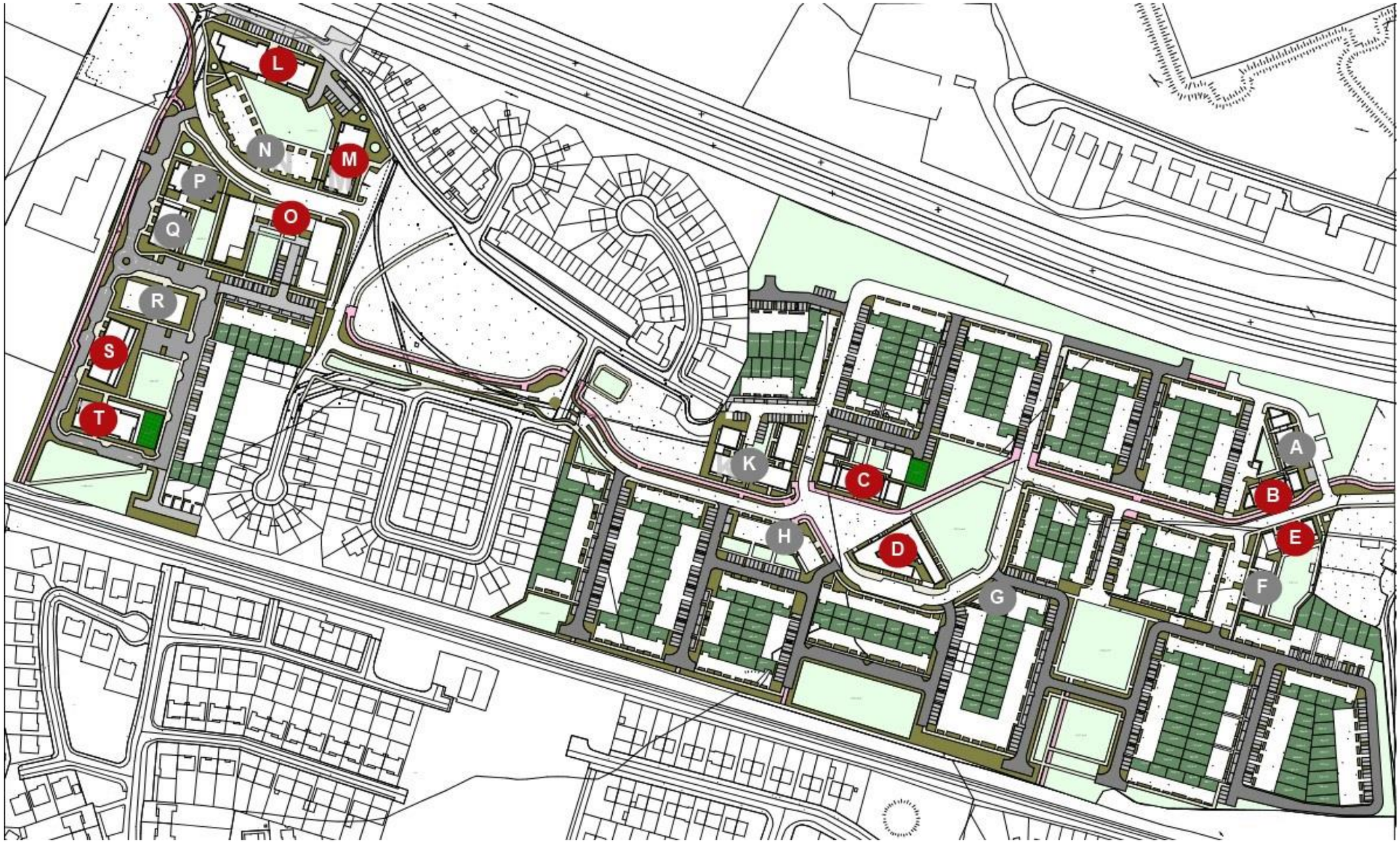
Surface	Description	Reflectance		
External Plane	Earth	0.2		
External Walls	Grey render / concrete	0.4		
Floor	Light Wood / cream carpet	0.4		
Internal Wall	Cream	0.7		
Ceiling	White	0.8		
Frame	Medium Grey	0.5		
Glass	Sealed double glazed unit	0.63	**<Transmittance**	

We note that for apartment developments the majority of councils in Ireland and the UK accept the lower value of 1.5% assigned to living rooms to also include those with a small food preparation area (kitchen) as part of this space. The higher kitchen figure of 2.0% is more appropriate to a traditional house layout and room usage. The use of a reduced value accepted by Local Authorities is still compliant within the terms of the guidelines. This has been confirmed as acceptable and standard practice by the author Dr Paul Littlefair.

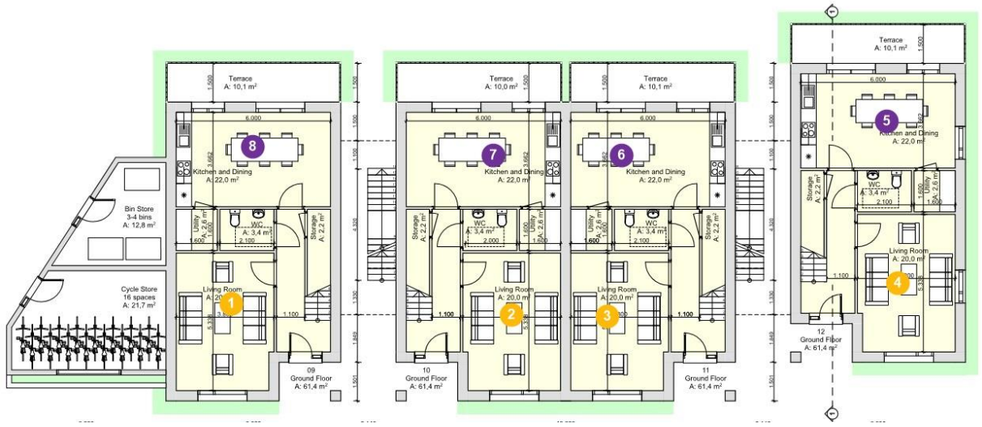
We have thus used the minimum values of **1.0%** for bedrooms and **1.5%** for the Living room spaces.

A selection of apartments was tested all at GFL namely blocks: **B, C, D, E, L, M, O, S & T.** These blocks were chosen for testing as they are considered representative of the worst-case scenario across the scheme in terms of receipt of light and considered an accurate representation of the design / building form of the overall apartment blocks proposed

Apartments selected for testing, B, C, D, E, L, M, O, S & T, highlighted in red:



GFL Floor Layout – Block B – Naming Convention



Legend for radiance plots:

Daylight Factor [DF] %

0%	0.5%	1%	1.5%	2%	3%	4%	5%	6%+

GFL Floor Analysis

B-v2	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	**Ref**	**Type**	**Min**	**ADF**	**Check**
1	B01-L	Living Room	1.5	1.8	Pass
2	B02-L	Living Room	1.5	1.7	Pass
3	B03-L	Living Room	1.5	1.7	Pass
4	B04-L	Living Room	1.5	2.8	Pass
5	B05-K	Kitchen	2.0	2.0	Pass
6	B06-K	Kitchen	2.0	2.6	Pass
7	B07-K	Kitchen	2.0	3.0	Pass
8	B08-K	Kitchen	2.0	3.1	Pass
				Pass	8
				Count	8
				Percentage	100%

ADF Check – Block B - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

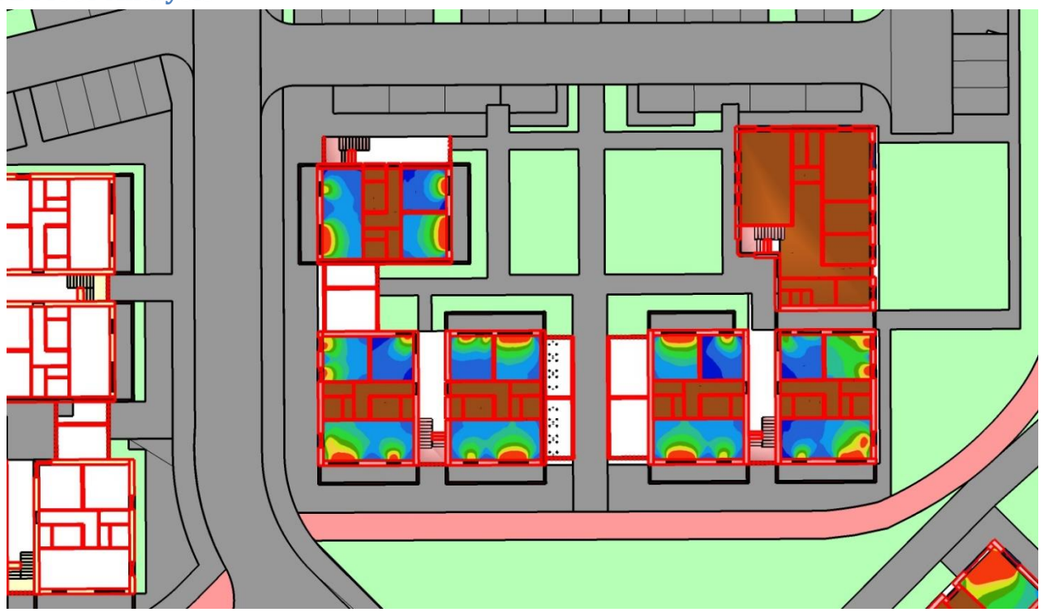
Average ADF for the tested living rooms is 2.0% and for Kitchens 2.5%

GFL Floor Layout – Block C – Naming Convention

Legend for radiance plots:

C-v2	Average Daylight Factor				
				For all habitable rooms	
	ADF Values from radiance 3D model			Yes	
		Type			
Room	**Ref**	**Type**	**Min**	**ADF**	**Check**
1	C01-L	Living Room	1.5	2.0	Pass
2	C02	Bedroom	1.0	2.8	Pass
3	C03	Bedroom	1.0	1.3	Pass
4	C04-L	Living Room	1.5	2.4	Pass
5	C05	Bedroom	1.0	1.1	Pass
6	C06	Bedroom	1.0	2.1	Pass
7	C07-L	Living Room	1.5	2.3	Pass
8	C08	Bedroom	1.0	2.6	Pass
9	C09	Bedroom	1.0	1.6	Pass
10	C10-L	Living Room	1.5	2.3	Pass
11	C11	Bedroom	1.0	1.1	Pass
12	C12	Bedroom	1.0	2.8	Pass
13	C13-L	Living Room	1.5	2.1	Pass
14	C14	Bedroom	1.0	3.0	Pass
15	C15	Bedroom	1.0	1.0	Pass
				Pass	15
				Count	15
				Percentage	100%

GFL Floor Analysis



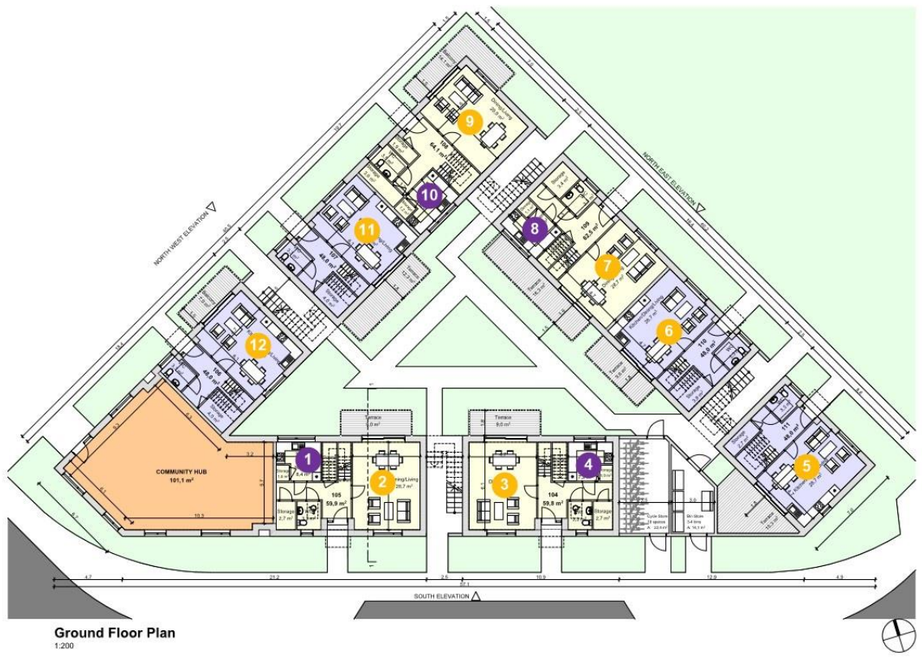
ADF Check – Block C - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

Average ADF for the tested living rooms is 2.2% and for bedrooms 2.0%

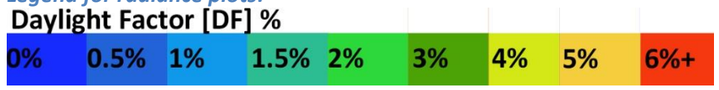
GFL Floor Layout – Block D – Naming Convention



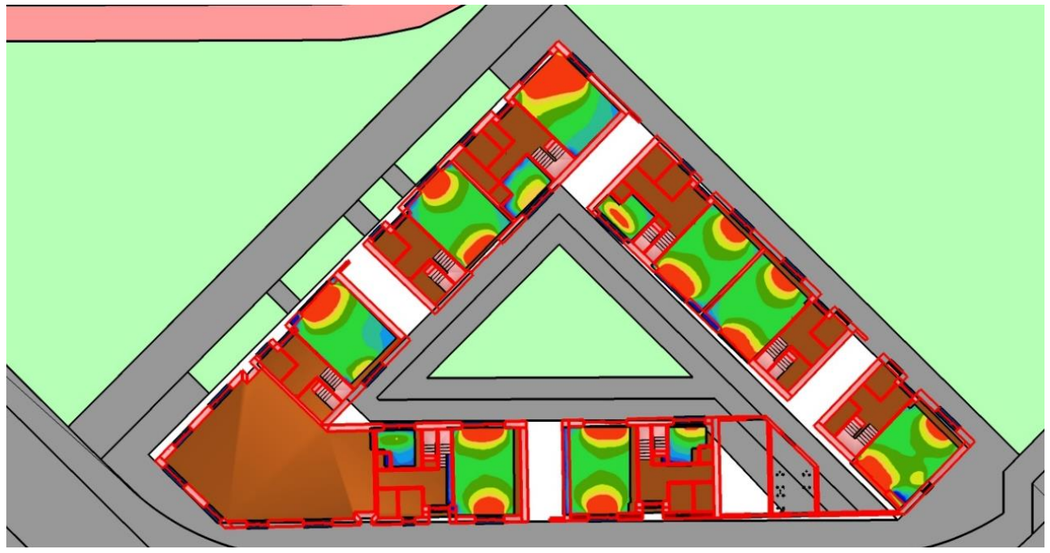
Ground Floor Plan
1:200

D-v2	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	**Ref**	**Type**	**Min**	**ADF**	**Check**
1	D01-K	Kitchen	2.0	1.7	**1
2	D02-L	Living Room	1.5	4.1	Pass
3	D03-L	Living Room	1.5	4.1	Pass
4	D04-K	Kitchen	2.0	2.2	Pass
5	D05-L	Living Room	1.5	6.1	Pass
6	D06-L	Living Room	1.5	5.1	Pass
7	D07-L	Living Room	1.5	4.4	Pass
8	D08-K	Kitchen	2.0	3.4	Pass
9	D09-L	Living Room	1.5	5.4	Pass
10	D10-K	Kitchen	2.0	2.7	Pass
11	D11-L	Living Room	1.5	4.0	Pass
12	D12-L	Living Room	1.5	4.7	Pass
				Pass	11
				Count	12
				Percentage	92%

Legend for radiance plots:



GFL Floor Analysis



ADF Check – Block D - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

***1 Only the kitchen D01-K is marginal at 1.7%*

Average ADF for the tested living rooms is 4.7% and for Kitchen 2.5%

GFL Floor Layout – Block E – Naming Convention

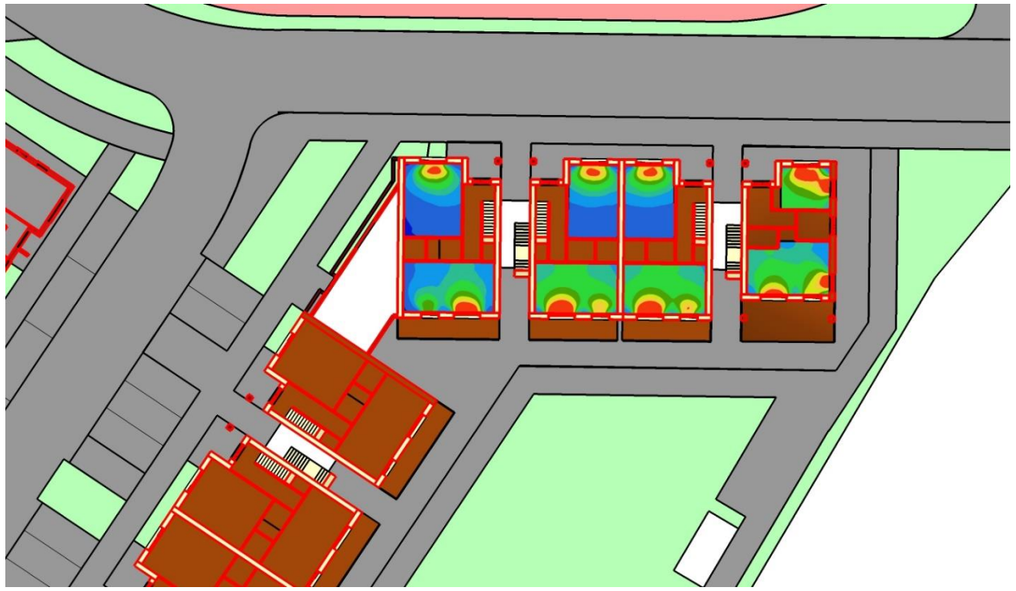
Ground Floor
1:100

Legend for radiance plots:

Daylight Factor [DF] %

0%	0.5%	1%	1.5%	2%	3%	4%	5%	6%+

GFL Floor Analysis



E	Average Daylight Factor				
				For all habitable rooms	
	ADF Values from radiance 3D model			Yes	
		Type			
Room	**Ref**	**Type**	**Min**	**ADF**	**Check**
1	E01-K	Kitchen	2.0	2.1	Pass
2	E02-K	Kitchen	2.0	3.1	Pass
3	E03-K	Kitchen	2.0	3.2	Pass
4	E04-L	Living Room	1.5	2.7	Pass
5	E05	Bedroom	1.0	4.1	Pass
6	E06-L	Living Room	1.5	1.7	Pass
7	E07-L	Living Room	1.5	1.7	Pass
8	E08-L	Living Room	1.5	1.5	Pass
				Pass	8
				Count	8
				Percentage	100%

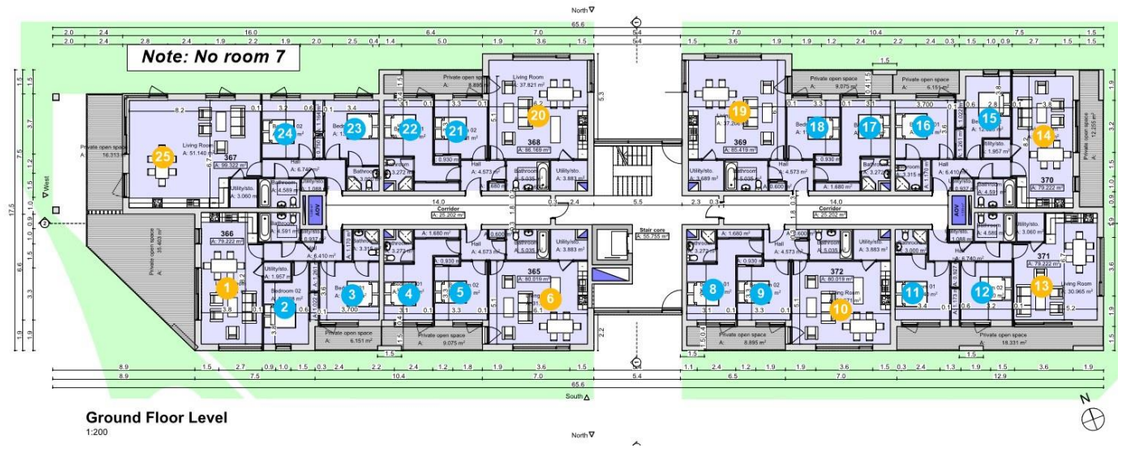
ADF Check – Block E - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

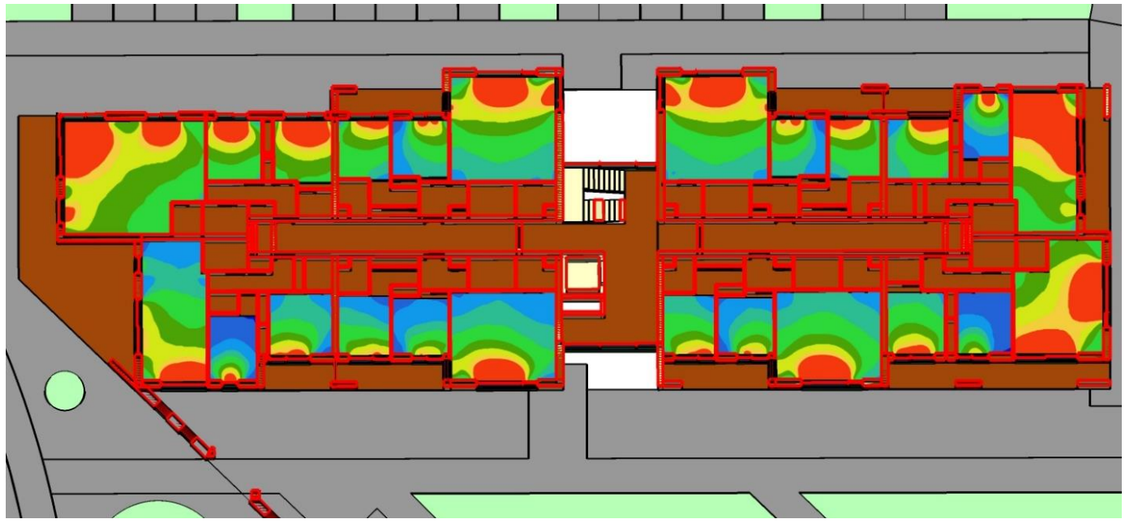
Average ADF for the tested living rooms is 1.9% and for bedrooms 4.1% Kitchen 2.8%

GFL Floor Layout – Block L – Naming Convention



Legend for radiance plots:

GFL Floor Analysis



L	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	Ref	Type	Min	ADF	Check
1	L01-L	Living Room	1.5	3.0	Pass
2	L02	Bedroom	1.0	1.5	Pass
3	L03	Bedroom	1.0	2.1	Pass
4	L04	Bedroom	1.0	2.1	Pass
5	L05	Bedroom	1.0	1.6	Pass
6	L06-L	Living Room	1.5	3.1	Pass
7	L08	Bedroom	1.0	2.6	Pass
8	L09	Bedroom	1.0	1.9	Pass
9	L10-L	Living Room	1.5	3.4	Pass
10	L11	Bedroom	1.0	2.9	Pass
11	L12	Bedroom	1.0	1.1	Pass
12	L13-L	Living Room	1.5	5.6	Pass
13	L14-L	Living Room	1.5	5.7	Pass
14	L15	Bedroom	1.0	2.0	Pass
15	L16	Bedroom	1.0	3.0	Pass
16	L17	Bedroom	1.0	3.1	Pass
17	L18	Bedroom	1.0	2.3	Pass
18	L19-L	Living Room	1.5	4.1	Pass
19	L20-L	Living Room	1.5	4.0	Pass
20	L21	Living Room	1.5	2.3	Pass
21	L22	Bedroom	1.0	3.0	Pass
22	L23	Bedroom	1.0	5.0	Pass
23	L24	Bedroom	1.0	4.4	Pass
24	L25-L	Living Room	1.5	4.8	Pass
				Pass	24
				Count	24
				Percentage	100%

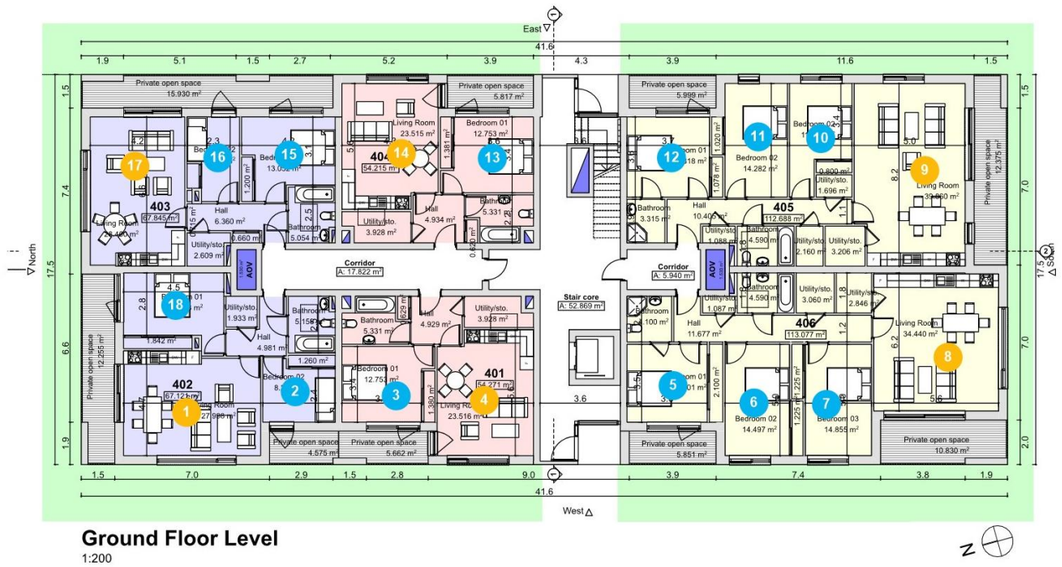
ADF Check – Block L - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

Average ADF for the tested living rooms is 4.0% and for bedrooms 2.6%

GFL Floor Layout – Block M – Naming Convention



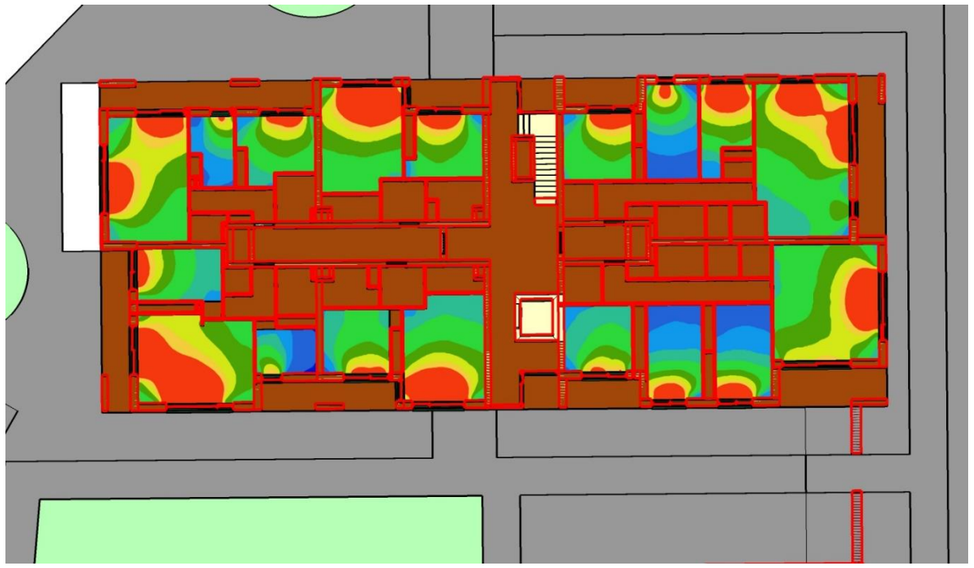
Ground Floor Level
1:200

Legend for radiance plots:

Daylight Factor [DF] %

0%	0.5%	1%	1.5%	2%	3%	4%	5%	6%+

GFL Floor Analysis



M	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	**Ref**	**Type**	**Min**	**ADF**	**Check**
1	M01-L	Living Room	1.5	6.1	Pass
2	M02	Bedroom	1.0	1.5	Pass
3	M03	Bedroom	1.0	2.7	Pass
4	M04-L	Living Room	1.5	4.3	Pass
5	M05	Bedroom	1.0	2.2	Pass
6	M06	Bedroom	1.0	2.3	Pass
7	M07	Bedroom	1.0	2.2	Pass
8	M08-L	Living Room	1.5	4.1	Pass
9	M09-L	Living Room	1.5	3.9	Pass
10	M10	Living Room	1.5	4.8	Pass
11	M11	Bedroom	1.0	1.9	Pass
12	M12	Bedroom	1.0	3.7	Pass
13	M13	Bedroom	1.0	3.8	Pass
14	M14-L	Living Room	1.5	5.1	Pass
15	M15	Bedroom	1.0	3.0	Pass
16	M16	Bedroom	1.0	1.8	Pass
17	M17-L	Living Room	1.5	4.5	Pass
18	M18	Bedroom	1.0	2.9	Pass
				Pass	18
				Count	18
				Percentage	100%

ADF Check – Block L - Summary

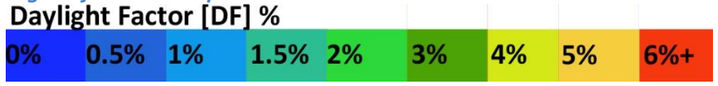
ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

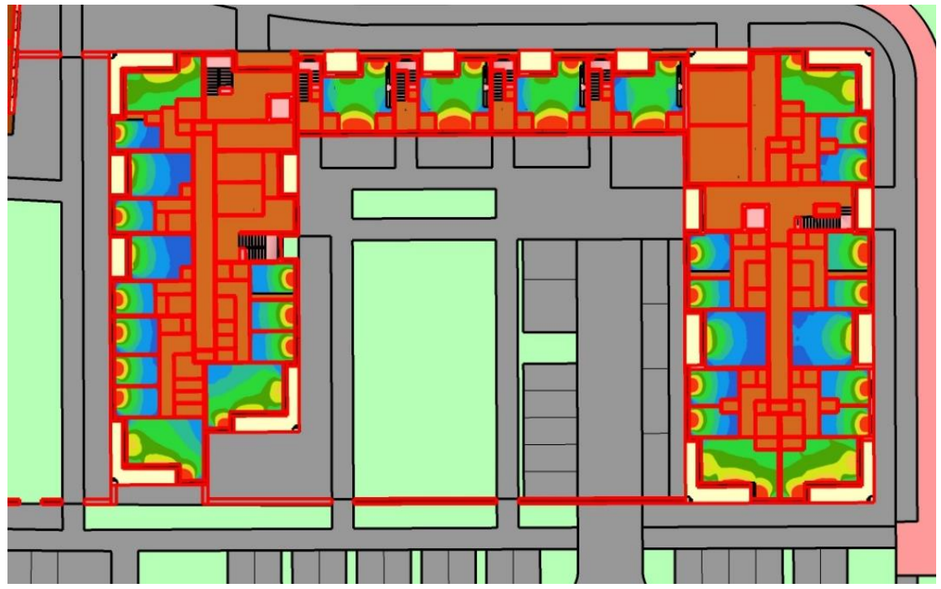
Average ADF for the tested living rooms is 4.7% and for bedrooms 2.5%

GFL Floor Layout – Block O – Naming Convention

Legend for radiance plots:



GFL Floor Analysis



O-v2	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	Ref	Type	Min	ADF	Check
1	o01	Bedroom	1.0	2.2	Pass
2	o02	Bedroom	1.0	2.8	Pass
3	o03-L	Living Room	1.5	1.5	Pass
4	o04	Bedroom	1.0	2.3	Pass
5	o05	Bedroom	1.0	2.6	Pass
6	o06-L	Living Room	1.5	3.8	Pass
7	o07-L	Living Room	1.5	4.0	Pass
8	o08	Bedroom	1.0	2.9	Pass
9	o09	Bedroom	1.0	2.7	Pass
10	o10-L	Living Room	1.5	1.6	Pass
11	o11	Bedroom	1.0	2.9	Pass
12	o12	Bedroom	1.0	3.3	Pass
13	o13	Bedroom	1.0	2.3	Pass
14	o14	Bedroom	1.0	2.7	Pass
15	o15-L	Living Room	1.5	3.4	Pass
16	o16-L	Living Room	1.5	3.1	Pass
17	o17-L	Living Room	1.5	3.6	Pass
18	o18-L	Living Room	1.5	3.7	Pass
19	o19-L	Living Room	1.5	3.4	Pass
20	o20	Bedroom	1.0	2.6	Pass
21	o21	Bedroom	1.0	3.0	Pass
22	o22	Bedroom	1.0	2.7	Pass
23	o23-L	Living Room	1.5	2.7	Pass
24	o24-L	Living Room	1.5	3.0	Pass
25	o25	Bedroom	1.0	2.5	Pass
26	o26	Bedroom	1.0	2.6	Pass
27	o27	Bedroom	1.0	2.3	Pass
28	o28	Bedroom	1.0	2.6	Pass
29	o29-L	Living Room	1.5	1.5	Pass
30	o30	Bedroom	1.0	2.4	Pass
31	o31-L	Living Room	1.5	1.5	Pass
32	o32	Bedroom	1.0	2.1	Pass
33	o33-L	Living Room	1.5	3.5	Pass
				Pass	33
				Count	33
				Percentage	100%

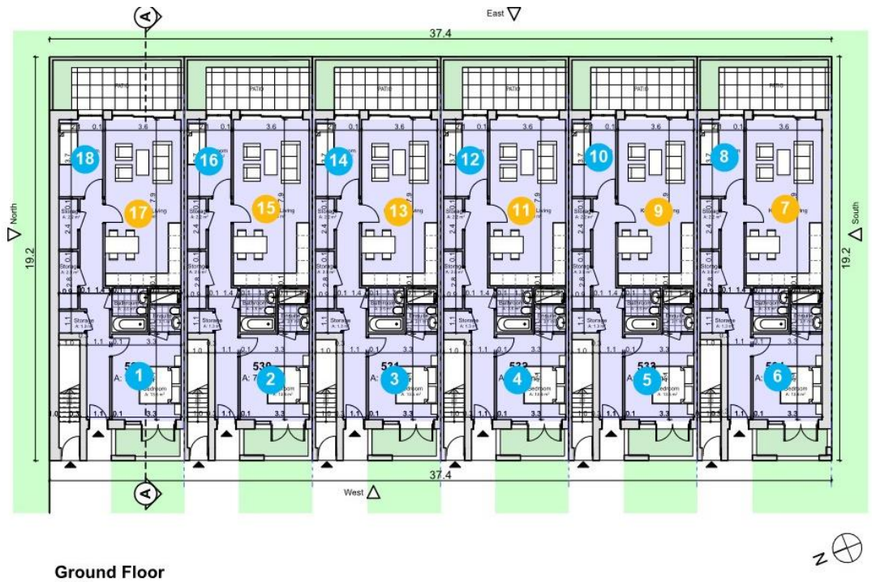
ADF Check – Block O - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

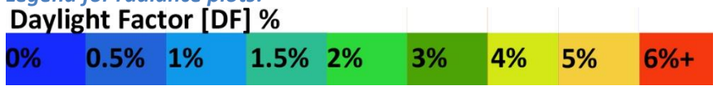
Average ADF for the tested living rooms is 2.9% and for bedrooms 2.6%

GFL Floor Layout – Block S – Naming Convention



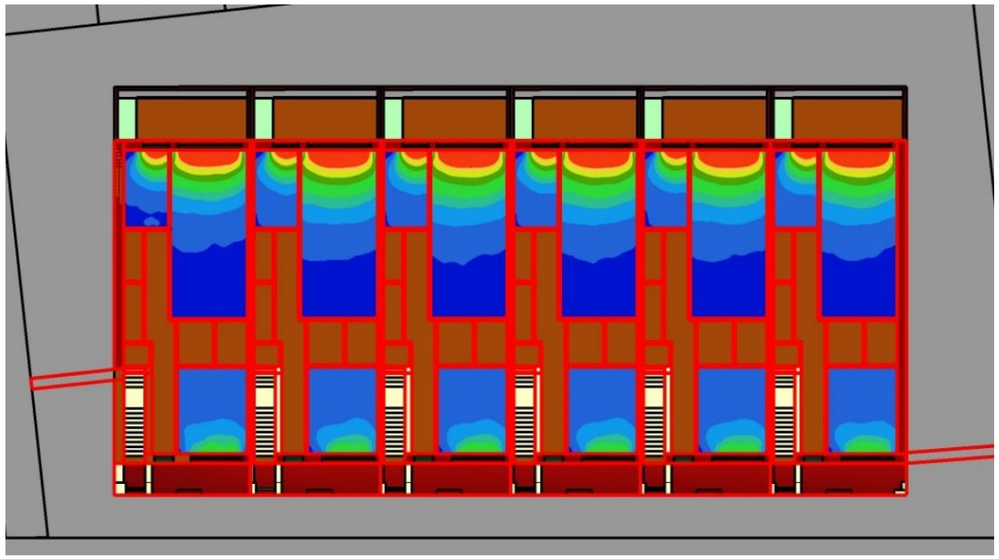
Ground Floor
1:200

Legend for radiance plots:



S	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	**Ref**	**Type**	**Min**	**ADF**	**Check**
1	S01	Bedroom	1.0	1.0	Pass
2	S02	Bedroom	1.0	1.0	Pass
3	S03	Bedroom	1.0	1.0	Pass
4	S04	Bedroom	1.0	1.0	Pass
5	S05	Bedroom	1.0	1.0	Pass
6	S06	Bedroom	1.0	1.0	Pass
7	S07-L	Living Room	1.5	1.9	Pass
8	S08	Bedroom	1.0	1.7	Pass
9	S09-L	Living Room	1.5	1.9	Pass
10	S10	Bedroom	1.0	1.6	Pass
11	S11-L	Living Room	1.5	1.9	Pass
12	S12	Bedroom	1.0	1.7	Pass
13	S13-L	Living Room	1.5	1.9	Pass
14	S14	Bedroom	1.0	1.7	Pass
15	S15-L	Living Room	1.5	1.9	Pass
16	S16	Bedroom	1.0	1.7	Pass
17	S17-L	Living Room	1.5	1.7	Pass
18	S18	Bedroom	1.0	1.5	Pass
				Pass	18
				Count	18
				Percentage	100%

GFL Floor Analysis



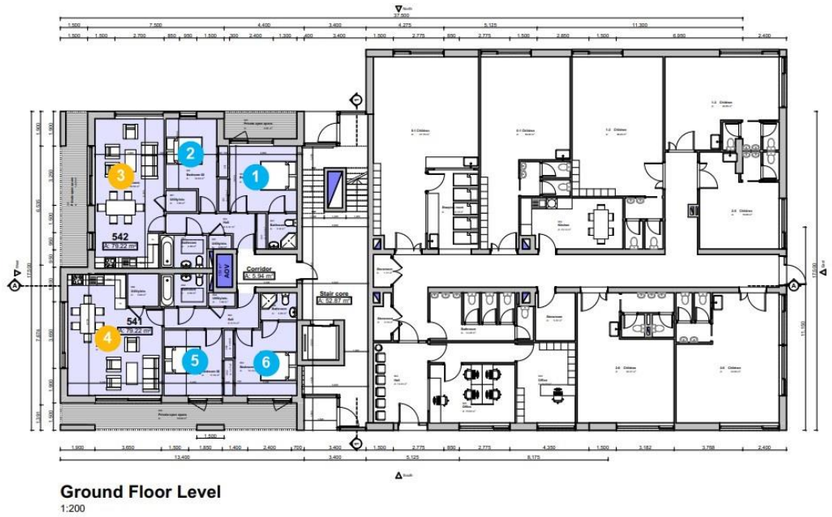
ADF Check – Block S - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

Average ADF for the tested living rooms is 1.8% and for bedrooms 1.3%

GFL Floor Layout – Block T – Naming Convention



Ground Floor Level
1:200

Legend for radiance plots:

GFL Floor Analysis

T	Average Daylight Factor				
					For all habitable rooms
	ADF Values from radiance 3D model			Yes	
		Type			
Room	Ref	Type	Min	ADF	Check
1	T01	Bedroom	1.0	2.4	Pass
2	T02	Bedroom	1.0	1.5	Pass
3	T03-L	Living Room	1.5	5.0	Pass
4	T04-L	Living Room	1.5	6.0	Pass
5	T05	Bedroom	1.0	1.3	Pass
6	T06	Bedroom	1.0	3.1	Pass
				Pass	6
				Count	6
				Percentage	100%

ADF Check – Block T - Summary

ADF (average daylight factors) for all tested rooms on the GFL of this block complies with the requirements of the BRE guidelines in relation to ADF light distribution.

This block shows excellent ADF results.

Average ADF for the tested living rooms is 5.5% and for bedrooms 2.1%

ADF Check – Summary

ADF (average daylight factors) analysis was completed for all rooms at Ground Floor Level GFL for the following blocks: **B, C, D, E, L, M, O, S & T**

The development shows excellent ADF results well in excess of the requirements.
Average ADF for all tested Living Rooms **3.3%**, Bedrooms: **2.3%** & Kitchens **2.6%**

Only one room a kitchen D01-K which is in a corner is marginal at 1.7%

The proposed development complies with the requirements of the BRE guidelines in relation to ADF light distribution.

Development Performance - Sunlight Annual & Winter

Clause 3.1.2 of the guidance document BRE indicates that special checks should be applied to living rooms to ensure that these core rooms receive the necessary sunlight.

> *In Housing, the main requirement for sunlight is in living rooms. where it is valued at any time of day but especially in the afternoon.*

Check Clauses

> *Clause 3.1.15 In general a dwelling, or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided:*
>
> - *at least one main window wall faces within 90˚ of due south and*
> - *the centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March*
>
> *3.1.16 Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations.*
>
> *3.1.12…….. If a room has two windows on opposite walls, the APSH due to each can be added together.*

The guidelines accept the difficulty imposed by this requirement and that it will not always be possible to achieve this requirement for ALL living spaces. While it is preferred to have sunlight the guidelines are pragmatic in this regard.

The guidelines further define:

> *3.1.8……. For larger developments of flats, especially those with site constraints, it may not be possible to have every living room facing within 90° of south…….*
> *……Arranging the flats so that living rooms are placed at the end corners of the building and hence can be dual aspect. That way, living rooms on the north side of the building can also have an east- or west-facing window which can receive some sun…..*

It then follows with an example of a careful layout for a relative small block where 4/5 flats have south facing living rooms, and one North which would receive no sunlight at all. From this layout and results we can conclude that an 80% pass rate is considered good design.

Figure 26: Careful layout design means that four out of the five flats shown have a south-facing living room

The results for the availability of sunlight on all living rooms windows as tested above at GFL tested are provided here.

Tabulated results

East		Sunlight APSH - Living rooms					
			Annual > 25%			Winter > 5%	
Block	Floor	Room	APSH			WPSH	
B	00-GFL	W1	61.0	Pass		21.2	Pass
B	00-GFL	W2	58.5	Pass		16.6	Pass
B	00-GFL	W3	59.0	Pass		19.1	Pass
B	00-GFL	W4	67.7	Pass		25.8	Pass
C	00-GFL	W1	22.5	Marginal		5.0	Pass
C	00-GFL	W4	54.6	Pass		30.2	Pass
C	00-GFL	W7	67.5	Pass		28.6	Pass
C	00-GFL	W10	63.7	Pass		23.9	Pass
C	00-GFL	W13	40.9	Pass		15.3	Pass
D	00-GFL	W2	70.6	Pass		27.1	Pass
D	00-GFL	W3	70.2	Pass		26.7	Pass
D	00-GFL	W5	25.1	Pass		3.6	**1
D	00-GFL	W6	28.8	Pass		11.4	Pass
D	00-GFL	W7	33.1	Pass		7.5	Pass
D	00-GFL	W9	26.5	Pass		4.9	Marginal
D	00-GFL	W11	34.0	Pass		6.1	Pass
D	00-GFL	W12	16.5	**1		0.0	**1
E	00-GFL	W4	37.8	Pass		33.1	Pass
E	00-GFL	W6	4.1	**1		0.0	**1
E	00-GFL	W7	2.1	**1		0.0	**1
E	00-GFL	W8	4.1	**1		0.0	**1
			Count	21		Count	21
			Pass	16		Pass	15
			Pass Rate	76%		Pass Rate	71%

West		Sunlight APSH - Living rooms					
			Annual > 25%			Winter > 5%	
Block	Floor	Room	APSH			WPSH	
L	00-GLF	W1	39.6	Pass		12.7	Pass
L	00-GLF	W6	64.5	Pass		21.2	Pass
L	00-GLF	W10	71.2	Pass		26.9	Pass
L	00-GLF	W13	51.3	Pass		18.7	Pass
L	00-GLF	W14	31.7	Pass		16.1	Pass
L	00-GLF	W19	9.5	**1		0.0	**1
L	00-GLF	W20	11.3	**1		0.0	**1
L	00-GLF	W25	10.9	**1		3.3	**1
M	00-GLF	W1	29.2	Pass		5.8	Pass
M	00-GLF	W4	20.6	Marginal		3.1	**1
M	00-GLF	W8	69.3	Pass		23.6	Pass
M	00-GLF	W9	54.2	Pass		23.0	Pass
M	00-GLF	W14	56.4	Pass		25.1	Pass
M	00-GLF	W17	33.0	Pass		18.1	Pass
O	00-GLF	W3	10.1	**1		1.1	**1
O	00-GLF	W4	79.4	Pass		33.7	Pass
O	00-GLF	W6	8.0	**1		0.8	**1
O	00-GLF	W7	81.4	Pass		34.8	Pass
O	00-GLF	W10	29.5	Pass		13.9	Pass
O	00-GLF	W15	36.7	Pass		17.7	Pass
O	00-GLF	W16	42.8	Pass		13.4	Pass
O	00-GLF	W17	60.5	Pass		19.8	Pass
O	00-GLF	W18	63.1	Pass		24.2	Pass
O	00-GLF	W19	55.2	Pass		23.2	Pass
O	00-GLF	W23	42.2	Pass		15.9	Pass
O	00-GLF	W24	59.2	Pass		22.5	Pass
O	00-GLF	W29	10.8	**1		1.9	**1
O	00-GLF	W31	10.9	**1		2.0	**1
O	00-GLF	W33	11.4	**1		2.9	**1
S	00-GLF	W7	37.2	Pass		6.8	Pass
S	00-GLF	W9	41.3	Pass		10.8	Pass
S	00-GLF	W11	43.9	Pass		13.4	Pass
S	00-GLF	W13	44.1	Pass		13.6	Pass
S	00-GLF	W15	44.1	Pass		13.6	Pass
S	00-GLF	W17	42.9	Pass		13.6	Pass
T	00-GLF	W3	13.9	**1		4.4	Marginal
T	00-GLF	W4	32.8	Pass		31.0	Pass
			Count	37		Count	37
			Pass	27		Pass	27
			Pass Rate	73%		Pass Rate	73%

**1 All windows receive some sunlight and the number that face North are small.
If we include the few marginal results **78%** pass the Annual APSH requirements and **76%** pass the WPSH which is generally in accordance with the guidelines example of “careful” design 80%.

This high quality of sunlight coupled with the excellent ADF and room depth results detailed above show that the living rooms to the apartments tested will receive an excellent quality of light

Sunlight to Living rooms - Summary

All Living rooms receive some sunlight over the course of the year.
78% achieve the BRE Annual APSH and **76%** the Winter WPSH requirements.
This is in generally in accordance with what the guidelines define as “careful” design 80%.

These results should be considered in conjunction with the high daylight ADF results achieved throughout.

The proposed development generally complies with the requirements of the BRE guidelines in relation to Sunlight availability.

Development Performance - Shadow/Sunlight - Gardens and Open spaces

Tests for the availability of sunlight in amenity areas.

Shadow/Sunlight - Clause 3.3.17

> ***It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. ……***

> ***3.3.3 The availability of sunlight should be checked for all open spaces where it will be required. This would normally include:***
> ***• gardens, usually the main back garden of a house***
> ***• parks and playing fields***
> ***• children's playgrounds***
> ***• outdoor swimming pools and paddling pools***
> ***• sitting out areas such as those between non-domestic buildings and in public squares***
> ***• focal points for views such as a group of monuments or fountains.***

The amenities of the following were tested.

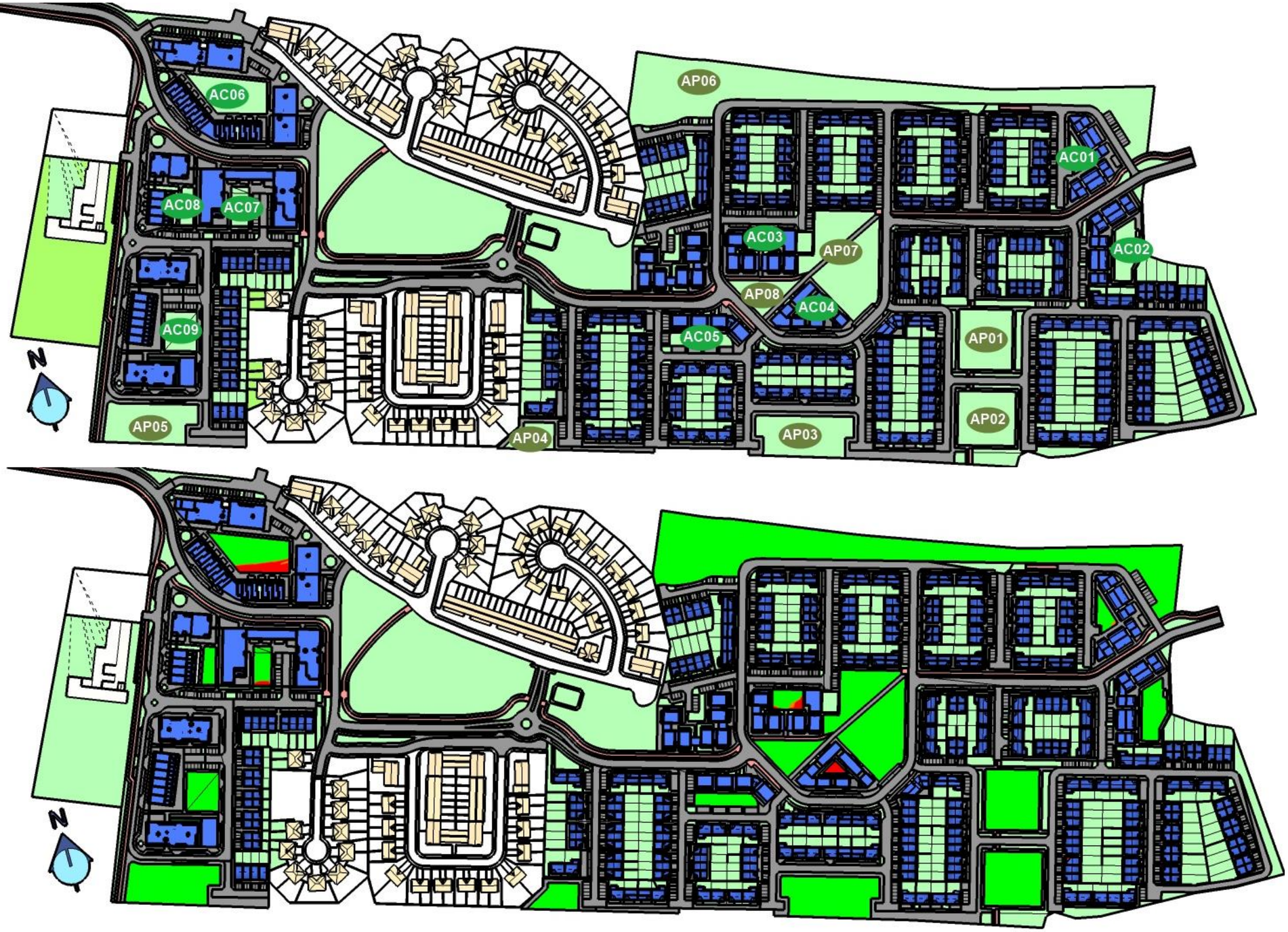
- Communal / Shared Amenity between the Apartment Blocks
  - AC01 … AC09
- Public Amenity Spaces
  - Includes Pocket Parks
  - Habitat Buffer
  - Parkland
  - Urban Plaza
  - Designated: AP01 .. AP08

BRE 2-hour Shadow Plots

The graphic below indicates the areas which receive 2 hours of sunlight on the 21st March in accordance with the BRE guidelines.

- **Green** represents areas which exceed the 2-hour requirement - pass
- **Red** is less than the 2-hour requirement - fail
- **Orange** are marginal or borderline - just below the 2-hour requirement

Tested Amenity Spaces



The results are tabulated below:

Shadow / Sunlight Amenity

>50% receives 2 hours of sunlight on 21st March)

	Ref	% 2hr Sunlight	Check	
AC01	Communal A B	94	Pass	
AC02	Communal E F	100	Pass	
AC03	Communal C	74	Pass	
AC04	Communal D - Enclosed	N/A		**2
AC05	Communal H	100	Pass	
AC06	Communal L M N	88	Pass	
AC07	Communal O	76	Pass	
AC08	Communal P Q	97	Pass	
AC09	Communal R S T	100	Pass	
AP01	Pocket Park 1	100	Pass	
AP02	Pocket Park 2	100	Pass	
AP03	Pocket Park 3	100	Pass	
AP04	Pocket Park 4	100	Pass	
AP05	Pocket Park 5	100	Pass	
AP06	Habitat Buffer North	100	Pass	
AP07	Parkland	100	Pass	
AP08	Urban Plaza	100	Pass	
		Count	16	
		Pass	16	
		Pass Rate	100%	

Note: When the proposed value exceeds the minimum requirement the ratio check is not required, and the result is coloured grey.

Please note that passing the BRE requirements does not imply that shadows will not be cast over an amenity space at all. Shadows which are transient by nature may not impact on the percentage of the space which receives 2 hours of sunlight on the 21st of March.

**2 The small triangular space to the centre of Block D was never expected to receive sunlight and the design of the same will allow for this. Additional public amenity spaces around this area will ameliorate for this.

Conclusion

All new provided shared and public amenity spaces pass the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.
The communal core space **AC04** is fully enclosed and the design is cognisant of the lack of sunlight to this space.

The relevant tested spaces comply with the requirements of the BRE guidelines.

Summary – Development Performance

This report is in compliance with: "Site layout planning for daylight and sunlight a guide to good practice Second Edition - 2011 by Paul J Littlefair - BR209". It also references "BS 8206-2:2008 Lighting for buildings – Part 2: Code of practice for daylighting" as and where called for in the above BRE guidance document.

- **Performance of the proposed design**
  - **Light Distribution ADF -** ADF (average daylight factors) for all tested rooms blocks: **B, C, D, E, L, M, O, S & T** at GFL (Ground Floor Level) comply with the relevant requirements.
    - The development shows excellent ADF results.
    - Average ADF for all tested Living Rooms: **3.3%**, Bedrooms: **2.3%** & Kitchens: **2.6%**
    - Only one room a kitchen D01-K which is in a corner is marginal at 1.7%
  - **Sunlight to Living rooms:** All Living rooms receive some sunlight over the course of the year.
    - **78%** achieve the BRE Annual APSH and **76%** the Winter WPSH requirements.
    - This is in generally in accordance with what the guidelines define as “careful” design **80%.**
    - These results should be considered in conjunction with the high daylight ADF results achieved throughout.
  - **Shadow:** All relevant new provided shared and public amenity spaces pass the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.
    - The communal core space **AC04** is fully enclosed and the *design* is cognisant of the lack of sunlight to this space.

The application generally complies with the recommendations and guidelines of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE 2011) and BS 8206 Lighting for Buildings, Part 2: Code of Practice for Daylighting.

Overall Summary

- **Change/Impact to existing buildings in the adjoining residential areas**
  - **Skylight- VSC**– All tested windows pass the relevant VSC checks.
    - The VSC average change ratio is **0.86**
  - **Sunlight APSH & WPSH –** All tested windows pass the relevant Annual and WPSH checks.
    - The average change ratio for annual sunlight APSH is **0.91** and for winter WPSH is **0.84**
  - **Shadow –** All tested amenity spaces pass the 2-hour test requirements for the 21st March.
    - The average change ratio for the tested amenity spaces is **0.99**
- **Performance of the proposed design**
  - **Light Distribution ADF -** ADF (average daylight factors) for all tested rooms blocks: **B, C, D, E, L, M, O, S & T** at GFL (Ground Floor Level) comply with the relevant requirements.
    - The development shows excellent ADF results.
    - Average ADF for all tested Living Rooms: **3.3%**, Bedrooms: **2.3%** & Kitchens: **2.6%**
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    - These results should be considered in conjunction with the high daylight ADF results achieved throughout.
  - **Shadow:** All relevant new provided shared and public amenity spaces pass the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.
    - The communal core space **AC04** is fully enclosed and the design is cognisant of the lack of sunlight to this space.

The application generally complies with the recommendations and guidelines of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE 2011) and BS 8206 Lighting for Buildings and Part 2: Code of Practice for Daylighting.

Note: Subsequent Design Changes

We note that after this analysis had been completed that there was a change to the road layout as it threaded between the existing Brawley Estate North/South.

In consultation with the council the roundabout originally planned for this area was removed.

This change has been examined and we confirm that it will have no impact on the results of this report.