# SANTRY AVENUE SHD,
# CHADWICKS BUILDERS MERCHANTS SITE

***Daylight & Shadow Assessment***

V2b


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# Executive Summary

This report examines the performance of Blocks AB, CD, EF & G in terms of light distribution and the shared amenity spaces. We have also provided a commentary on impact or lack thereof on neighbours.

The report is, in accordance with "Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice, BS 8206 Lighting for Buildings, Part 2: Code of Practice for Daylighting and other updated relevant documents".

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...."*

## Performance of the proposed design

- **Light Distribution ADF -** ADF (average daylight factors)
  - The development generally shows excellent ADF results.
  - **90%** comply with the strict BRE requirements.
    - 7 of the 12 that do not are marginal
  - **98%** tested rooms on the 1st floor comply with the relaxed requirements.
    - The 2 that do not are marginal.
  - Average high ADFs for all tested living rooms is **3.2%** and for bedrooms **2.5%**
  - A supplementary ADF analysis for the Ground Floor is also provided in Appendix 1.
- **Sunlight to Living rooms:** All windows were tested for Annual APSH and Winter WPSH
  - **100%** of Living rooms receive some sunlight over the course of the year.
  - If we include the marginal results then:
    - 1st Floor **58%** pass the Annual APSH requirements and **56%** pass the WPSH
    - 3rd Floor **71%** pass the Annual APSH requirements and **80%** pass the WPSH
  - This is in generally in accordance with what the guidelines define as "careful layout" design 80%.
- **Shadow:** Provided shared and public amenity were tested against the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.
  - Private amenity spaces, if we include the marginal results then:
    - 1st Floor **64%** of private spaces pass the shadow requirements.
    - 3rd Floor **91%** of private spaces pass the shadow requirements.
    - This is in generally in accordance with what the guidelines define as "careful layout" design **80%.**
  - **100%** of the main shared spaces receive excellent and compliant sunlight results.
- Please see Architects comments on alternative, compensatory design solutions relating to sunlight/shadow.

### *Summary impact Neighbours*

- Non-residential buildings sit to the West, North and East of the proposal and do not require testing.
- Phase 1 Santry Place sits to the South of this Phase 2 proposal.
  - Sunlight to amenity and windows of the granted Santry Place cannot be impacted by this current proposal as it sits to the North.
  - In relation to skylight (VSC) this proposal Phase 2 along the interface line is a mirrored development of the permitted and constructed Phase 1 design. Any impact along the closer façades will therefore be compliant with the guidelines and Mirrored development approach of Appendix F.

## Solar Orientation and Architect's Compensatory Measures/Justification.

The design is an urban infill scheme with competing design constraints and objectives it is specifically covered by clause 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities – amended Dec 2020:

*6.6 Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision.*

*6.7 Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to design constraints associated with the site or location and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.*

We accept that some balconies and living rooms may not meet the BRE recommendations for sun lighting in certain locations at the lower levels of the development, however, a high level of residential amenity will be delivered for all the residents of this scheme, such as:

a) In this urban infill site, a strong emphasis was placed on catering for high-quality sun lit areas such as the public and communal spaces, as well as private amenity spaces, which ensures that sunlit spaces will be accessible to all residents within the development and not just those with more favourably orientated apartments. A wide variety of communal amenity areas are also provided for within the scheme at the Ground, First, Seventh and Fourteenth floors. Furthermore, there is an overprovision of communal amenity space, of over 860sq.m, which can be likened to a compensatory measure for certain apartments receiving below the BRE recommendations. All amenity spaces surpass the sun-lighting requirement by substantial margins.

b) The design of the private balconies has been influenced by the necessity to provide shelter and protection from the wind in addition to any sunlighting requirement. In this regard, all balconies are fully or partially recessed into the block, and we recognize that these recessed balconies will naturally reduce sunlight exposure, but they will ultimately contribute to a more user-friendly and comfortable private amenity space for residents. It should also be noted, however, that a high proportion of balconies are substantially larger than the required areas for private open space, thus affording increased residential amenity for future residents of the development.

c) 98 % of the apartments receive above the required levels of daylighting and the analysis shows that all private spaces and living rooms also receive sunlight. There are no single north-facing single-aspect apartments within the entire scheme of 350 no. dwellings.

d) In order to improve sun lighting to ground floor units, the floor to ceiling height has been set at a generous 3m height and ground floor windows will be 2.7m high, which is substantially higher than the 2.1m standard height.

Future occupants will enjoy great levels of both daylight and sunlight within the proposed units and while having access to a number of amenity areas that are capable of receiving excellent levels of sunlight. The site is also directly opposite Santry Demesne Park which has large areas of open space and additional amenities. The results find that any impact on the sunlight received by individual apartments would be minimal in the overall context of the urban setting of the proposed development. There is a sufficient good quality of daylight in the apartments analysed and the amenity areas all have sufficient sunlight to be bright and pleasant spaces.

**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 and other updated relevant documents.**

It has successfully been designed to maximise the occupants' access to light. As such the design has used the guidelines in the spirit they have been written and balanced the requirements of this report with other design constraints to arrive at this design.

# Introduction

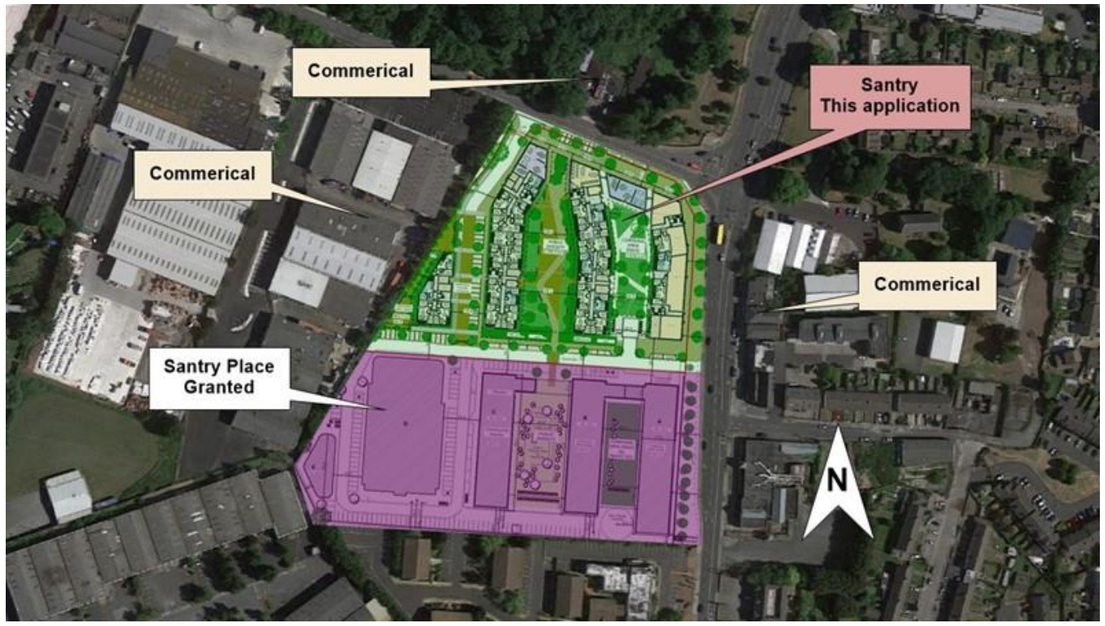
CSC have been asked to examine the performance of Blocks AB, CD, EF & G in terms of light distribution and the shared amenity spaces. We have also provided a commentary on impact or lack thereof on neighbours.

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

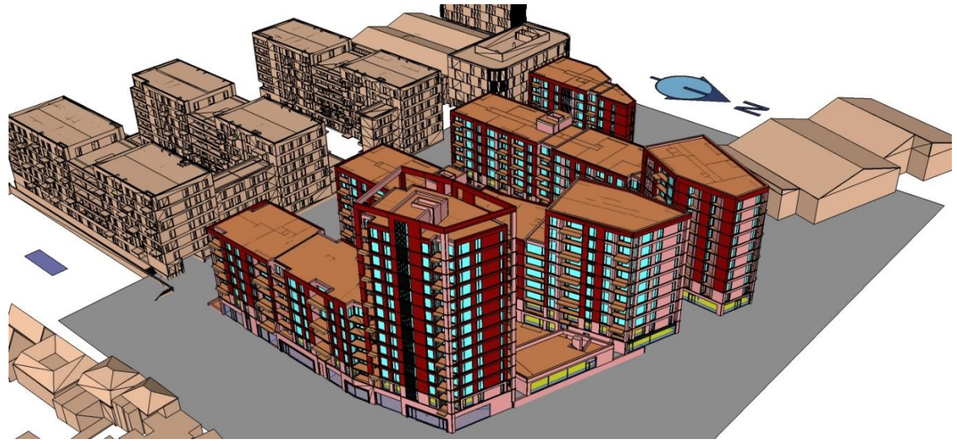
The aerial extract from Google Earth shows the context for the site. The proposed development provides for 350 no. apartments, comprised of 113 no. 1 bed, 218 no. 2 bed, & 19 no. 3 bed dwellings, in 4 no. seven to fourteen storey buildings, over basement level, with 5 no. retail / commercial units and a community use unit located at ground floor level facing onto Santry Avenue and Swords Road. A one storey residential amenity unit, facing onto Santry Avenue, is also provided for between Blocks A & D.




*Google Earth extract © Google 2021*

# Design Model

A 3D model of the proposed development was provided by the client. This model was extracted from the BIM design model and is an accurate representation proposal and used in this analysis. This model was geo-referenced to its correct location and an accurate solar daylight system was introduced. The analysis is based on the information provided.




**Proposed Model**

# Scope of this Report

Development performance was examined under the following headings:

- Light distribution Average Daylight Factor - ADF
  - This report looks at all rooms at 1st floor level for each of the 7 x blocks
    The 1st floor was selected across these blocks since it is representative of multiple floor levels. (Ground floor is less representative since it includes entrances, lobbies, stores, and usually taller floor heights).
  - Sunlight to living room windows.
  - Sunlight/Shadow to:
    - Private amenities – Balconies
    - Shared Amenity spaces
- An additional ADF analysis was also provided for the Ground floor in Appendix 1 as requested.

A commentary was also provided relating to Impact on Neighbours.

# 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 if 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 provided columns and results for the minimum targets of **1.0%** for bedrooms and both relaxed **1.5%** and strict **2.0%** targets for Livingroom/Kitchen spaces.

The original application explanation of the reasoning behind this relaxed test figure and the constraints relating to single aspect living rooms in larger developments is provided below.

# Alternative targets for Living rooms and specifically for Single Aspect ones

The BRE guidelines are standard guidelines which may be applied to room types in all development forms. It is evident that constraints applied to traditional housing would differ greatly from that applied to apartment design especially where density and other constraints apply and must be balanced in the planning process.

The BRE guidelines acknowledge in their introduction that natural lighting is only one of the factors in design and that while numerical values are provided, they should be interpreted flexibly.

> ***1.6 The guide is intended for building designers and their clients, consultants, and planning officials. 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 (see Section 5). In special circumstances the developer or planning authority may wish to use different target values…***

The guidelines note the following ADF minimums relating to Living spaces.

- Living rooms: 1.5%
- Kitchens: 2.0%
- The guidelines further expand as follows:
    - Where a 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%.

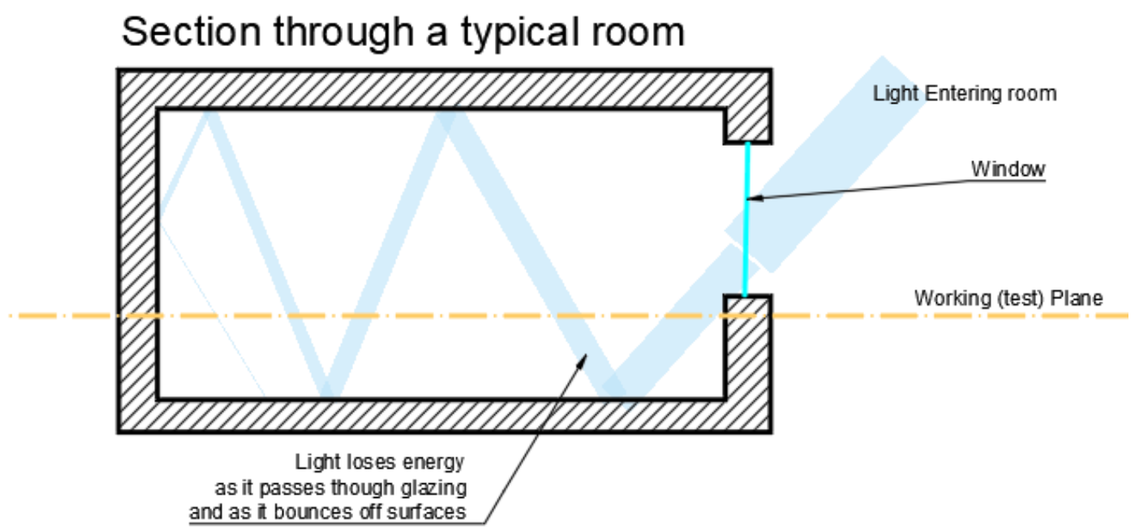
## ADF Radiance Analysis

Daylight Factor (DF) is used to study daylight illuminance levels under overcast sky conditions. It depends on space geometry, materials and external obstructions (environment buildings and relief), regardless of climate data for building location.

Daylight factor is defined as the ratio of the inside illuminance to the exterior diffuse horizontal illuminance on an unobstructed plane, for a standard CIE Overcast Sky luminance distribution.

The advantages of DF are its ease of apprehension, speed of calculation and independence of climate. DF is a good indicator of the behaviour of the project in an unfavourable climatic situation (overcast sky) more typical in temperate climates such as our own.

The standard radiance analysis used for rooms looks at the light entering a space and its propagation around the same. Light entering a room is initially and immediately reduced by the transmittance value assigned to the glazing. As it moves around the room it bounces off the various surfaces (walls, floors, ceilings) each with their own reflectance properties. As it does, energy is lost to the reflectance of the same. Each time the light passes through the defined working plane (0.85m above floor level for residential) its contribution is added.

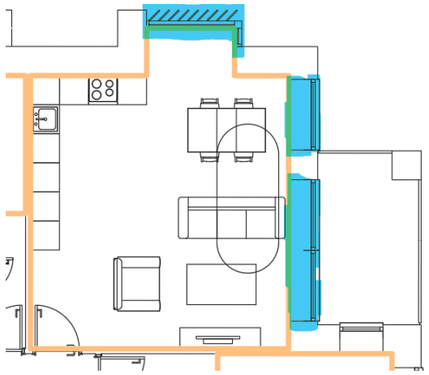



The various Daylight factors taken as an average over a test area (room) is defined as the Average Daylight Factor or ADF.

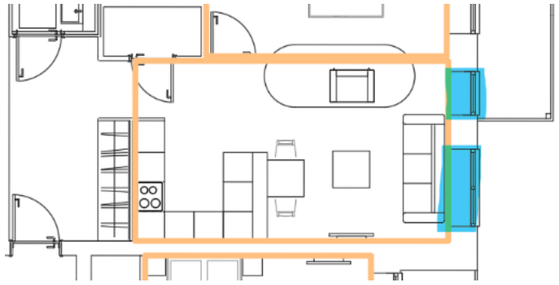
## Typical Layouts Multi vs Single Aspect

In the case of a multi aspect living or open plan rooms with a traditional “window over the sink design” in both conventional housing and apartment developments will typically achieve the minimum combined requirement of 2%. Light can come from a number of directions and is thus distributed throughout the space,

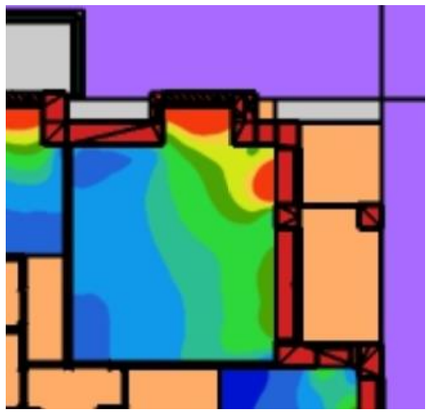
Single aspect rooms, however, receive light from only one source. The front element of the room near the window will receive the best light and this will tail off towards the rear. The graphics below show some typical examples of layouts (windows highlighted in blue) and the matching radiance maps of light distribution are shown below.

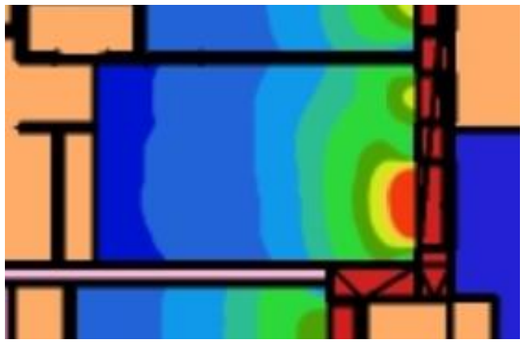


Multi-Aspect Living Space (ADF 2.3%)



Single Aspect Living Space (ADF 1.6%)



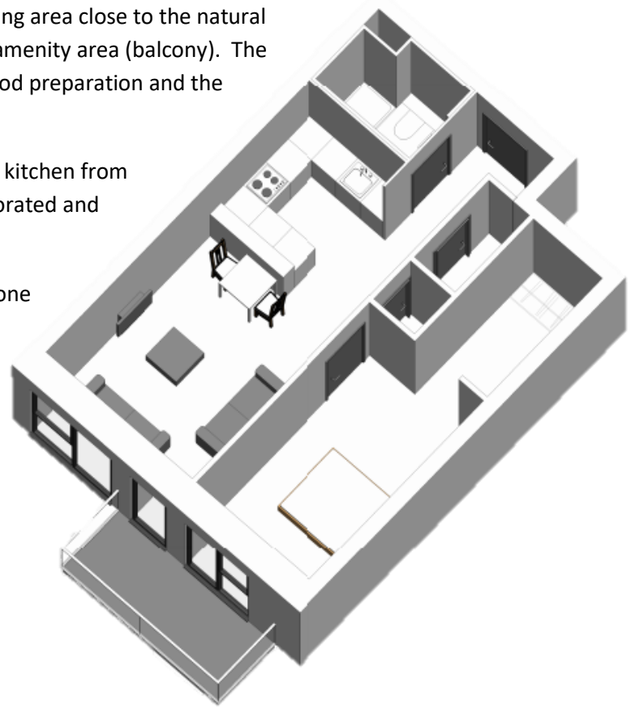


While both of these rooms receive high quality light near the external windows, rear of the single aspect room receives considerably less. This will be the case regardless of what average daylight factor is achieved over the full room surface area.

We can also see in these localised images that light is also reduce by the required provision of amenity space in terms of private balconies.

## Design considerations

The isometric view here of an apartment shows a typical design. The architect has considered the usage of the space and prioritised the living area close to the natural light though the window and easy access to the private amenity area (balcony). The kitchen (unlike a traditional house kitchen) is used for food preparation and the space for living and dining sits beyond the same.



This is an effective use of the space and the offset of the kitchen from the natural light provided through the windows is ameliorated and supplemented by specific artificial kitchen task lighting.

Given the constraints and design form with windows to one end light will always be substantially less furthest from the same regardless of any average calculation of the full surface (ADF)

## Analysis and guideline references for resolution Single Aspect layouts.

In terms of the guidelines, we can consider the food preparation element of the main living space as a non-daylit internal galley kitchen. This layout is inevitable if we are to balance the various objectives set by the department guidelines, project and site specific design constraints. This is acceptable since it does not include a dining area and the space opens onto a well daylit living room.

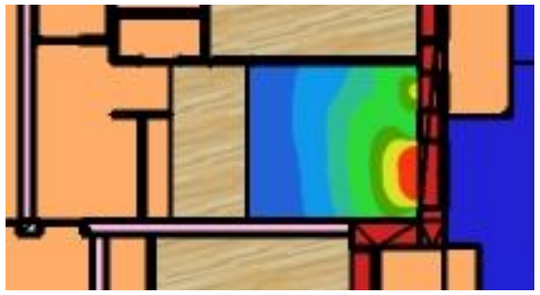
> ***2.1.14 Non-daylit internal kitchens should be avoided wherever possible, especially if the kitchen is used as a dining area too. If the layout means that a small internal galley-type kitchen is inevitable, it should be directly linked to a well daylit living room.***

Since the remaining space is a living room the minimum requirement is thus 1.5%. In addition, the area tested will now be limited to the living space (excluding the galley kitchen area) and thus the average results will improve since the tested area is closer to the windows.

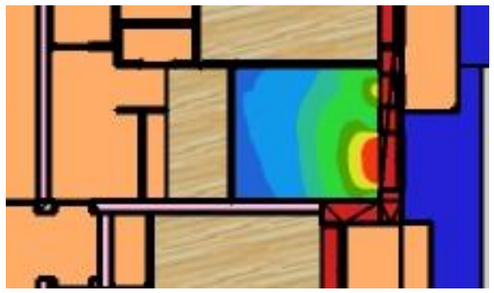
We can consider the galley kitchen in two ways.

1. As a physical space separated by a wall, into which no daylight will be received.
    - The physical wall will bounce light back into the front section of the room.
2. As a virtual space without a wall, into which some daylight will be received.
    - As a virtual space light will continue progress to light the space behind.

The radiance graphics for the ADF analysis for the spaces based on these two options is show below. In both cases the ADF results relate to the same front area defined as “well daylit living room” clause 2.1.14.



Virtual Wall - ADF 2.0%



Physical Wall - ADF 2.1%

We can see that the ADF for the living rooms well exceed the 1.5% living room requirement and may be considered as well lit. The results with a physical wall are slightly higher but the benefits of having some natural daylight penetrate the galley kitchens we believe outweigh the minimal improvement this might make.

## Alternative/Relaxed Strategy – Adopted

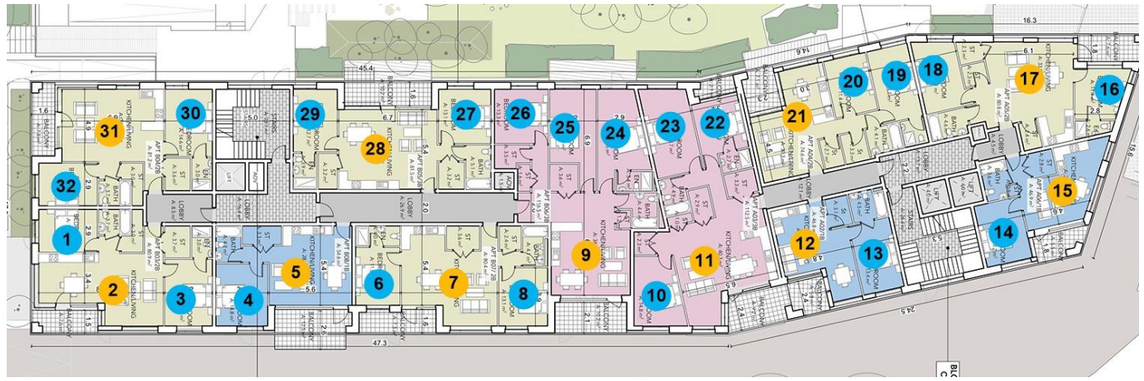
While this methodology shows a compliant result based on segregating the space into a non-daylit internal galley kitchen and a well daylit living room, common practice in Ireland and the UK is to assign an alternative target to such single aspect rooms.

In this case the primary use of the single aspect living room is considered as living room with a target ADF of 1.5% set. The entire floor area including the gally kitchen is then evaluated at this relaxed specification.

Typically, this requirement is more onerous as it requires overall light levels to include the food preparations areas, notwithstanding specific task lighting which will be provided.

These options have been discussed with Dr Littlefair the Author of the BRE guidelines and this option is the preferred relaxation and is in common usage.

## 1st Floor Layout – Naming Convention - AB

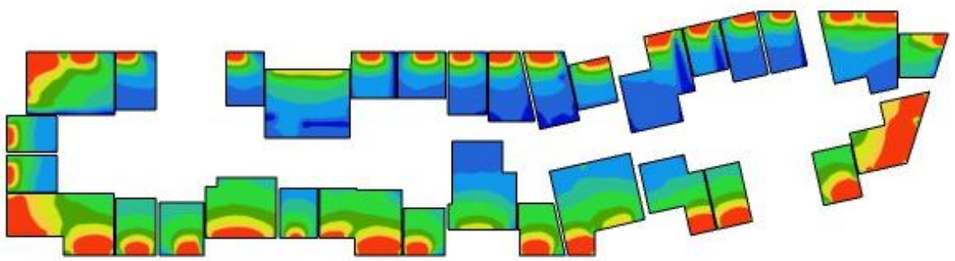



*Legend for radiance plots:*

Daylight Factor [DF] %

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

## 1st Floor Analysis - AB

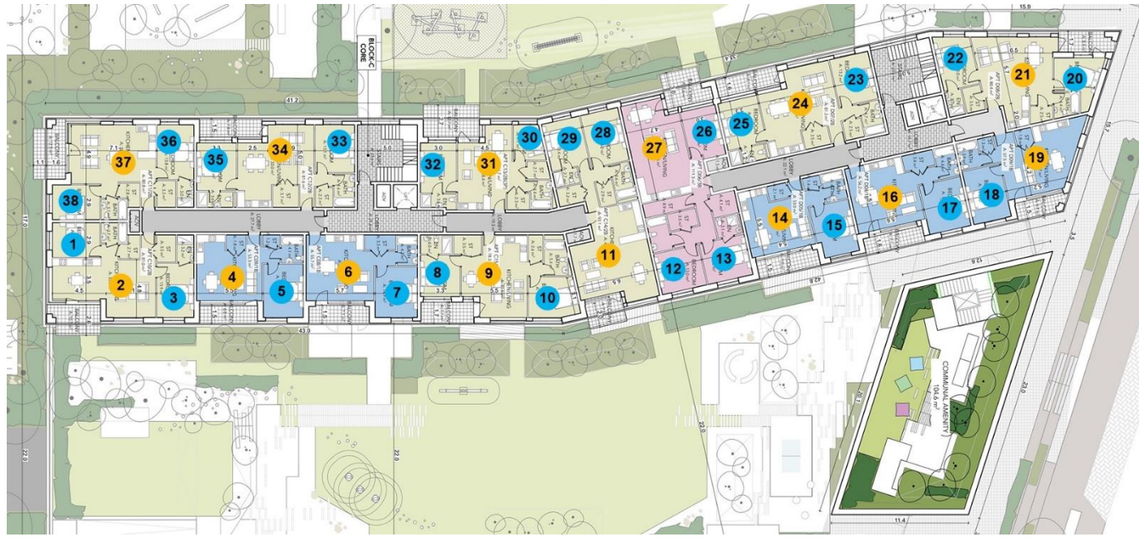


| 1AB | Average Daylight Factor | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *For all habitable rooms* | | | | |
| | ADF Values from radiance 3D m | | Yes | | | | | |
| | | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | | Type | ADF | Min | Check | Min | Check |
| 1 | 1AB01 | | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 2 | 1AB02L | | Living/Kitchen | 5.9 | 1.5 | Pass | 2.0 | Pass |
| 3 | 1AB03 | | Bedroom | 3.6 | 1.0 | Pass | 1.0 | Pass |
| 4 | 1AB04 | | Bedroom | 3.4 | 1.0 | Pass | 1.0 | Pass |
| 5 | 1AB05L | | Living/Kitchen | 3.7 | 1.5 | Pass | 2.0 | Pass |
| 6 | 1AB06 | | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 7 | 1AB07L | | Living/Kitchen | 4.4 | 1.5 | Pass | 2.0 | Pass |
| 8 | 1AB08 | | Bedroom | 3.7 | 1.0 | Pass | 1.0 | Pass |
| 9 | 1AB09L | | Living/Kitchen | 1.7 | 1.5 | Pass | 2.0 | Fail |
| 10 | 1AB10 | | Bedroom | 4.4 | 1.0 | Pass | 1.0 | Pass |
| 11 | 1AB11L | | Living/Kitchen | 2.9 | 1.5 | Pass | 2.0 | Pass |
| 12 | 1AB12L | | Living/Kitchen | 3.2 | 1.5 | Pass | 2.0 | Pass |
| 13 | 1AB13 | | Bedroom | 4.5 | 1.0 | Pass | 1.0 | Pass |
| 14 | 1AB14 | | Bedroom | 5.2 | 1.0 | Pass | 1.0 | Pass |
| 15 | 1AB15L | | Living/Kitchen | 7.3 | 1.5 | Pass | 2.0 | Pass |
| 16 | 1AB16 | | Bedroom | 3.0 | 1.0 | Pass | 1.0 | Pass |
| 17 | 1AB17L | | Living/Kitchen | 2.7 | 1.5 | Pass | 2.0 | Pass |
| 18 | 1AB18 | | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 19 | 1AB19 | | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 20 | 1AB20 | | Bedroom | 2.5 | 1.0 | Pass | 1.0 | Pass |
| 21 | 1AB21L | | Living/Kitchen | 1.6 | 1.5 | Pass | 2.0 | Fail |
| 22 | 1AB22 | | Bedroom | 2.4 | 1.0 | Pass | 1.0 | Pass |
| 23 | 1AB23 | | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 24 | 1AB24 | | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 25 | 1AB25 | | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 26 | 1AB26 | | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 27 | 1AB27 | | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 28 | 1AB28L | | Living/Kitchen | 1.7 | 1.5 | Pass | 2.0 | Fail |
| 29 | 1AB29 | | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 30 | 1AB30 | | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 31 | 1AB31L | | Living/Kitchen | 4.2 | 1.5 | Pass | 2.0 | Pass |
| 32 | 1AB32 | | Bedroom | 2.4 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | | |
| | | | | Pass | | 32 | | 29 |
| | | | | Count | | 32 | | 32 |
| | | | | Percentage | | 100% | | 91% |

## ADF Check - Summary

**Average ADF** for the tested living rooms is **3.6%** and for bedrooms **2.8%**

## 1st Floor Layout – Naming Convention - CD

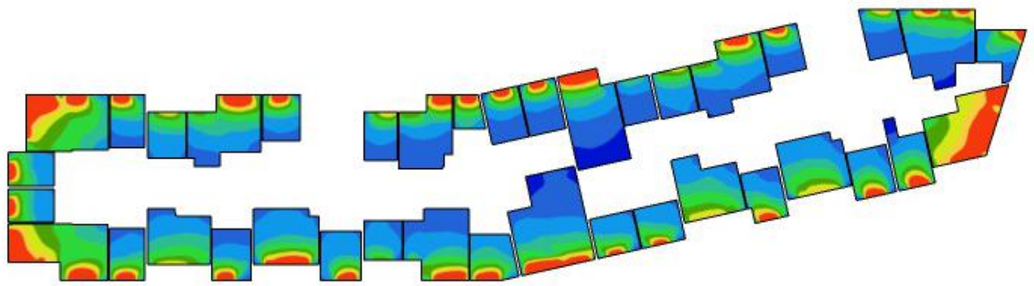



*Legend for radiance plots:*

Daylight Factor [DF] %

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

## 1st Floor Analysis - CD

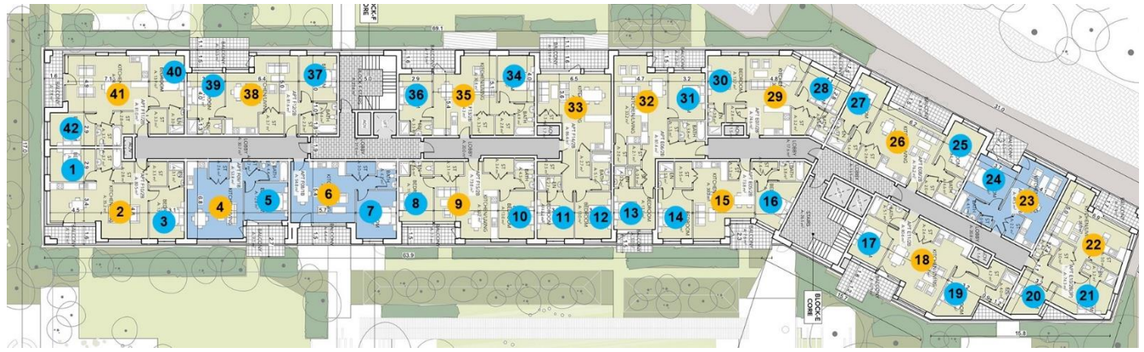


| 1CD | Average Daylight Factor | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | *For all habitable rooms* | | | |
| | ADF Values from radiance 3D m | | Yes | | | | | |
| | | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | | Type | ADF | Min | Check | Min | Check |
| 1 | 1CD01 | | Bedroom | 2.5 | 1.0 | Pass | 1.0 | Pass |
| 2 | 1CD02L | | Living/Kitchen | 4.6 | 1.5 | Pass | 2.0 | Pass |
| 3 | 1CD03 | | Bedroom | 2.4 | 1.0 | Pass | 1.0 | Pass |
| 4 | 1CD04L | | Living/Kitchen | 1.8 | 1.5 | Pass | 2.0 | Marginal |
| 5 | 1CD05 | | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 6 | 1CD06L | | Living/Kitchen | 2.4 | 1.5 | Pass | 2.0 | Pass |
| 7 | 1CD07 | | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 8 | 1CD08 | | Bedroom | 1.4 | 1.0 | Pass | 1.0 | Pass |
| 9 | 1CD09L | | Living/Kitchen | 2.1 | 1.5 | Pass | 2.0 | Pass |
| 10 | 1CD10 | | Bedroom | 2.7 | 1.0 | Pass | 1.0 | Pass |
| 11 | 1CD11L | | Living/Kitchen | 2.1 | 1.5 | Pass | 2.0 | Pass |
| 12 | 1CD12 | | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 13 | 1CD13 | | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 14 | 1CD14L | | Living/Kitchen | 2.1 | 1.5 | Pass | 2.0 | Pass |
| 15 | 1CD15 | | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 16 | 1CD16L | | Living/Kitchen | 2.0 | 1.5 | Pass | 2.0 | Pass |
| 17 | 1CD17 | | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 18 | 1CD18 | | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 19 | 1CD19L | | Living/Kitchen | 6.4 | 1.5 | Pass | 2.0 | Pass |
| 20 | 1CD20 | | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 21 | 1CD21L | | Living/Kitchen | 1.7 | 1.5 | Pass | 2.0 | Fail |
| 22 | 1CD22 | | Bedroom | 1.3 | 1.0 | Pass | 1.0 | Pass |
| 23 | 1CD23 | | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 24 | 1CD24L | | Living/Kitchen | 1.9 | 1.5 | Pass | 2.0 | Marginal |
| 25 | 1CD25 | | Bedroom | 1.6 | 1.0 | Pass | 1.0 | Pass |
| 26 | 1CD26 | | Bedroom | 0.9 | 1.0 | Marginal | 1.0 | Marginal |
| 27 | 1CD27L | | Living/Kitchen | 2.0 | 1.5 | Pass | 2.0 | Pass |
| 28 | 1CD28 | | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 29 | 1CD29 | | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 30 | 1CD30 | | Bedroom | 3.4 | 1.0 | Pass | 1.0 | Pass |
| 31 | 1CD31L | | Living/Kitchen | 1.9 | 1.5 | Pass | 2.0 | Marginal |
| 32 | 1CD32 | | Bedroom | 1.6 | 1.0 | Pass | 1.0 | Pass |
| 33 | 1CD33 | | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 34 | 1CD34L | | Living/Kitchen | 2.5 | 1.5 | Pass | 2.0 | Pass |
| 35 | 1CD35 | | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 36 | 1CD36 | | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 37 | 1CD37L | | Living/Kitchen | 4.5 | 1.5 | Pass | 2.0 | Pass |
| 38 | 1CD38 | | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | | |
| | | | | Pass | | 37 | | 33 |
| | | | | Count | | 38 | | 38 |
| | | | | Percentage | | 97% | | 87% |

## ADF Check - Summary

**Average ADF** for the tested living rooms is **2.7%** and for bedrooms **2.1%**

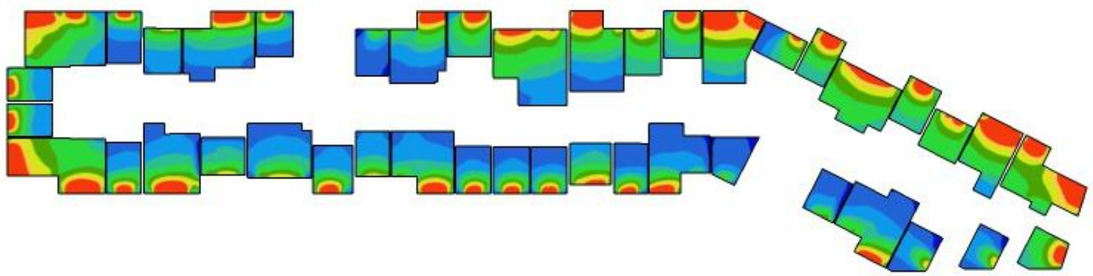
## 1st Floor Layout – Naming Convention - EF




*Legend for radiance plots:*

Daylight Factor [DF] %


## 1st Floor Analysis - EF

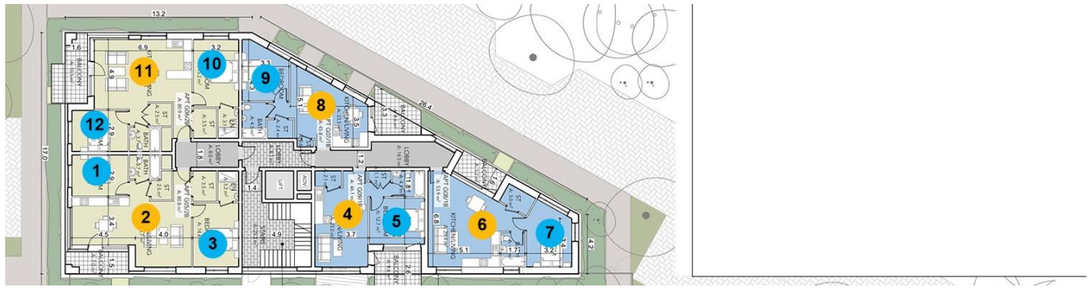


| 1EF | Average Daylight Factor | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | *For all habitable rooms* | | |
| | ADF Values from radiance 3D m | | Yes | | | | |
| | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | Type | ADF | Min | Check | Min | Check |
| 1 | 1EF01 | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 2 | 1EF02L | Living/Kitchen | 4.9 | 1.5 | Pass | 2.0 | Pass |
| 3 | 1EF03 | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 4 | 1EF04L | Living/Kitchen | 2.8 | 1.5 | Pass | 2.0 | Pass |
| 5 | 1EF05 | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 6 | 1EF06L | Living/Kitchen | 1.5 | 1.5 | Pass | 2.0 | Fail |
| 7 | 1EF07 | Bedroom | 2.4 | 1.0 | Pass | 1.0 | Pass |
| 8 | 1EF08 | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 9 | 1EF09L | Living/Kitchen | 2.3 | 1.5 | Pass | 2.0 | Pass |
| 10 | 1EF10 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 11 | 1EF11 | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 12 | 1EF12 | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 13 | 1EF13 | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 14 | 1EF14 | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 15 | 1EF15L | Living/Kitchen | 1.8 | 1.5 | Pass | 2.0 | Marginal |
| 16 | 1EF16 | Bedroom | 0.9 | 1.0 | Marginal | 1.0 | Marginal |
| 17 | 1EF17 | Bedroom | 1.1 | 1.0 | Pass | 1.0 | Pass |
| 18 | 1EF18L | Living/Kitchen | 1.8 | 1.5 | Pass | 2.0 | Marginal |
| 19 | 1EF19 | Bedroom | 1.3 | 1.0 | Pass | 1.0 | Pass |
| 20 | 1EF20 | Bedroom | 1.5 | 1.0 | Pass | 1.0 | Pass |
| 21 | 1EF21 | Bedroom | 3.7 | 1.0 | Pass | 1.0 | Pass |
| 22 | 1EF22L | Living/Kitchen | 5.1 | 1.5 | Pass | 2.0 | Pass |
| 23 | 1EF23L | Living/Kitchen | 5.1 | 1.5 | Pass | 2.0 | Pass |
| 24 | 1EF24 | Bedroom | 3.1 | 1.0 | Pass | 1.0 | Pass |
| 25 | 1EF25 | Bedroom | 3.6 | 1.0 | Pass | 1.0 | Pass |
| 26 | 1EF26L | Living/Kitchen | 3.5 | 1.5 | Pass | 2.0 | Pass |
| 27 | 1EF27 | Bedroom | 3.9 | 1.0 | Pass | 1.0 | Pass |
| 28 | 1EF28 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 29 | 1EF29L | Living/Kitchen | 4.6 | 1.5 | Pass | 2.0 | Pass |
| 30 | 1EF30 | Bedroom | 3.4 | 1.0 | Pass | 1.0 | Pass |
| 31 | 1EF31 | Bedroom | 2.7 | 1.0 | Pass | 1.0 | Pass |
| 32 | 1EF32L | Living/Kitchen | 3.0 | 1.5 | Pass | 2.0 | Pass |
| 33 | 1EF33L | Living/Kitchen | 2.6 | 1.5 | Pass | 2.0 | Pass |
| 34 | 1EF34 | Bedroom | 3.2 | 1.0 | Pass | 1.0 | Pass |
| 35 | 1EF35L | Living/Kitchen | 2.4 | 1.5 | Pass | 2.0 | Pass |
| 36 | 1EF36 | Bedroom | 1.0 | 1.0 | Pass | 1.0 | Pass |
| 37 | 1EF37 | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 38 | 1EF38L | Living/Kitchen | 2.6 | 1.5 | Pass | 2.0 | Pass |
| 39 | 1EF39 | Bedroom | 1.7 | 1.0 | Pass | 1.0 | Pass |
| 40 | 1EF40 | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 41 | 1EF41L | Living/Kitchen | 3.8 | 1.5 | Pass | 2.0 | Pass |
| 42 | 1EF42 | Bedroom | 2.5 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | |
| | | | Pass | | 41 | | 38 |
| | | | Count | | 42 | | 42 |
| | | | Percentage | | 98% | | 90% |

## ADF Check - Summary

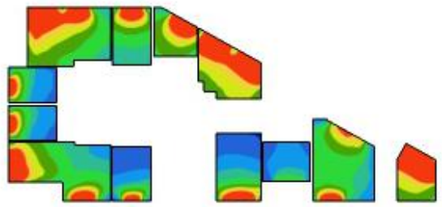
**Average ADF** for the tested living rooms is **3.2%** and for bedrooms **2.4%**

## 1st Floor Layout – Naming Convention - G




*Legend for radiance plots:*


## 1st Floor Analysis - G



| 1G | Average Daylight Factor | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | *For all habitable rooms* | | | |
| | ADF Values from radiance 3D m | | Yes | | | | | |
| | | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | | Type | ADF | Min | Check | Min | Check |
| 1 | 1G01 | | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 2 | 1G02L | | Living/Kitchen | 4.1 | 1.5 | Pass | 2.0 | Pass |
| 3 | 1G03 | | Bedroom | 1.7 | 1.0 | Pass | 1.0 | Pass |
| 4 | 1G04L | | Living/Kitchen | 2.4 | 1.5 | Pass | 2.0 | Pass |
| 5 | 1G05 | | Bedroom | 1.3 | 1.0 | Pass | 1.0 | Pass |
| 6 | 1G06L | | Living/Kitchen | 3.0 | 1.5 | Pass | 2.0 | Pass |
| 7 | 1G07 | | Bedroom | 7.7 | 1.0 | Pass | 1.0 | Pass |
| 8 | 1G08L | | Living/Kitchen | 6.7 | 1.5 | Pass | 2.0 | Pass |
| 9 | 1G09 | | Bedroom | 5.3 | 1.0 | Pass | 1.0 | Pass |
| 10 | 1G10 | | Bedroom | 3.7 | 1.0 | Pass | 1.0 | Pass |
| 11 | 1G11L | | Living/Kitchen | 5.3 | 1.5 | Pass | 2.0 | Pass |
| 12 | 1G12 | | Bedroom | 2.5 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | | |
| | | | | Pass | | 12 | | 12 |
| | | | | Count | | 12 | | 12 |
| | | | | Percentage | | 100% | | 100% |

## ADF Check - Summary

**Average ADF** for the tested living rooms is **4.3%** and for bedrooms **3.5%**

## Summary for all blocks 1st Floor

| | Relaxed BRE | | | | Strict BRE | | |
|---|---|---|---|---|---|---|---|
| | Pass | Rooms | | | Pass | Rooms | |
| AB | 32 | 32 | | | 29 | 32 | |
| CD | 37 | 38 | | | 33 | 38 | |
| DE | 41 | 42 | | | 38 | 42 | |
| G | 12 | 12 | | | 12 | 12 | |
| | | | | | | | |
| Total | 122 | 124 | 98% | | 112 | 124 | 90% |

Of the 124 rooms tested at 1st floor level
90% pass the strict BRE requirements and 7 of the 12 that don't are marginal.
98% pass the relaxed requirements and the and the 2 that don't are marginal.
Given the scale of the project this represents careful design which we can see from the high average overall ADF for the living rooms of 3.2% and 2.5% for bedrooms. These results will only improve at higher floor levels. There are specific constraints relating to these two rooms which limit light access.

## ADF Check - Summary

ADF (average daylight factors)

**90%** comply with the strict BRE requirements and of 7 of the 12 that do not are marginal.
**98%** tested rooms on the 1st floor comply with the relaxed requirements and the two that do not are marginal.
The development shows excellent average ADF results.
Average ADF for all tested living rooms in all blocks is an excellent is **3.2%** and for bedrooms **2.5%**

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

# Development Performance - Sunlight into living spaces

## Proposed Development - 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 relatively 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

## Tabulated results 1st Floor

| 1st Floor | | Sunlight APSH - Living rooms | | | | | | |
|---|---|---|---|---|---|---|---|---|
| V3 | | | | | | | | |
| | | | Annual > 25% | | | | Winter > 5% | |
| Block | Floor | Ref | APSH | | | | WPSH | |
| AB | F1 | W2 | 69.8 | Pass | | | 17.6 | Pass |
| AB | F1 | W5 | 27.4 | Pass | | | 8.5 | Pass |
| AB | F1 | W7 | 51.3 | Pass | | | 17.8 | Pass |
| AB | F1 | W9 | 15.2 | Fail | | | 4.4 | Marginal |
| AB | F1 | W11 | 49.6 | Pass | | | 16.2 | Pass |
| AB | F1 | W12 | 35.7 | Pass | | | 13.4 | Pass |
| AB | F1 | W15 | 9.9 | Fail | | | 5.1 | Pass |
| AB | F1 | W17 | 17.9 | Fail | | | 2.1 | Fail |
| AB | F1 | W21 | 27.1 | Pass | | | 6.7 | Pass |
| AB | F1 | W28 | 7.1 | Fail | | | 1.6 | Fail |
| AB | F1 | W31 | 29.0 | Pass | | | 9.2 | Pass |
| CD | F1 | W2 | 59.7 | Pass | | | 6.1 | Pass |
| CD | F1 | W4 | 9.2 | Fail | | | 4.0 | Marginal |
| CD | F1 | W6 | 13.7 | Fail | | | 2.7 | Fail |
| CD | F1 | W9 | 25.0 | Pass | | | 7.5 | Pass |
| CD | F1 | W11 | 12.3 | Fail | | | 1.3 | Fail |
| CD | F1 | W14 | 1.9 | Fail | | | 0.0 | Fail |
| CD | F1 | W16 | 6.8 | Fail | | | 0.8 | Fail |
| CD | F1 | W19 | 12.1 | Fail | | | 0.8 | Fail |
| CD | F1 | W21 | 12.5 | Fail | | | 1.9 | Fail |
| CD | F1 | W24 | 27.9 | Pass | | | 6.9 | Pass |
| CD | F1 | W27 | 30.4 | Pass | | | 7.8 | Pass |
| CD | F1 | W31 | 19.7 | Marginal | | | 2.9 | Fail |
| CD | F1 | W34 | 22.2 | Marginal | | | 5.0 | Pass |
| CD | F1 | W37 | 25.0 | Pass | | | 5.7 | Pass |
| EF | F1 | W2 | 61.2 | Pass | | | 7.3 | Pass |
| EF | F1 | W4 | 23.8 | Marginal | | | 7.5 | Pass |
| EF | F1 | W6 | 6.6 | Fail | | | 3.6 | Fail |
| EF | F1 | W9 | 18.4 | Fail | | | 3.8 | Fail |
| EF | F1 | W15 | 26.7 | Pass | | | 8.2 | Pass |
| EF | F1 | W18 | 25.0 | Pass | | | 8.5 | Pass |
| EF | F1 | W22 | 18.0 | Fail | | | 0.6 | Fail |
| EF | F1 | W23 | 27.0 | Pass | | | 2.7 | Fail |
| EF | F1 | W26 | 12.1 | Fail | | | 0.6 | Fail |
| EF | F1 | W29 | 37.5 | Pass | | | 5.8 | Pass |
| EF | F1 | W32 | 30.1 | Pass | | | 3.3 | Fail |
| EF | F1 | W33 | 11.1 | Fail | | | 0.0 | Fail |
| EF | F1 | W35 | 17.2 | Fail | | | 3.7 | Fail |
| EF | F1 | W38 | 19.2 | Marginal | | | 7.3 | Pass |
| EF | F1 | W41 | 17.9 | Fail | | | 2.2 | Fail |
| G | F1 | W2 | 59.6 | Pass | | | 7.4 | Pass |
| G | F1 | W4 | 20.7 | Marginal | | | 7.5 | Pass |
| G | F1 | W6 | 17.2 | Fail | | | 7.1 | Pass |
| G | F1 | W8 | 27.0 | Pass | | | 2.7 | Fail |
| G | F1 | W11 | 19.7 | Marginal | | | 1.7 | Fail |

| 3rd Floor | | Sunlight APSH - Living rooms | | | | | | |
|---|---|---|---|---|---|---|---|---|
| V3 | | | | | | | | |
| | | | Annual > 25% | | | | Winter > 5% | |
| Block | Floor | Ref | APSH | | | | WPSH | |
| AB | F3 | W2 | 75.4 | Pass | | | 22.5 | Pass |
| AB | F3 | W5 | 28.7 | Pass | | | 9.8 | Pass |
| AB | F3 | W7 | 52.4 | Pass | | | 18.9 | Pass |
| AB | F3 | W9 | 16.1 | Fail | | | 5.3 | Pass |
| AB | F3 | W11 | 50.3 | Pass | | | 16.9 | Pass |
| AB | F3 | W12 | 36.0 | Pass | | | 13.8 | Pass |
| AB | F3 | W15 | 10.0 | Fail | | | 5.2 | Pass |
| AB | F3 | W17 | 25.1 | Pass | | | 4.3 | Marginal |
| AB | F3 | W21 | 37.2 | Pass | | | 9.9 | Pass |
| AB | F3 | W28 | 14.1 | Fail | | | 2.5 | Fail |
| AB | F3 | W31 | 34.0 | Pass | | | 13.9 | Pass |
| CD | F3 | W2 | 71.8 | Pass | | | 17.3 | Pass |
| CD | F3 | W4 | 9.0 | Fail | | | 5.0 | Pass |
| CD | F3 | W6 | 19.4 | Marginal | | | 4.0 | Marginal |
| CD | F3 | W9 | 32.4 | Pass | | | 10.7 | Pass |
| CD | F3 | W11 | 17.9 | Fail | | | 4.7 | Marginal |
| CD | F3 | W14 | 2.8 | Fail | | | 0.3 | Fail |
| CD | F3 | W16 | 8.2 | Fail | | | 2.2 | Fail |
| CD | F3 | W19 | 11.7 | Fail | | | 0.4 | Fail |
| CD | F3 | W21 | 18.9 | Fail | | | 4.4 | Marginal |
| CD | F3 | W24 | 37.2 | Pass | | | 9.7 | Pass |
| CD | F3 | W27 | 39.2 | Pass | | | 10.6 | Pass |
| CD | F3 | W31 | 27.1 | Pass | | | 4.2 | Marginal |
| CD | F3 | W34 | 32.2 | Pass | | | 8.1 | Pass |
| CD | F3 | W37 | 30.1 | Pass | | | 11.0 | Pass |
| EF | F3 | W2 | 73.3 | Pass | | | 18.5 | Pass |
| EF | F3 | W4 | 32.7 | Pass | | | 12.2 | Pass |
| EF | F3 | W6 | 8.7 | Fail | | | 4.0 | Marginal |
| EF | F3 | W9 | 28.2 | Pass | | | 7.7 | Pass |
| EF | F3 | W15 | 32.9 | Pass | | | 11.2 | Pass |
| EF | F3 | W18 | 28.1 | Pass | | | 12.0 | Pass |
| EF | F3 | W22 | 18.0 | Fail | | | 0.6 | Fail |
| EF | F3 | W23 | 27.5 | Pass | | | 3.2 | Fail |
| EF | F3 | W26 | 7.5 | Fail | | | 0.6 | Fail |
| EF | F3 | W29 | 39.2 | Pass | | | 7.5 | Pass |
| EF | F3 | W32 | 33.1 | Pass | | | 5.2 | Pass |
| EF | F3 | W33 | 13.9 | Fail | | | 0.0 | Fail |
| EF | F3 | W35 | 24.8 | Marginal | | | 5.4 | Pass |
| EF | F3 | W38 | 28.9 | Pass | | | 9.1 | Pass |
| EF | F3 | W41 | 23.9 | Marginal | | | 7.7 | Pass |
| G | F3 | W2 | 70.1 | Pass | | | 15.7 | Pass |
| G | F3 | W4 | 27.9 | Pass | | | 10.0 | Pass |
| G | F3 | W6 | 23.9 | Marginal | | | 9.2 | Pass |
| G | F3 | W8 | 27.5 | Pass | | | 3.2 | Fail |
| G | F3 | W11 | 29.4 | Pass | | | 10.9 | Pass |

All windows receive some sunlight and the number that face North are small.
The orientation of these blocks is set by the granted Phase 1 design.

If we include the marginal results then:

1st Floor **58%** pass the Annual APSH requirements and **56%** pass the WPSH
3rd Floor **71%** pass the Annual APSH requirements and **80%** pass the WPSH

The results on these higher floors are closer to the guidelines example of “careful layout” design 80%.

## Sunlight to Living rooms - Summary

**100%** of Living rooms receive some sunlight over the course of the year.

If we include the marginal results then:
1st Floor **58%** pass the Annual APSH requirements and **56%** pass the WPSH
3rd Floor **71%** pass the Annual APSH requirements and **80%** pass the WPSH
This is in generally in accordance with what the guidelines define as “careful layout” design 80%.

**The proposed development generally complies with the requirements of the BRE guidelines in relation to Sunlight availability and careful layout design.**

## 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 properties were tested.

- Private balconies
- Shared amenity spaces

### 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

| 1st Floor | Shadow / Sunlight Amenity | | | |
|---|---|---|---|---|
| | >50% receives 2 hours of sunlight on 21st March) | | | |
| V3 | | | | |
| | | Ref | % 2hr Sunlight | Check |
| **AB** | F1 | A2 | 89% | Pass |
| AB | F1 | A5 | 93% | Pass |
| AB | F1 | A7 | 79% | Pass |
| AB | F1 | A9 | 81% | Pass |
| AB | F1 | A11 | 74% | Pass |
| AB | F1 | A12 | 22% | Fail |
| AB | F1 | A15 | 42% | Marginal |
| AB | F1 | A17 | 0% | Fail |
| AB | F1 | A21 | 6% | Fail |
| AB | F1 | A28 | 2% | Fail |
| AB | F1 | A31 | 97% | Pass |
| CD | F1 | A2 | 87% | Pass |
| CD | F1 | A4 | 70% | Pass |
| CD | F1 | A6 | 17% | Fail |
| CD | F1 | A9 | 19% | Fail |
| CD | F1 | A11 | 34% | Fail |
| CD | F1 | A14 | 0% | Fail |
| CD | F1 | A16 | 10% | Fail |
| CD | F1 | A19 | 0% | Fail |
| CD | F1 | A21 | 0% | Fail |
| CD | F1 | A24 | 34% | Fail |
| CD | F1 | A27 | 68% | Pass |
| CD | F1 | A31 | 58% | Pass |
| CD | F1 | A34 | 77% | Pass |
| CD | F1 | A37 | 95% | Pass |
| EF | F1 | A2 | 83% | Pass |
| EF | F1 | A4 | 71% | Pass |
| EF | F1 | A6 | 37% | Fail |
| EF | F1 | A9 | 33% | Fail |
| EF | F1 | A15 | 41% | Marginal |
| EF | F1 | A18 | 86% | Pass |
| EF | F1 | A22 | 46% | Marginal |
| EF | F1 | A23 | 51% | Pass |
| EF | F1 | A26 | 64% | Pass |
| EF | F1 | A29 | 100% | Pass |
| EF | F1 | A32 | 76% | Pass |
| EF | F1 | A33 | 43% | Marginal |
| EF | F1 | A35 | 0% | Fail |
| EF | F1 | A38 | 71% | Pass |
| EF | F1 | A41 | 95% | Pass |
| G | F1 | A2 | 81% | Pass |
| G | F1 | A4 | 21% | Fail |
| G | F1 | A6 | 43% | Marginal |
| G | F1 | A8 | 66% | Pass |
| G | F1 | A11 | 76% | Pass |

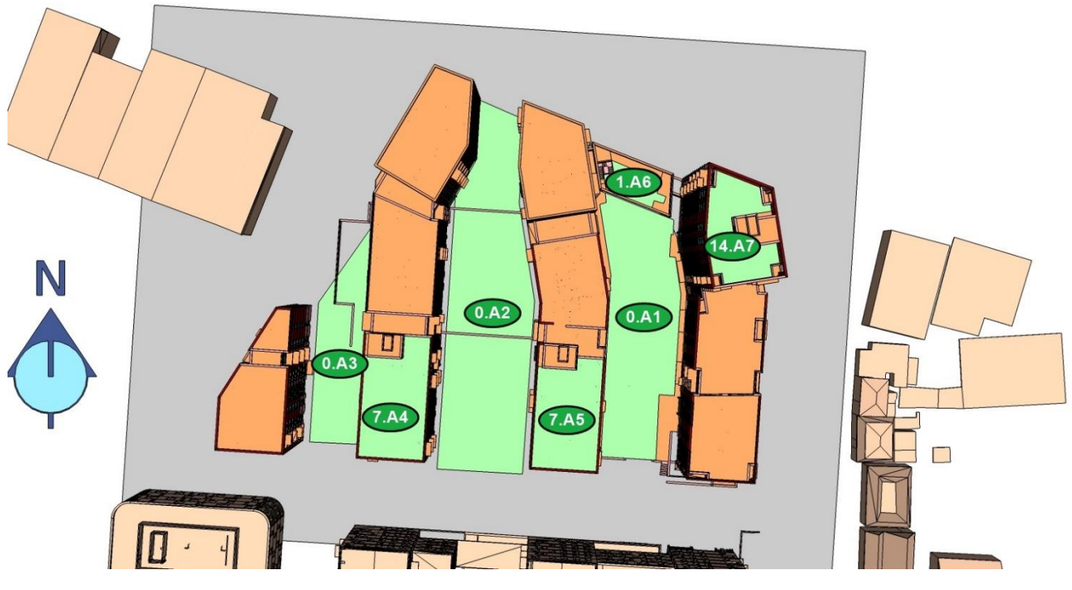
| 3rd Floor | Shadow / Sunlight Amenity | | | |
|---|---|---|---|---|
| | >50% receives 2 hours of sunlight on 21st March) | | | |
| V3 | | | | |
| | | Ref | % 2hr Sunlight | Check |
| **AB** | F3 | A2 | 98% | Pass |
| AB | F3 | A5 | 95% | Pass |
| AB | F3 | A7 | 88% | Pass |
| AB | F3 | A9 | 81% | Pass |
| AB | F3 | A11 | 74% | Pass |
| AB | F3 | A12 | 26% | Fail |
| AB | F3 | A15 | 65% | Pass |
| AB | F3 | A17 | 40% | Marginal |
| AB | F3 | A21 | 13% | Fail |
| AB | F3 | A28 | 61% | Pass |
| AB | F3 | A31 | 99% | Pass |
| CD | F3 | A2 | 94% | Pass |
| CD | F3 | A4 | 84% | Pass |
| CD | F3 | A6 | 63% | Pass |
| CD | F3 | A9 | 58% | Pass |
| CD | F3 | A11 | 61% | Pass |
| CD | F3 | A14 | 49% | Marginal |
| CD | F3 | A16 | 60% | Pass |
| CD | F3 | A19 | 0% | Fail |
| CD | F3 | A21 | 43% | Marginal |
| CD | F3 | A24 | 64% | Pass |
| CD | F3 | A27 | 81% | Pass |
| CD | F3 | A31 | 79% | Pass |
| CD | F3 | A34 | 71% | Pass |
| CD | F3 | A37 | 95% | Pass |
| EF | F3 | A2 | 97% | Pass |
| EF | F3 | A4 | 78% | Pass |
| EF | F3 | A6 | 50% | Pass |
| EF | F3 | A9 | 60% | Pass |
| EF | F3 | A15 | 61% | Pass |
| EF | F3 | A18 | 91% | Pass |
| EF | F3 | A22 | 46% | Marginal |
| EF | F3 | A23 | 51% | Pass |
| EF | F3 | A26 | 63% | Pass |
| EF | F3 | A29 | 99% | Pass |
| EF | F3 | A32 | 83% | Pass |
| EF | F3 | A33 | 76% | Pass |
| EF | F3 | A35 | 19% | Fail |
| EF | F3 | A38 | 64% | Pass |
| EF | F3 | A41 | 97% | Pass |
| G | F3 | A2 | 97% | Pass |
| G | F3 | A4 | 53% | Pass |
| G | F3 | A6 | 61% | Pass |
| G | F3 | A8 | 66% | Pass |
| G | F3 | A11 | 99% | Pass |

If we include the marginal results then:

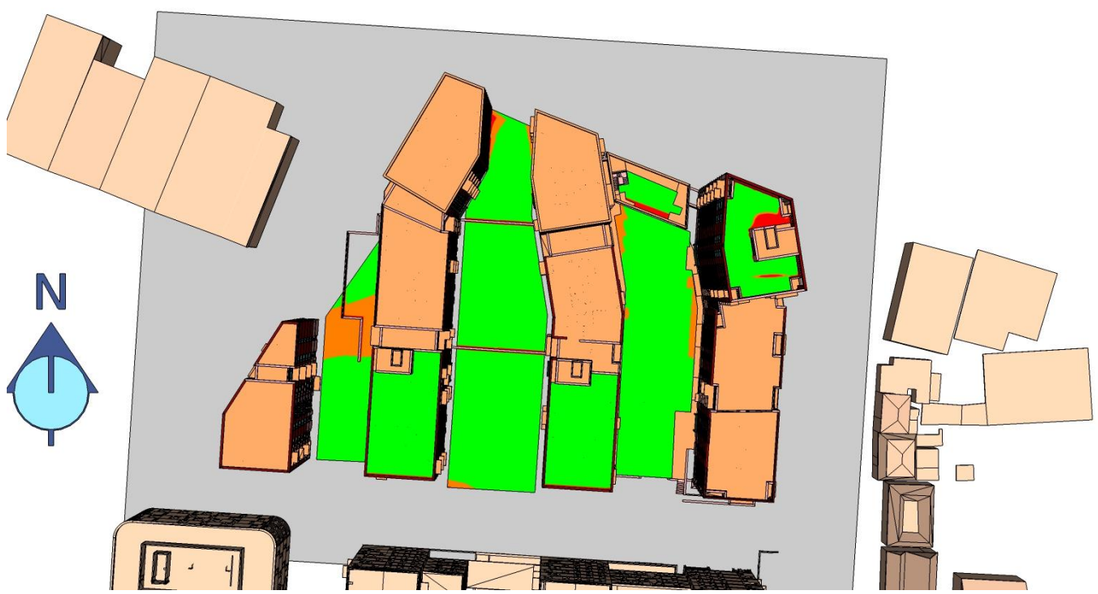
1st Floor **64%** pass the shadow requirements.
3rd Floor **91%** pass the shadow requirements.

The results on these higher floors are compatible with the guidelines example of “careful layout” design 80%.

## Shared Amenity Spaces, Ground and upper floors




Proposed




### The results are tabulated below:

| | Shadow / Sunlight Amenity | | | |
|---|---|---|---|---|
| | >50% receives 2 hours of sunlight on 21st March) | | | |
| V3 | | | | |
| | | Ref | % 2hr Sunlight | Check |
| AS | F0 | A1 | 95% | Pass |
| AS | F0 | A2 | 96% | Pass |
| AS | F0 | A3 | 70% | Pass |
| AS | F7 | A4 | 99% | Pass |
| AS | F7 | A5 | 99% | Pass |
| AS | F1 | A6 | 86% | Pass |
| AS | F14 | A7 | 87% | Pass |

All shared amenity spaces receive excellent sunlight.

*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

Provided shared and public amenity were tested against the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.

If we include the marginal results, then:
1st Floor **64%** of private spaces pass the shadow requirements.
3rd Floor **91%** of private spaces pass the shadow requirements.

**100%** of the Shared Spaces receive excellent and compliant sunlight results

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

# Development Solar Orientation

The design is constrained as an extension of the Phase 1 regeneration development, by the site shape and orientation. The scheme has a number of competing design constraints and objectives it is specifically covered by clause 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities – amended Dec 2020:

*6.6 Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision.*

*6.7 Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to design constraints associated with the site or location and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.*

# Details of Architect's Compensatory Measures / Justification

We accept that some balconies and living rooms may not meet the BRE recommendations for sun lighting in certain locations at the lower levels of the development, however, a high level of residential amenity will be delivered for all the residents of this scheme, such as:

a) In this urban infill site, a strong emphasis was placed on catering for high-quality sun lit areas such as the public and communal spaces, as well as private amenity spaces, which ensures that sunlit spaces will be accessible to all residents within the development and not just those with more favourably orientated apartments. A wide variety of communal amenity areas are also provided for within the scheme at the Ground, First, Seventh and Fourteenth floors. Furthermore, there is an overprovision of communal amenity space, of over 860sq.m, which can be likened to a compensatory measure for certain apartments receiving below the BRE recommendations. All amenity spaces surpass the sun-lighting requirement by substantial margins.

b) The design of the private balconies has been influenced by the necessity to provide shelter and protection from the wind in addition to any sunlighting requirement. In this regard, all balconies are fully or partially recessed into the block, and we recognize that these recessed balconies will naturally reduce sunlight exposure, but they will ultimately contribute to a more user-friendly and comfortable private amenity space for residents. It should also be noted, however, that a high proportion of balconies are substantially larger than the required areas for private open space, thus affording increased residential amenity for future residents of the development.

c) 98 % of the apartments receive above the required levels of daylighting and the analysis shows that all private spaces and living rooms also receive sunlight. There are no single north-facing single-aspect apartments within the entire scheme of 350 no. dwellings.

d) In order to improve sun lighting to ground floor units, the floor to ceiling height has been set at a generous 3m height and ground floor windows will be 2.7m high, which is substantially higher than the 2.1m standard height.

Future occupants will enjoy great levels of both daylight and sunlight within the proposed units and while having access to a number of amenity areas that are capable of receiving excellent levels of sunlight. The site is also directly opposite Santry Demesne Park which has large areas of open space and additional amenities. The results find that any impact on the sunlight received by individual apartments would be minimal in the overall context of the urban setting of the proposed development. There is a sufficient good quality of daylight in the apartments analysed and the amenity areas all have sufficient sunlight to be bright and pleasant spaces.

# 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.

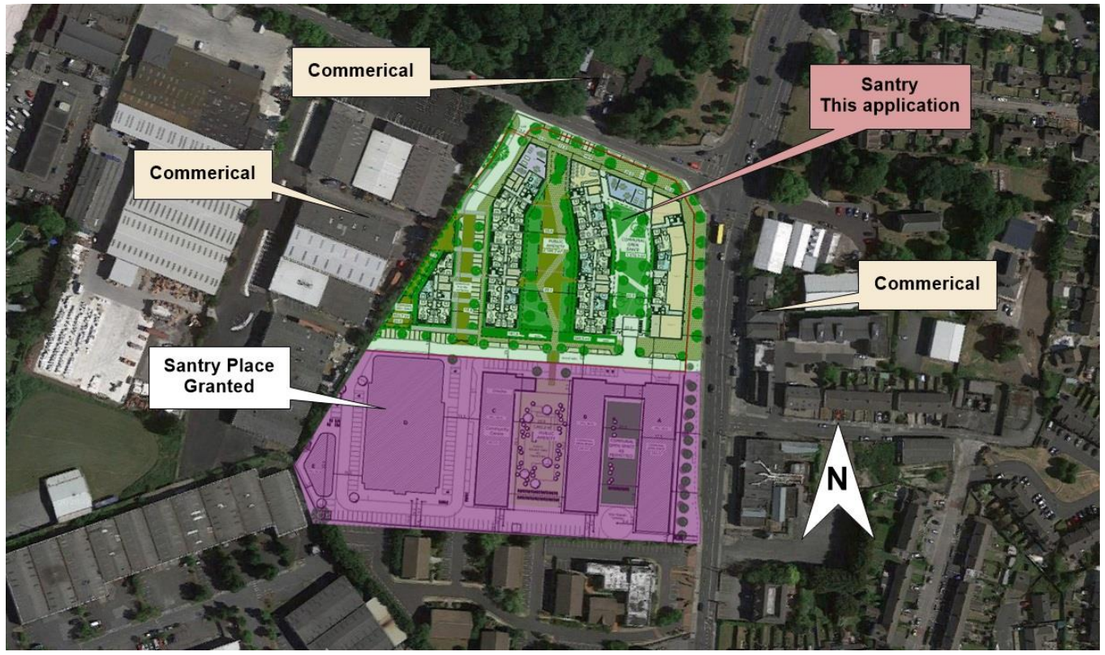
### Performance of the proposed design

- **Light Distribution ADF -** ADF (average daylight factors)
  - The development generally shows excellent ADF results.
  - **90%** comply with the strict BRE requirements.
    - 7 of the 12 that do not are marginal
  - **98%** tested rooms on the 1st floor comply with the relaxed requirements.
    - The 2 that do not are marginal.
  - Average high ADFs for all tested living rooms is **3.2%** and for bedrooms **2.5%**
  - A supplementary ADF analysis for the Ground Floor is also provided in Appendix 1.
- **Sunlight to Living rooms:** All windows were tested for Annual APSH and Winter WPSH
  - All Living rooms receive some sunlight over the course of the year.
  - If we include the marginal results then:
    - 1st Floor **58%** pass the Annual APSH requirements and **56%** pass the WPSH
    - 3rd Floor **71%** pass the Annual APSH requirements and **80%** pass the WPSH
  - This is in generally in accordance with what the guidelines define as “careful layout” design 80%.
- **Shadow:** Provided shared and public amenity were tested against the BRE requirement relating to the area receiving 2 hours of sunlight on the 21st of March > 50%.
  - Private amenity spaces, if we include the marginal results then:
    - 1st Floor **64%** of private spaces pass the shadow requirements.
    - 3rd Floor **91%** of private spaces pass the shadow requirements.
    - This is in generally in accordance with what the guidelines define as “careful layout” design **80%.**
  - **100%** of the main shared spaces receive excellent and compliant sunlight results.
- Please see Architects comments on alternative, compensatory design solutions relating to sunlight/shadow.

**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.**

# Impact on Neighbours

The proposed development generally sits amid commercial and retail buildings.




- **North:** To the North is a single storey commercial building in the heavily forested section of Santry Park.
- **West:** Commercial, office and warehouse buildings lie to the West.
- **East:** Across the relatively wide Swords Road lies retails and commercial buildings.
- **South:** Finally, to the South in line with each of the proposed blocks lies the permitted Santry Place, mixed use development.

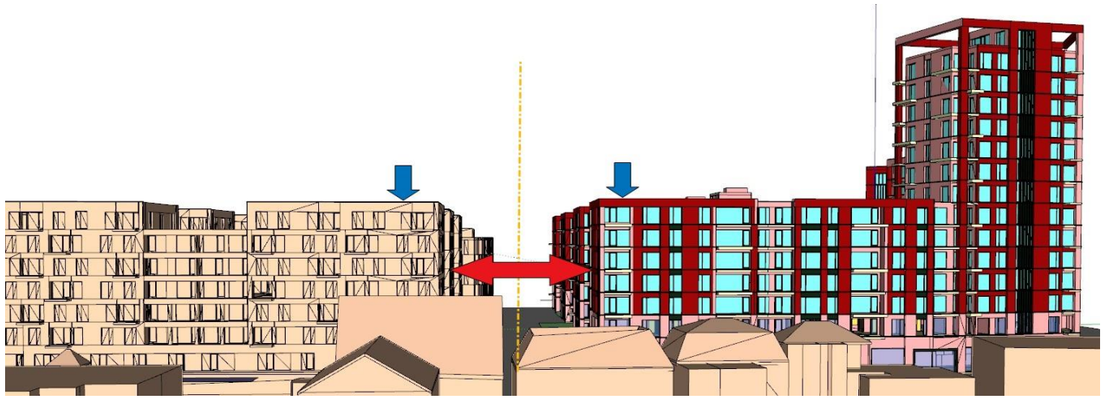
Impact is only considered for residential neighbours and thus we only need to look South in this case at the adjacent apartments permitted in the Santry place development.

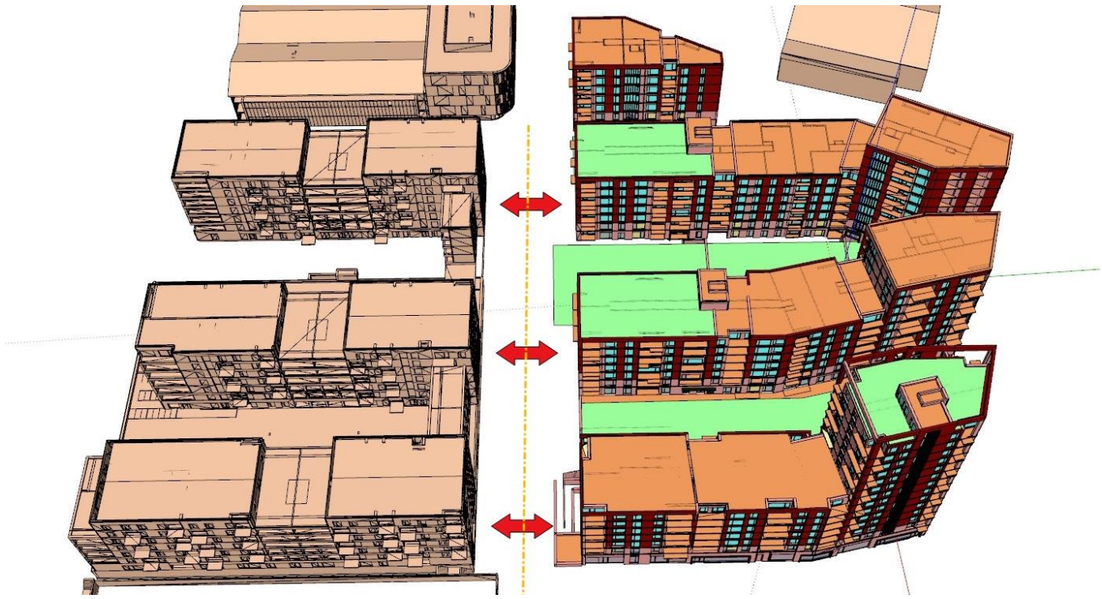
Since the current proposal sits directly to the North of Santry Place, there can be no impact on sunlight and no shadows can be cast this direction.

Particular care has been taken by the Architect to ensure good separation of the inline blocks in both the permitted development to the south and the current proposal to the north of same.

## Mirrored Development.

This proposal Phase 2 along the interface line is a mirrored development of the permitted and constructed Phase 1 design. The proposed design extends the existing blocks in height and location along the interface. The design of both Phase 1 and Phase 2 were cognisant of the neighbouring proposals and development potential.





Appendix F provides clarity on how adjacent and mirrored developments should be examined clause F5 applies

> ***F5 A similar approach may be adopted in cases where an existing building has windows that are unusually close to the site boundary and taking more than their fair share of light. Figure F3 shows an example, where side windows of an existing building are close to the boundary. To ensure that new development matches the height and proportions of existing buildings, the VSC and APSH targets for these windows could be set to those for a 'mirror-image' building of the same height and size, an equal distance away on the other side of the boundary.***

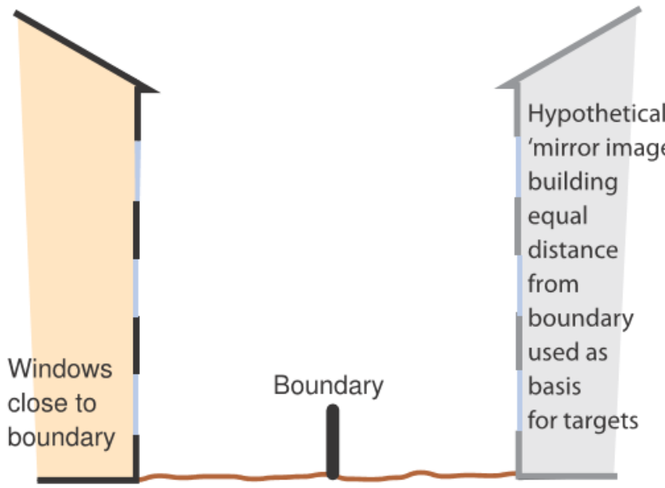



*Figure F3:* Use of a hypothetical mirror image building to set target daylight values

The layout of the current proposal, if approved, when read with Santry Place, will represent a comprehensive redevelopment of this brownfield condition at the junction of Santry Place & Swords Road. The Phase 2 proposed development (along the interface) is a direct mirror of granted Phase 1 application as it is evident that any impact on the Northern gable façade will be the same as the theoretical mirrored design. The development impact is therefore compliant with the guidelines and Mirrored development approach of Appendix F.

### *Summary impact Neighbours*

- Non-residential buildings sit to the West, North and East of the proposal and do not require testing.
- Phase 1 Santry Place sits to the South of this Phase 2 proposal.
    - Sunlight to amenity and windows of the granted Santry Place cannot be impacted by this current proposal as it sits to the North.
    - In relation to skylight (VSC) this proposal Phase 2 along the interface line is a mirrored development of the permitted and constructed Phase 1 design. Any impact along the closer façades will therefore be compliant with the guidelines and Mirrored development approach of Appendix F.

# Appendix 1
# Ground Floor Supplementary Analysis ADF

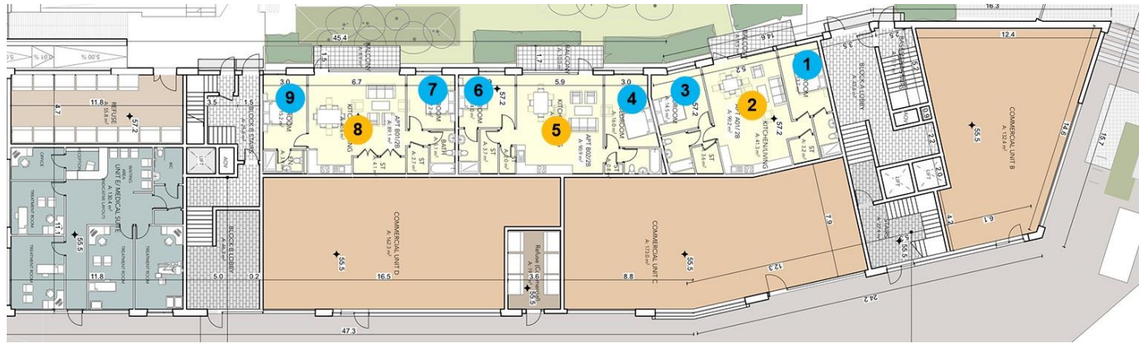
*Additional supplementary light distribution for Ground Floor apartments*

*Requested by Local Authority / ABP*

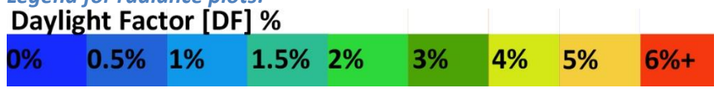
*Average Daylight Factor (ADF) only*

*By Induction higher floors will achieve better results as the windows will have less obstructions to skylight.*

## GFL Floor Layout – Naming Convention - AB

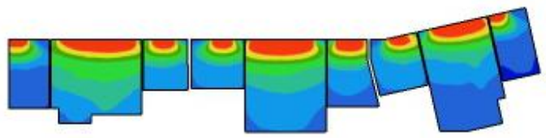



*Legend for radiance plots:*




| 0AB | Average Daylight Factor | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | *For all habitable rooms* | | |
| | ADF Values from radiance 3D m | | Yes | | | | |
| | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | Type | ADF | Min | Check | Min | Check |
| 1 | 0AB01 | Bedroom | 1.4 | 1.0 | Pass | 1.0 | Pass |
| 2 | 0AB02L | Living/Kitchen | 2.1 | 1.5 | Pass | 2.0 | Pass |
| 3 | 0AB03 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 4 | 0AB04 | Bedroom | 2.5 | 1.0 | Pass | 1.0 | Pass |
| 5 | 0AB05L | Living/Kitchen | 2.9 | 1.5 | Pass | 2.0 | Pass |
| 6 | 0AB06 | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 7 | 0AB07 | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 8 | 0AB08L | Living/Kitchen | 3.0 | 1.5 | Pass | 2.0 | Pass |
| 9 | 0AB09 | Bedroom | 1.6 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | |
| | | | Pass | | 9 | | 9 |
| | | | Count | | 9 | | 9 |
| | | | Percentage | | 100% | | 100% |

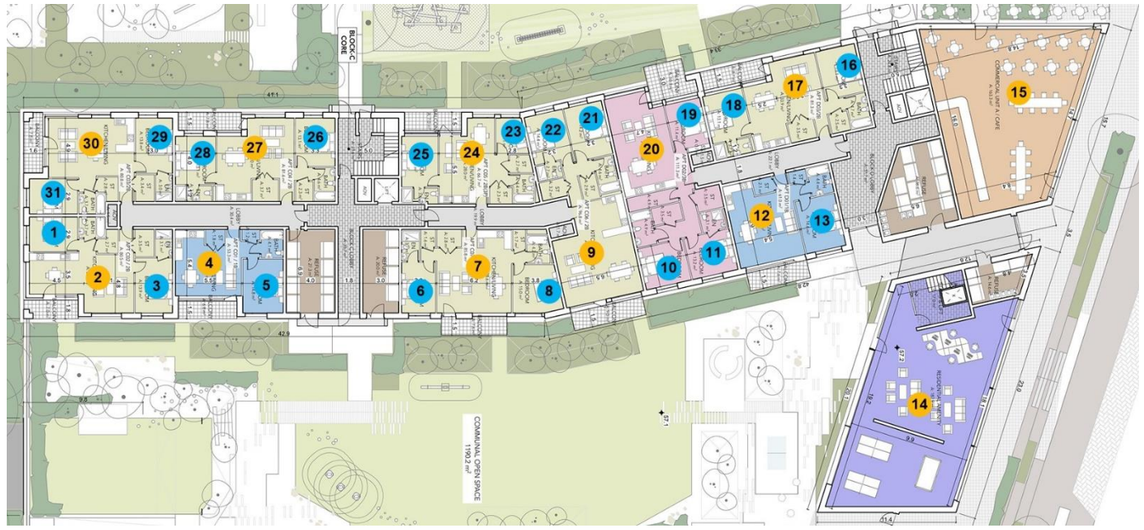
## GFL Floor Analysis - AB



## ADF Check - Summary

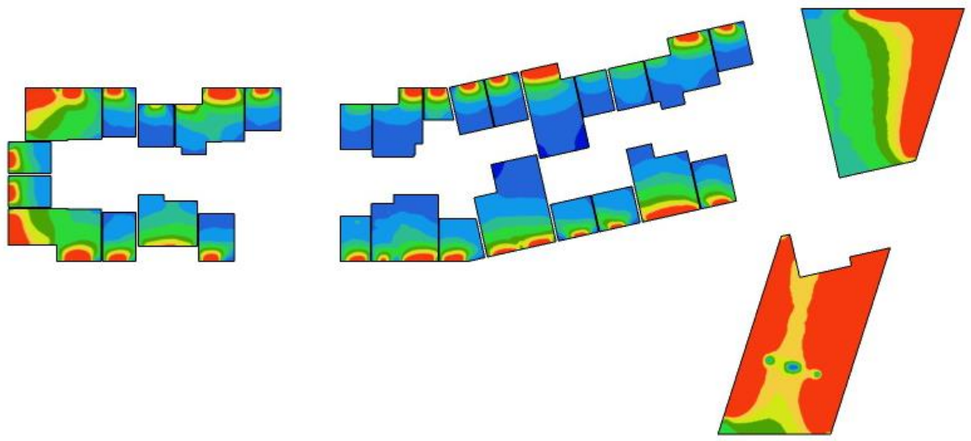
**Average ADF** for the tested living rooms is **2.7%** and for bedrooms **2.1%**

## GFL Floor Layout – Naming Convention - CD




*Legend for radiance plots:*


## GFL Floor Analysis - CD

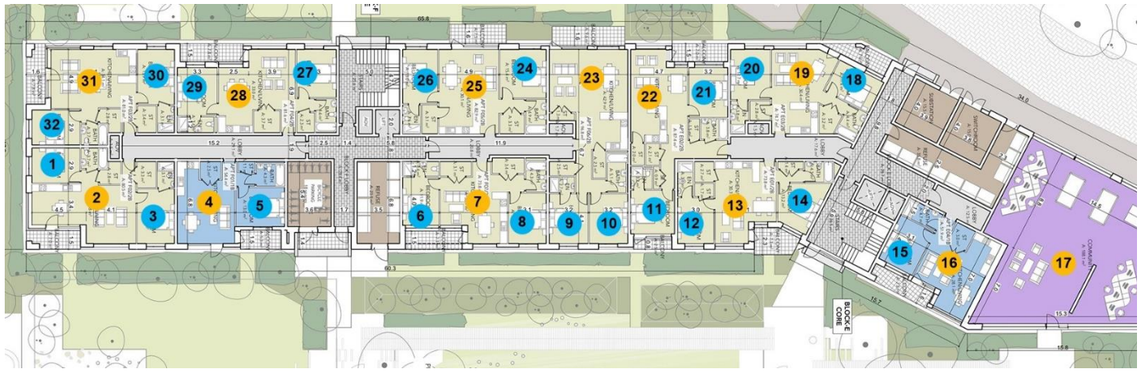


| 0CD | Average Daylight Factor | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | *For all habitable rooms* | | |
| | ADF Values from radiance 3D m | | Yes | | | | |
| | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | Type | ADF | Min | Check | Min | Check |
| 1 | 0CD01 | Bedroom | 2.7 | 1.0 | Pass | 1.0 | Pass |
| 2 | 0CD02L | Living/Kitchen | 4.4 | 1.5 | Pass | 2.0 | Pass |
| 3 | 0CD03 | Bedroom | 2.4 | 1.0 | Pass | 1.0 | Pass |
| 4 | 0CD04L | Living/Kitchen | 2.2 | 1.5 | Pass | 2.0 | Pass |
| 5 | 0CD05 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 6 | 0CD06 | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 7 | 0CD07L | Living/Kitchen | 2.0 | 1.5 | Pass | 2.0 | Pass |
| 8 | 0CD08 | Bedroom | 2.3 | 1.0 | Pass | 1.0 | Pass |
| 9 | 0CD09L | Living/Kitchen | 1.9 | 1.5 | Pass | 2.0 | Marginal |
| 10 | 0CD10 | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 11 | 0CD11 | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 12 | 0CD12L | Living/Kitchen | 2.8 | 1.5 | Pass | 2.0 | Pass |
| 13 | 0CD13 | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 14 | 0CD14L | Living/Kitchen | 9.1 | 1.5 | Pass | 2.0 | Pass |
| 15 | 0CD15L | Living/Kitchen | 5.5 | 1.5 | Pass | 2.0 | Pass |
| 16 | 0CD16 | Bedroom | 1.8 | 1.0 | Pass | 1.0 | Pass |
| 17 | 0CD17L | Living/Kitchen | 1.8 | 1.5 | Pass | 2.0 | Marginal |
| 18 | 0CD18 | Bedroom | 1.4 | 1.0 | Pass | 1.0 | Pass |
| 19 | 0CD19 | Bedroom | 1.1 | 1.0 | Pass | 1.0 | Pass |
| 20 | 0CD20L | Living/Kitchen | 2.0 | 1.5 | Pass | 2.0 | Pass |
| 21 | 0CD21 | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 22 | 0CD22 | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 23 | 0CD23 | Bedroom | 3.4 | 1.0 | Pass | 1.0 | Pass |
| 24 | 0CD24L | Living/Kitchen | 1.6 | 1.5 | Pass | 2.0 | Fail |
| 25 | 0CD25 | Bedroom | 1.2 | 1.0 | Pass | 1.0 | Pass |
| 26 | 0CD26 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 27 | 0CD27L | Living/Kitchen | 2.8 | 1.5 | Pass | 2.0 | Pass |
| 28 | 0CD28 | Bedroom | 1.2 | 1.0 | Pass | 1.0 | Pass |
| 29 | 0CD29 | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 30 | 0CD30L | Living/Kitchen | 4.5 | 1.5 | Pass | 2.0 | Pass |
| 31 | 0CD31 | Bedroom | 2.7 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | |
| | | | Pass | | 31 | | 28 |
| | | | Count | | 31 | | 31 |
| | | | Percentage | | 100% | | 90% |

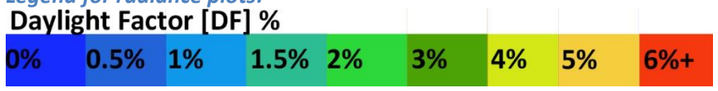
## ADF Check - Summary

**Average ADF** for the tested living rooms is **3.4%** and for bedrooms **2.0%**

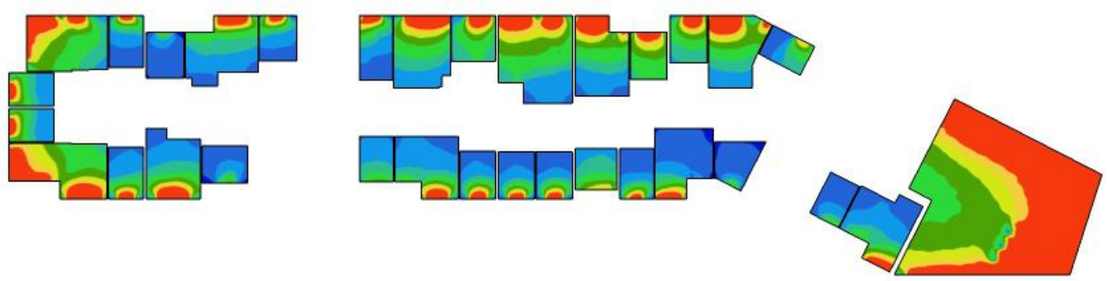
## GFL Floor Layout – Naming Convention - EF




*Legend for radiance plots:*




## GFL Floor Analysis - EF

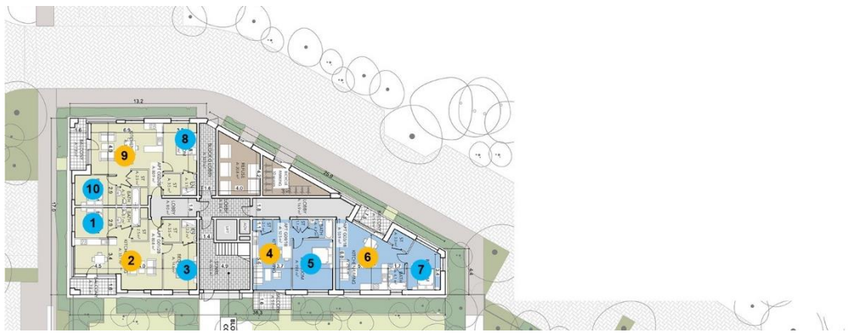


| OEF | Average Daylight Factor | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | *For all habitable rooms* | | |
| | ADF Values from radiance 3D m | | Yes | | | | |
| | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | Type | ADF | Min | Check | Min | Check |
| 1 | 0EF01 | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 2 | 0EF02L | Living/Kitchen | 5.4 | 1.5 | Pass | 2.0 | Pass |
| 3 | 0EF03 | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 4 | 0EF04L | Living/Kitchen | 2.7 | 1.5 | Pass | 2.0 | Pass |
| 5 | 0EF05 | Bedroom | 1.0 | 1.0 | Pass | 1.0 | Pass |
| 6 | 0EF06 | Bedroom | 1.6 | 1.0 | Pass | 1.0 | Pass |
| 7 | 0EF07L | Living/Kitchen | 2.1 | 1.5 | Pass | 2.0 | Pass |
| 8 | 0EF08 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 9 | 0EF09 | Bedroom | 1.9 | 1.0 | Pass | 1.0 | Pass |
| 10 | 0EF10 | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 11 | 0EF11 | Bedroom | 2.2 | 1.0 | Pass | 1.0 | Pass |
| 12 | 0EF12 | Bedroom | 1.6 | 1.0 | Pass | 1.0 | Pass |
| 13 | 0EF13L | Living/Kitchen | 1.5 | 1.5 | Pass | 2.0 | Fail |
| 14 | 0EF14 | Bedroom | 0.8 | 1.0 | Marginal | 1.0 | Marginal |
| 15 | 0EF15 | Bedroom | 1.0 | 1.0 | Pass | 1.0 | Pass |
| 16 | 0EF16L | Living/Kitchen | 1.9 | 1.5 | Pass | 2.0 | Marginal |
| 17 | 0EF17L | Living/Kitchen | 7.9 | 1.5 | Pass | 2.0 | Pass |
| 18 | 0EF18 | Bedroom | 1.7 | 1.0 | Pass | 1.0 | Pass |
| 19 | 0EF19L | Living/Kitchen | 3.9 | 1.5 | Pass | 2.0 | Pass |
| 20 | 0EF20 | Bedroom | 3.5 | 1.0 | Pass | 1.0 | Pass |
| 21 | 0EF21 | Bedroom | 3.6 | 1.0 | Pass | 1.0 | Pass |
| 22 | 0EF22L | Living/Kitchen | 3.4 | 1.5 | Pass | 2.0 | Pass |
| 23 | 0EF23L | Living/Kitchen | 3.4 | 1.5 | Pass | 2.0 | Pass |
| 24 | 0EF24 | Bedroom | 3.3 | 1.0 | Pass | 1.0 | Pass |
| 25 | 0EF25L | Living/Kitchen | 3.5 | 1.5 | Pass | 2.0 | Pass |
| 26 | 0EF26 | Bedroom | 2.1 | 1.0 | Pass | 1.0 | Pass |
| 27 | 0EF27 | Bedroom | 2.0 | 1.0 | Pass | 1.0 | Pass |
| 28 | 0EF28L | Living/Kitchen | 2.3 | 1.5 | Pass | 2.0 | Pass |
| 29 | 0EF29 | Bedroom | 0.8 | 1.0 | Marginal | 1.0 | Marginal |
| 30 | 0EF30 | Bedroom | 1.7 | 1.0 | Pass | 1.0 | Pass |
| 31 | 0EF31L | Living/Kitchen | 4.2 | 1.5 | Pass | 2.0 | Pass |
| 32 | 0EF32 | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | |
| | | | Pass | | 30 | | 28 |
| | | | Count | | 32 | | 32 |
| | | | Percentage | | 94% | | 88% |

## ADF Check - Summary

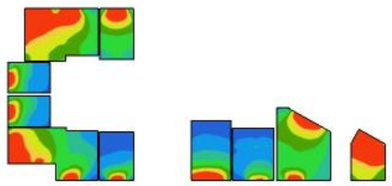
**Average ADF** for the tested living rooms is **3.5%** and for bedrooms **2.0%**

## GFL Floor Layout – Naming Convention - G




*Legend for radiance plots:*


## GFL Floor Analysis - G



| 0G | Average Daylight Factor | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | *For all habitable rooms* | | | |
| | ADF Values from radiance 3D m | | Yes | | | | |
| | | Type | Calc | Relaxed | | Strict | |
| Room | Ref | Type | ADF | Min | Check | Min | Check |
| 1 | 0G01 | Bedroom | 2.6 | 1.0 | Pass | 1.0 | Pass |
| 2 | 0G02L | Living/Kitchen | 4.2 | 1.5 | Pass | 2.0 | Pass |
| 3 | 0G03 | Bedroom | 1.6 | 1.0 | Pass | 1.0 | Pass |
| 4 | 0G04L | Living/Kitchen | 2.5 | 1.5 | Pass | 2.0 | Pass |
| 5 | 0G05 | Bedroom | 1.5 | 1.0 | Pass | 1.0 | Pass |
| 6 | 0G06L | Living/Kitchen | 3.5 | 1.5 | Pass | 2.0 | Pass |
| 7 | 0G07 | Bedroom | 8.6 | 1.0 | Pass | 1.0 | Pass |
| 8 | 0G08 | Bedroom | 3.9 | 1.0 | Pass | 1.0 | Pass |
| 9 | 0G09L | Living/Kitchen | 6.0 | 1.5 | Pass | 2.0 | Pass |
| 10 | 0G10 | Bedroom | 2.4 | 1.0 | Pass | 1.0 | Pass |
| | | | | | | | |
| | | | Pass | | 10 | | 10 |
| | | | Count | | 10 | | 10 |
| | | | Percentage | | 100% | | 100% |

## ADF Check - Summary

**Average ADF** for the tested living rooms is **4.0%** and for bedrooms **3.5%**

## Summary for all blocks GFL Floor

| | Relaxed BRE | | | | Strict BRE | | |
|---|---|---|---|---|---|---|---|
| | Pass | Rooms | | | Pass | Rooms | |
| AB | 9 | 9 | | | 9 | 9 | |
| CD | 31 | 31 | | | 28 | 31 | |
| DE | 30 | 32 | | | 28 | 32 | |
| G | 10 | 10 | | | 10 | 10 | |
| | | | | | | | |
| Total | 80 | 82 | 98% | | 75 | 82 | 91% |

Of the 82 rooms tested at GFL floor level
**91%** pass the strict BRE requirements and 5 of the 7 that don't are marginal.
**98%** pass the relaxed requirements and the and the 2 that don't are marginal.

# Appendix 2
# Supplementary Analysis

*The report above reproduces the analysis previous submitted with for this project with the re-arrangement of rooms withing the layout. The references in this report are consistent with the earlier application.*

*Recently the primary reference for light studies BRE-209 "Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice" was updated to its Third Edition - 2022.*

*This was required to take into account EN 17037 and the withdraw of* BS 8206 Lighting for Buildings, Part 2: Code of Practice for Daylighting.

*The BRE209 – 2022 notes that "*The guidance here is intended for use in the United Kingdom and in the Republic of Ireland"

# The differences between the guidelines

BRE v3 – 2022 provides best practice guidelines for analysing new developments and this guideline has been considered the de-facto standard since 1991 and it now provides details how to apply EN 17037.

National Standards Authority of Ireland have adopted EN 17037 to directly become IS/EN 17037. There are no amendments were made to this document and particularly there is no national Annex as can be found in BS/EN 17037. The standard document provides only a single target for new buildings and does not include specific usage targets for spaces such as living room, bedroom, office, etc.

The UK variant referenced strongly in the BRE Best practice guidelines is more suitable to use in temperate climates where the Median External Diffuse Illuminance is low. We would concur with the UK committee that the recommendations for daylight provision in a space may not be achievable for some buildings, particularly dwellings, which are the subject to most analysis requests.

The reference standard used below is BS/EN 17037 / Annex NA which itself is derived from the now withdrawn BS 8206-2:2008 Lighting for buildings – Part 2: Code of practice for daylighting, Subclause 5.6. This provides alignment between the new and old standards.

## The differences in Versions 2 & 3 are summarised below:

| Impact Neighbours | | | |
|---|---|---|---|
| **Item being tested** | **BRE v2 & BS 8206-2** | **BRE v3 & BS/EN 17037 (Anx NA)** | **Change** |
| Light from the Sky Skylight VSC | VSC: 27% or Ratio 0.80 | VSC: 27% or Ratio 0.80 | **v2 – v3 No change to metric** |
| Sunlight Living rooms | APSH: 25% ratio 0.80<br>WPSH: 5% ratio 0.80<br>APSH change <4% | APSH: 25% ratio 0.80<br>WPSH: 5% ratio 0.80<br>APSH change <4% | **v2 – v3 No change to metric** |
| Sunlight/Shadow Sunlight on Ground SOG | Lit 21st March 50% or ratio 0.80 | Lit 21st March 50% or ratio 0.80 | **v2 – v3 No change to metric** |
| No Sky Line | Ratio 0.80 | Ratio 0.80 | **v2 – v3 No change to metric**<br>*Only needed if neighbouring interior layouts are known, which they usually are not.* |

| Development Performance | | | |
|---|---|---|---|
| **Item being tested** | **BRE v2 & BS 8206-2** | **BRE v3 & BS/EN 17037 (Anx NA)** | **Change** |
| Light in rooms Average Daylight Factor (ADF) | ADF targets all space based on usage<br>Living: 1.5%<br>Bedroom: 1.0%<br>Kitchen: 2.0%<br>LKD: 2.0% | NA | *Superceeded* |
| Light in rooms Target Illuminance ($E_T$) | | **BS/EN Annex NA**<br>Target Illuminance @ 50% area based on usage<br>(Changes=Latitude)<br>Living: 150lx<br>Bedroo: 100lx<br>Kitchen: 200lx<br>LKD: 200lx<br><br>No 95% requirement | **New metric**<br>*Based On the BS/EN Annex NA* |
| Sunlight to rooms | Living rooms:<br>APSH: 25%<br>WPSH: 5% | One window preferable living:<br>1.5hrs of sunlight on 21st March | **New metric** |
| Sunlight/Shadow Sunlight on Ground SOG | Lit 21st March 50% or ratio 0.80 | Lit 21st March 50% or ratio 0.80 | **v2 – v3 No change to metric** |

While some minor wording has changed, and some additional clauses have been added for clarity the metrics and targets are for the most part unchanged BRE v2 and so the assessment still stands.

In this appendix we will provide additional results for the 2 new metrics which are:

- Light in rooms - Target Illuminance ($E_T$)
  - Which replaces ADF
  - As previously run - 1st Floor (representative) & Ground floor
- Sunlight to rooms – 1.5hr requirement
  - Which replaces the APSH and WPSH checks
  - As previously run – 1st and 3rd floors

# Development Performance

## Development Performance - Target Illuminance $E_T$ Metric

National Standards Authority of Ireland have adopted EN 17037 to directly become IS/EN 17037. There are no amendments were made to this document and particularly there is no national Annex as can be found in BS/EN 17037. The standard document provides only a single target for new buildings and does not include specific usage targets for spaces such as living room, bedroom, office, etc.

The UK variant referenced strongly in the BRE Best practice guidelines is more suitable to use in Temperate climates where the Median External Diffuse Illuminance is low. We would concur with the UK committee that the recommendations for daylight provision in a space may not be achievable for some buildings, particularly dwellings, which are the subject to most Analysis requests.

The reference standard used below is BS/EN 17037 / Annex NA which itself is derived from the now withdrawn BS 8206-2:2008 Lighting for buildings – Part 2: Code of practice for daylighting, Subclause 5.6. This provides alignment between the new and old standards.

***Target illuminance (ET) :***

> ***Illuminance from daylight that should be achieved for at least half of annual daylight hours across a specified fraction of the reference plane in a daylit space***

## NA.2 - Minimum daylight provision in UK dwellings

*Even if a predominantly daylit appearance is not achievable for a room in a UK dwelling, the UK committee recommends that the target illuminance values given in Table NA.1 are exceeded over at least 50 % of the points on a reference plane 0.85 m above the floor, for at least half of the daylight hours.*

**Table NA.1 — Values of target illuminance for room types in UK dwellings**

| Room type | Target illuminance $E_T$ (lx) |
|---|---|
| Bedroom | 100 |
| Living room | 150 |
| Kitchen | 200 |

The information above is derived from BS 8206-2:2008 Lighting for buildings – Part 2: Code of practice for daylighting, Subclause 5.6

*Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx*

*It is the opinion of the UK committee that the recommendation in Clause A.2 – that a target illuminance level should be achieved across the entire (i.e. 95 %) fraction of the reference plane within a space – need not be applied to rooms in dwellings.*

This is echoed in The BRE Guidelines

> ***C16 The UK National Annex gives illuminance recommendations of 100 lux in bedrooms, 150 lux in living rooms and 200 lux in kitchens. These are the median illuminances, to be exceeded over at least 50% of the assessment points in the room for at least half of the daylight hours. The recommended levels over 95% of a reference plane need not apply to dwellings in the UK.***
>
> ***C17 Where a room has a shared use, the highest target should apply. For example in a bed sitting room in student accommodation, the value for a living room should be used if students would often spend time in their rooms during the day. Local authorities could use discretion here. For example, the target for a living room could be used for a combined living/dining/kitchen area if the kitchens are not treated as habitable spaces, as it may avoid small separate kitchens in a design. The kitchen space would still need to be included in the assessment area … . Alternatively, in rooms with a particular requirement for daylight, such as bed sitting rooms in homes for the elderly, higher values such as … may be taken.***

Analysis parameters are as per Annex B (and/or as revised by Annex NA), analysis method 1 was used. The following Parameters were used are within the recommended ranges and reflect the materials/finishes specified in this application. The Median External Diffuse Illuminance used is noted in the relevant results tables.

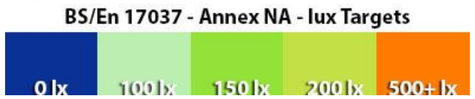
| Surface | Description | Reflectance |
|---|---|---|
| External Plane | Earth | 0.2 |
| External Walls | Grey Render / Concrete | 0.4 |
| Floor | Light wood/ cream Carpet | 0.4 |
| Internal Wall | Cream | 0.7 |
| Ceiling | White | 0.8 |
| Frames | Medium Grey | 0.5 |
| | | |
| | **Transmittance** | |
| Glazing clear | 0.63 (incls. Maintenance Factor) | |
| Glazing Translucent | 0.4 (incls. Maintenance Factor) | |

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 an analysis on the same. This analysis was based on a standard working plane for in this case residential of 0.850m.

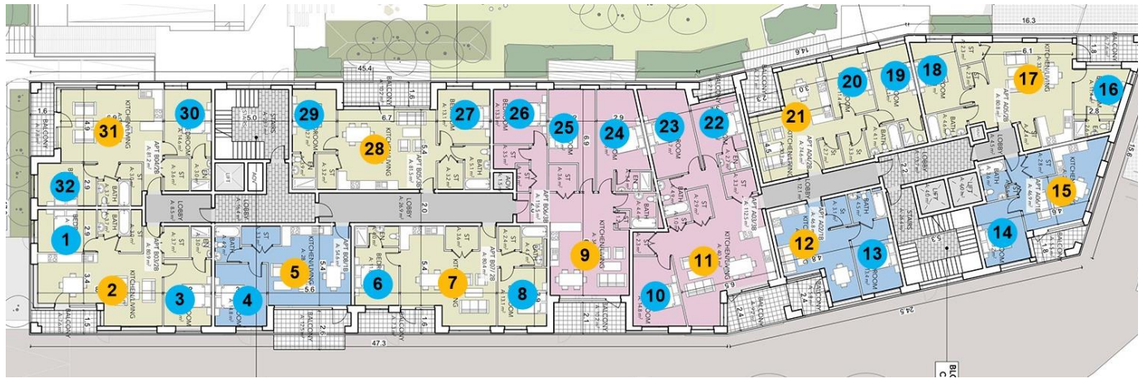
***Reference plane or working plane***

> ***Horizontal, vertical, or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85 m above the floor in houses and factories, 0.7 m above the floor in offices.***

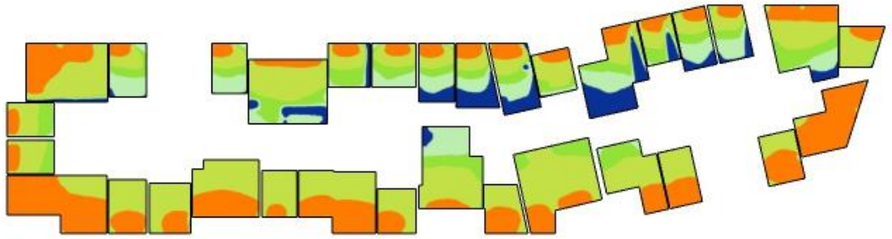
## Legend for Radiance Plots



## 1st Floor Layout – Naming Convention - AB



## 1st Floor Analysis - AB



## NA.2 Minimum daylight provision

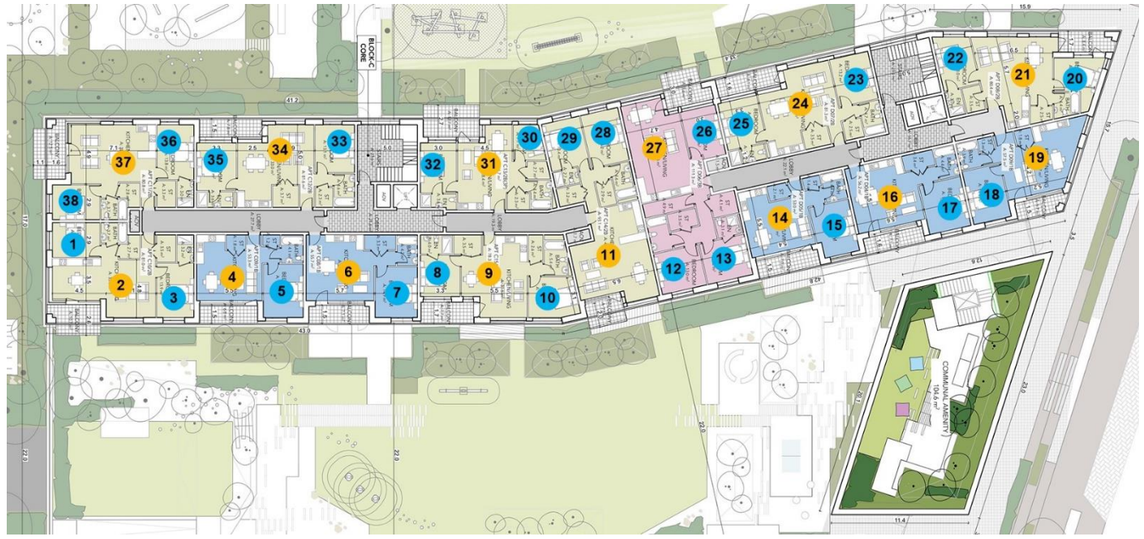
*For all habitable rooms*

| *Location* | *Dublin* | *14,900* | *lx* | |
|---|---|---|---|---|

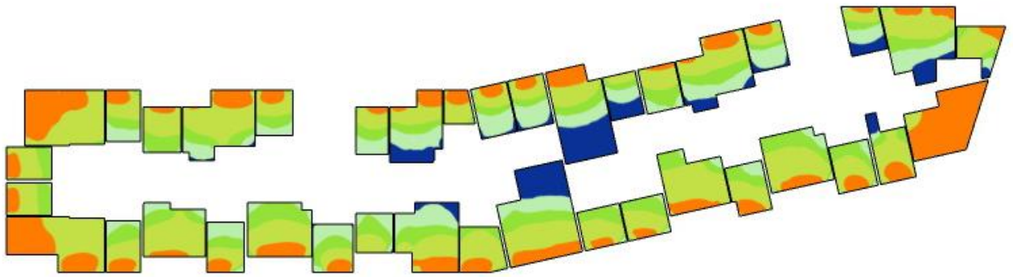
**>50 % of the points on a reference plane to exceed**

| **1AB** | **Type** | | | |
|---|---|---|---|---|
| **Ref** | **Type** | **Percentage within Target Lux** | **BS/EN17037 Annex AN Target Lux** | **Check** |
| 1AB01 | Bedroom | 100 | 100 | Pass |
| 1AB02C | Living/Kitchen | 100 | 200 | Pass |
| 1AB03 | Bedroom | 100 | 100 | Pass |
| 1AB04 | Bedroom | 97 | 100 | Pass |
| 1AB05C | Living/Kitchen | 100 | 200 | Pass |
| 1AB06 | Bedroom | 100 | 100 | Pass |
| 1AB07C | Living/Kitchen | 100 | 200 | Pass |
| 1AB08 | Bedroom | 100 | 100 | Pass |
| 1AB09C | Living/Kitchen | 51 | 200 | Pass |
| 1AB10 | Bedroom | 100 | 100 | Pass |
| 1AB11C | Living/Kitchen | 86 | 200 | Pass |
| 1AB12C | Living/Kitchen | 74 | 200 | Pass |
| 1AB13 | Bedroom | 100 | 100 | Pass |
| 1AB14 | Bedroom | 100 | 100 | Pass |
| 1AB15C | Living/Kitchen | 100 | 200 | Pass |
| 1AB16 | Bedroom | 98 | 100 | Pass |
| 1AB17C | Living/Kitchen | 60 | 200 | Pass |
| 1AB18 | Bedroom | 86 | 100 | Pass |
| 1AB19 | Bedroom | 85 | 100 | Pass |
| 1AB20 | Bedroom | 86 | 100 | Pass |
| 1AB21C | Living/Kitchen | 26 | 200 | Fail |
| 1AB22 | Bedroom | 99 | 100 | Pass |
| 1AB23 | Bedroom | 76 | 100 | Pass |
| 1AB24 | Bedroom | 65 | 100 | Pass |
| 1AB25 | Bedroom | 78 | 100 | Pass |
| 1AB26 | Bedroom | 100 | 100 | Pass |
| 1AB27 | Bedroom | 90 | 100 | Pass |
| 1AB28C | Living/Kitchen | 56 | 200 | Pass |
| 1AB29 | Bedroom | 99 | 100 | Pass |
| 1AB30 | Bedroom | 97 | 100 | Pass |
| 1AB31C | Living/Kitchen | 93 | 200 | Pass |
| 1AB32 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | **Count** | **32** |
| | | | **Pass** | **31** |
| | | | **Pass rate** | **97%** |

## 1st Floor Layout – Naming Convention - CD




## 1st Floor Analysis - CD



## NA.2 Minimum daylight provision

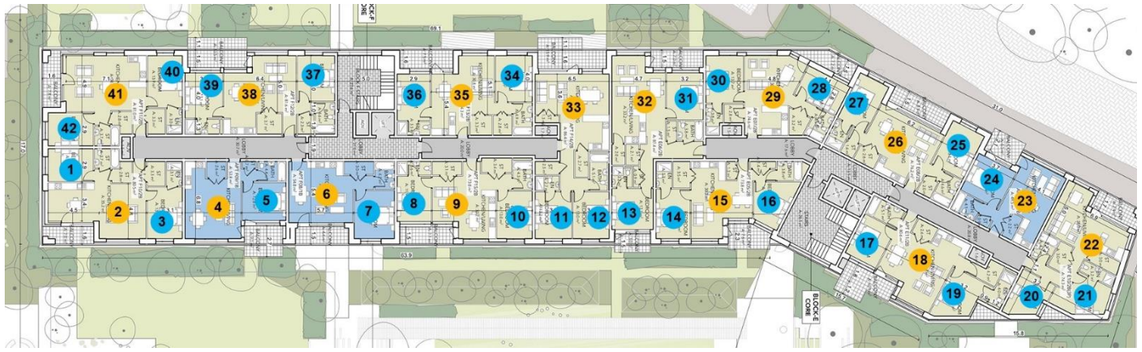
*For all habitable rooms*

| *Location* | *Dublin* | *14,900* | *lx* | |
|---|---|---|---|---|

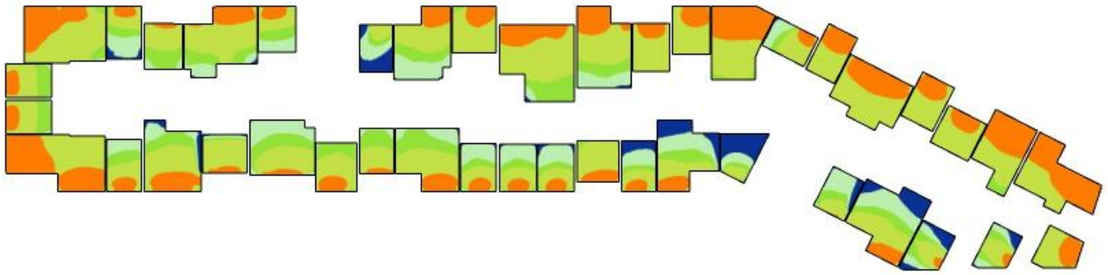
**>50 % of the points on a reference plane to exceed**

| **1CD** | **Type** | | | |
|---|---|---|---|---|
| **Ref** | **Type** | **Percentage within Target Lux** | **BS/EN17037 Annex AN Target Lux** | **Check** |
| 1CD01 | Bedroom | 100 | 100 | Pass |
| 1CD02C | Living/Kitchen | 99 | 200 | Pass |
| 1CD03 | Bedroom | 100 | 100 | Pass |
| 1CD04C | Living/Kitchen | 69 | 200 | Pass |
| 1CD05 | Bedroom | 100 | 100 | Pass |
| 1CD06C | Living/Kitchen | 62 | 200 | Pass |
| 1CD07 | Bedroom | 99 | 100 | Pass |
| 1CD08 | Bedroom | 99 | 100 | Pass |
| 1CD09C | Living/Kitchen | 44 | 200 | Marginal |
| 1CD10 | Bedroom | 100 | 100 | Pass |
| 1CD11C | Living/Kitchen | 42 | 200 | Marginal |
| 1CD12 | Bedroom | 100 | 100 | Pass |
| 1CD13 | Bedroom | 100 | 100 | Pass |
| 1CD14C | Living/Kitchen | 80 | 200 | Pass |
| 1CD15 | Bedroom | 100 | 100 | Pass |
| 1CD16C | Living/Kitchen | 61 | 200 | Pass |
| 1CD17 | Bedroom | 100 | 100 | Pass |
| 1CD18 | Bedroom | 91 | 100 | Pass |
| 1CD19C | Living/Kitchen | 100 | 200 | Pass |
| 1CD20 | Bedroom | 94 | 100 | Pass |
| 1CD21C | Living/Kitchen | 50 | 200 | Pass |
| 1CD22 | Bedroom | 75 | 100 | Pass |
| 1CD23 | Bedroom | 87 | 100 | Pass |
| 1CD24C | Living/Kitchen | 46 | 200 | Marginal |
| 1CD25 | Bedroom | 100 | 100 | Pass |
| 1CD26 | Bedroom | 62 | 100 | Pass |
| 1CD27C | Living/Kitchen | 34 | 200 | Fail |
| 1CD28 | Bedroom | 92 | 100 | Pass |
| 1CD29 | Bedroom | 95 | 100 | Pass |
| 1CD30 | Bedroom | 100 | 100 | Pass |
| 1CD31C | Living/Kitchen | 40 | 200 | Marginal |
| 1CD32 | Bedroom | 100 | 100 | Pass |
| 1CD33 | Bedroom | 100 | 100 | Pass |
| 1CD34C | Living/Kitchen | 69 | 200 | Pass |
| 1CD35 | Bedroom | 100 | 100 | Pass |
| 1CD36 | Bedroom | 100 | 100 | Pass |
| 1CD37C | Living/Kitchen | 99 | 200 | Pass |
| 1CD38 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | **Count** | **38** |
| | | | **Pass** | **33** |
| | | | **Pass rate** | **87%** |

## 1st Floor Layout – Naming Convention - EF




## 1st Floor Analysis - EF



## NA.2 Minimum daylight provision

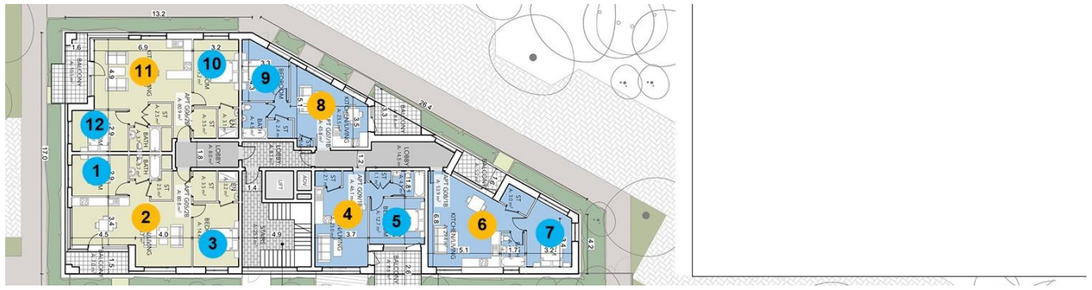
*For all habitable rooms*

| *Location* | *Dublin* | *14,900* | *lx* | |
|---|---|---|---|---|

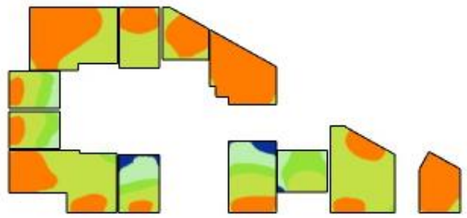
**>50 % of the points on a reference plane to exceed**

| **1EF** | **Type** | | | |
|---|---|---|---|---|
| **Ref** | **Type** | **Percentage within Target Lux** | **BS/EN17037 Annex AN Target Lux** | **Check** |
| 1EF01 | Bedroom | 100 | 100 | Pass |
| 1EF02C | Living/Kitchen | 100 | 200 | Pass |
| 1EF03 | Bedroom | 100 | 100 | Pass |
| 1EF04C | Living/Kitchen | 65 | 200 | Pass |
| 1EF05 | Bedroom | 98 | 100 | Pass |
| 1EF06C | Living/Kitchen | 43 | 200 | Marginal |
| 1EF07 | Bedroom | 100 | 100 | Pass |
| 1EF08 | Bedroom | 100 | 100 | Pass |
| 1EF09C | Living/Kitchen | 57 | 200 | Pass |
| 1EF10 | Bedroom | 98 | 100 | Pass |
| 1EF11 | Bedroom | 98 | 100 | Pass |
| 1EF12 | Bedroom | 94 | 100 | Pass |
| 1EF13 | Bedroom | 100 | 100 | Pass |
| 1EF14 | Bedroom | 78 | 100 | Pass |
| 1EF15C | Living/Kitchen | 39 | 200 | Fail |
| 1EF16 | Bedroom | 44 | 100 | Marginal |
| 1EF17 | Bedroom | 88 | 100 | Pass |
| 1EF18C | Living/Kitchen | 42 | 200 | Marginal |
| 1EF19 | Bedroom | 71 | 100 | Pass |
| 1EF20 | Bedroom | 86 | 100 | Pass |
| 1EF21 | Bedroom | 100 | 100 | Pass |
| 1EF22C | Living/Kitchen | 100 | 200 | Pass |
| 1EF23C | Living/Kitchen | 94 | 200 | Pass |
| 1EF24 | Bedroom | 100 | 100 | Pass |
| 1EF25 | Bedroom | 100 | 100 | Pass |
| 1EF26C | Living/Kitchen | 100 | 200 | Pass |
| 1EF27 | Bedroom | 100 | 100 | Pass |
| 1EF28 | Bedroom | 99 | 100 | Pass |
| 1EF29C | Living/Kitchen | 97 | 200 | Pass |
| 1EF30 | Bedroom | 100 | 100 | Pass |
| 1EF31 | Bedroom | 100 | 100 | Pass |
| 1EF32C | Living/Kitchen | 67 | 200 | Pass |
| 1EF33C | Living/Kitchen | 77 | 200 | Pass |
| 1EF34 | Bedroom | 100 | 100 | Pass |
| 1EF35C | Living/Kitchen | 51 | 200 | Pass |
| 1EF36 | Bedroom | 57 | 100 | Pass |
| 1EF37 | Bedroom | 100 | 100 | Pass |
| 1EF38C | Living/Kitchen | 70 | 200 | Pass |
| 1EF39 | Bedroom | 100 | 100 | Pass |
| 1EF40 | Bedroom | 88 | 100 | Pass |
| 1EF41C | Living/Kitchen | 95 | 200 | Pass |
| 1EF42 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | **Count** | **42** |
| | | | **Pass** | **38** |
| | | | **Pass rate** | **90%** |

## 1st Floor Layout – Naming Convention - G




## 1st Floor Analysis - G



**NA.2 Minimum daylight provision**

*For all habitable rooms*

| *Location* | *Dublin* | *14,900* | *lx* | |
|---|---|---|---|---|
| **>50 % of the points on a reference plane to exceed** | | | | |
| **1G** | Type | | | |
| Ref | Type | Percentage within Target Lux | BS/EN17037 Annex AN Target Lux | Check |
| 1G01 | Bedroom | 100 | 100 | Pass |
| 1G02L | Living | 100 | 150 | Pass |
| 1G03 | Bedroom | 87 | 100 | Pass |
| 1G04L | Living | 67 | 150 | Pass |
| 1G05 | Bedroom | 98 | 100 | Pass |
| 1G06L | Living | 100 | 150 | Pass |
| 1G07 | Bedroom | 100 | 100 | Pass |
| 1G08L | Living | 100 | 150 | Pass |
| 1G09 | Bedroom | 100 | 100 | Pass |
| 1G10 | Bedroom | 100 | 100 | Pass |
| 1G11L | Living | 100 | 150 | Pass |
| 1G12 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | Count | 12 |
| | | | Pass | 12 |
| | | | Pass rate | 100% |

## Comparison of BRE v2 vs BRE v3
## 1st Floor

| 1st FL | BRE v2 Strict | | | | BRE v3 | | |
|---|---|---|---|---|---|---|---|
| | Pass | Rooms | | | Pass | Rooms | |
| AB | 29 | 32 | | | 31 | 32 | |
| CD | 33 | 38 | | | 33 | 38 | |
| DE | 38 | 42 | | | 38 | 42 | |
| G | 12 | 12 | | | 12 | 12 | |
| | | | | | | | |
| Total | 112 | 124 | 90% | | 114 | 124 | 92% |

Of the 124 rooms tested at 1st floor level
**92%** pass the BRE requirements and most of those that don't are marginal.
Given the scale of the project this represents careful design which.
These results will only improve at higher floor levels.

## Target Illuminance Check - Summary

Target Illuminance – 1st Floor (representative)

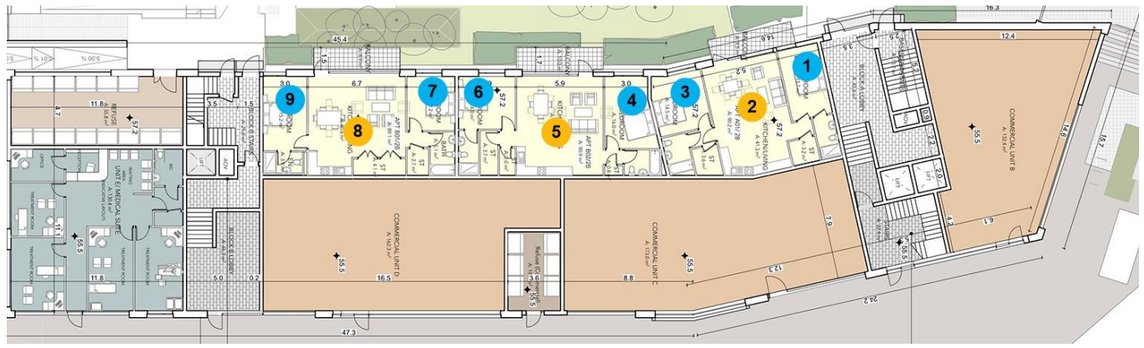
**92%** comply with the BRE v3 requirements as defined in Annex NA BS/EN 17037

The development shows excellent results.

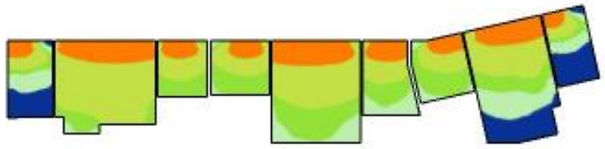
**The proposed development generally complies with the requirements of the BRE guidelines in relation to Target Illuminance.**

# Results for the Ground Floor presented in appendix 1 follow.

## GFL Floor Layout – Naming Convention - AB

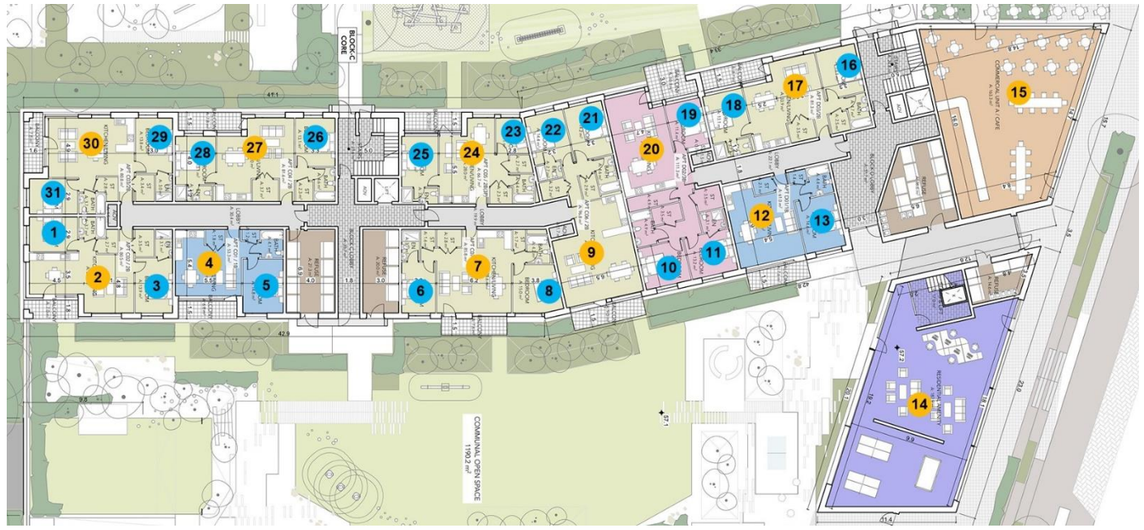



## GFL Floor Analysis - AB

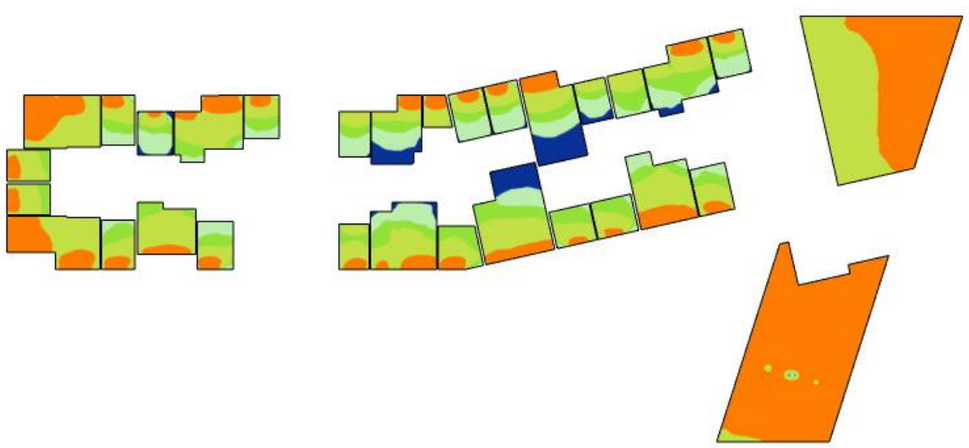


| NA.2 Minimum daylight provision | | | | |
|---|---|---|---|---|
| | | | | *For all habitable rooms* |
| *Location* | *Dublin* | *14,900* | *lx* | |
| >50 % of the points on a reference plane to exceed | | | | |
| **0AB** | Type | | | |
| Ref | Type | Percentage within Target Lux | BS/EN17037 Annex AN Target Lux | Check |
| 0AB01 | Bedroom | 54 | 100 | Pass |
| 0AB02C | Living/Kitchen | 44 | 200 | Marginal |
| 0AB03 | Bedroom | 100 | 100 | Pass |
| 0AB04 | Bedroom | 100 | 100 | Pass |
| 0AB05C | Living/Kitchen | 61 | 200 | Pass |
| 0AB06 | Bedroom | 100 | 100 | Pass |
| 0AB07 | Bedroom | 100 | 100 | Pass |
| 0AB08C | Living/Kitchen | 87 | 200 | Pass |
| 0AB09 | Bedroom | 62 | 100 | Pass |
| | | | | |
| | | | Count | 9 |
| | | | Pass | 8 |
| | | | Pass rate | 89% |

## GFL Floor Layout – Naming Convention - CD




## GFL Floor Analysis - CD



## NA.2 Minimum daylight provision

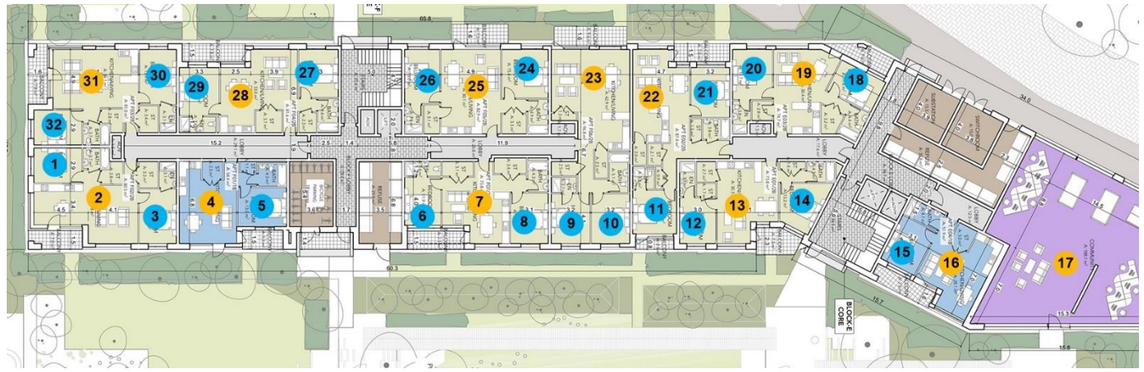
*For all habitable rooms*

| *Location* | *Dublin* | *14,900* | *lx* | |
|---|---|---|---|---|

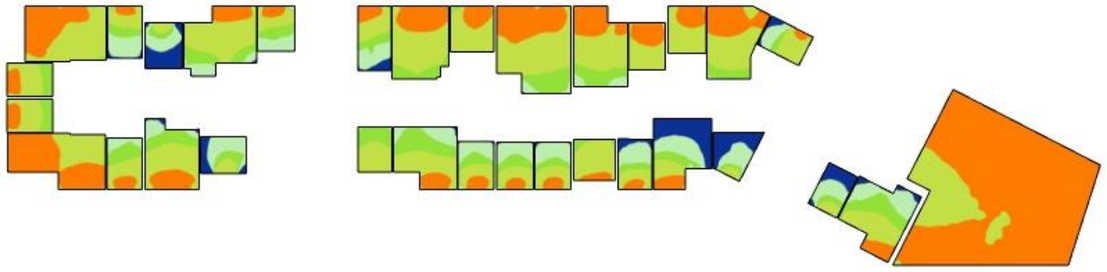
**>50 % of the points on a reference plane to exceed**

| **0CD** | **Type** | | | |
|---|---|---|---|---|
| **Ref** | **Type** | **Percentage within Target Lux** | **BS/EN17037 Annex AN Target Lux** | **Check** |
| 0CD01 | Bedroom | 100 | 100 | Pass |
| 0CD02C | Living/Kitchen | 100 | 200 | Pass |
| 0CD03 | Bedroom | 100 | 100 | Pass |
| 0CD04C | Living/Kitchen | 84 | 200 | Pass |
| 0CD05 | Bedroom | 100 | 100 | Pass |
| 0CD06 | Bedroom | 100 | 100 | Pass |
| 0CD07C | Living/Kitchen | 50 | 200 | Pass |
| 0CD08 | Bedroom | 100 | 100 | Pass |
| 0CD09C | Living/Kitchen | 50 | 200 | Pass |
| 0CD10 | Bedroom | 99 | 100 | Pass |
| 0CD11 | Bedroom | 99 | 100 | Pass |
| 0CD12C | Living/Kitchen | 75 | 200 | Pass |
| 0CD13 | Bedroom | 100 | 100 | Pass |
| 0CD14C | Living/Kitchen | 99 | 200 | Pass |
| 0CD15C | Living/Kitchen | 100 | 200 | Pass |
| 0CD16 | Bedroom | 97 | 100 | Pass |
| 0CD17C | Living/Kitchen | 38 | 200 | Fail |
| 0CD18 | Bedroom | 100 | 100 | Pass |
| 0CD19 | Bedroom | 85 | 100 | Pass |
| 0CD20C | Living/Kitchen | 36 | 200 | Fail |
| 0CD21 | Bedroom | 50 | 100 | Pass |
| 0CD22 | Bedroom | 98 | 100 | Pass |
| 0CD23 | Bedroom | 100 | 100 | Pass |
| 0CD24C | Living/Kitchen | 33 | 200 | Fail |
| 0CD25 | Bedroom | 99 | 100 | Pass |
| 0CD26 | Bedroom | 100 | 100 | Pass |
| 0CD27C | Living/Kitchen | 78 | 200 | Pass |
| 0CD28 | Bedroom | 89 | 100 | Pass |
| 0CD29 | Bedroom | 100 | 100 | Pass |
| 0CD30C | Living/Kitchen | 100 | 200 | Pass |
| 0CD31 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | **Count** | **31** |
| | | | **Pass** | **28** |
| | | | **Pass rate** | **90%** |

## GFL Floor Layout – Naming Convention - EF




## GFL Floor Analysis - EF



## NA.2 Minimum daylight provision

*For all habitable rooms*

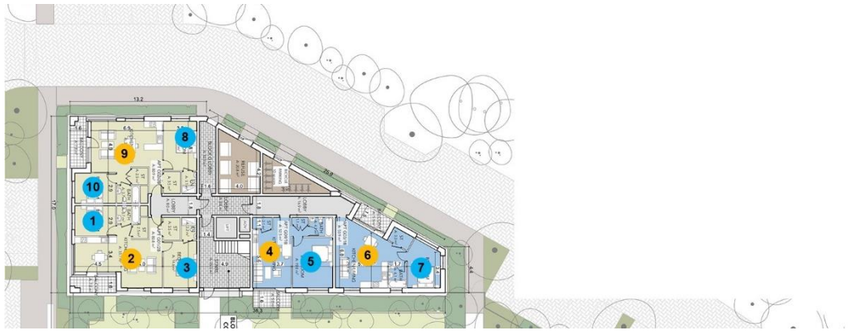
***Location*** ***Dublin*** ***14,900*** ***lx***

**>50 % of the points on a reference plane to exceed**

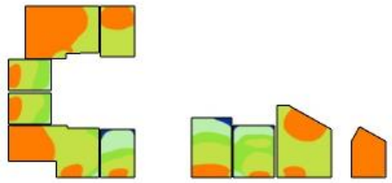
**0EF** **Type**

| Ref | Type | Percentage within Target Lux | BS/EN17037 Annex AN Target Lux | Check |
|---|---|---|---|---|
| 0EF01 | Bedroom | 100 | 100 | Pass |
| 0EF02C | Living/Kitchen | 100 | 200 | Pass |
| 0EF03 | Bedroom | 100 | 100 | Pass |
| 0EF04C | Living/Kitchen | 67 | 200 | Pass |
| 0EF05 | Bedroom | 75 | 100 | Pass |
| 0EF06 | Bedroom | 100 | 100 | Pass |
| 0EF07C | Living/Kitchen | 51 | 200 | Pass |
| 0EF08 | Bedroom | 99 | 100 | Pass |
| 0EF09 | Bedroom | 99 | 100 | Pass |
| 0EF10 | Bedroom | 98 | 100 | Pass |
| 0EF11 | Bedroom | 100 | 100 | Pass |
| 0EF12 | Bedroom | 87 | 100 | Pass |
| 0EF13C | Living/Kitchen | 25 | 200 | Fail |
| 0EF14 | Bedroom | 47 | 100 | Marginal |
| 0EF15 | Bedroom | 64 | 100 | Pass |
| 0EF16C | Living/Kitchen | 43 | 200 | Marginal |
| 0EF17C | Living/Kitchen | 100 | 200 | Pass |
| 0EF18 | Bedroom | 89 | 100 | Pass |
| 0EF19C | Living/Kitchen | 87 | 200 | Pass |
| 0EF20 | Bedroom | 100 | 100 | Pass |
| 0EF21 | Bedroom | 100 | 100 | Pass |
| 0EF22C | Living/Kitchen | 75 | 200 | Pass |
| 0EF23C | Living/Kitchen | 83 | 200 | Pass |
| 0EF24 | Bedroom | 100 | 100 | Pass |
| 0EF25C | Living/Kitchen | 85 | 200 | Pass |
| 0EF26 | Bedroom | 89 | 100 | Pass |
| 0EF27 | Bedroom | 100 | 100 | Pass |
| 0EF28C | Living/Kitchen | 72 | 200 | Pass |
| 0EF29 | Bedroom | 52 | 100 | Pass |
| 0EF30 | Bedroom | 96 | 100 | Pass |
| 0EF31C | Living/Kitchen | 99 | 200 | Pass |
| 0EF32 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | **Count** | **32** |
| | | | **Pass** | **29** |
| | | | **Pass rate** | **91%** |

## GFL Floor Layout – Naming Convention - G




## GFL Floor Analysis - G



| NA.2 Minimum daylight provision | | | | |
|---|---|---|---|---|
| | | | | *For all habitable rooms* |
| *Location* | *Dublin* | *14,900* | *lx* | |
| **>50 % of the points on a reference plane to exceed** | | | | |
| **0G** | **Type** | | | |
| **Ref** | **Type** | **Percentage within Target Lux** | **BS/EN17037 Annex AN Target Lux** | **Check** |
| 0G01 | Bedroom | 100 | 100 | Pass |
| 0G02C | Living/Kitchen | 94 | 200 | Pass |
| 0G03 | Bedroom | 96 | 100 | Pass |
| 0G04C | Living/Kitchen | 56 | 200 | Pass |
| 0G05 | Bedroom | 98 | 100 | Pass |
| 0G06C | Living/Kitchen | 100 | 200 | Pass |
| 0G07 | Bedroom | 100 | 100 | Pass |
| 0G08 | Bedroom | 100 | 100 | Pass |
| 0G09C | Living/Kitchen | 100 | 200 | Pass |
| 0G10 | Bedroom | 100 | 100 | Pass |
| | | | | |
| | | | **Count** | **10** |
| | | | **Pass** | **10** |
| | | | **Pass rate** | **100%** |

## Comparison of BRE v2 vs BRE v3
## GFL Floor

| GFL | BRE v2 Strict | | | | BRE v3 | | |
|---|---|---|---|---|---|---|---|
| | Pass | Rooms | | | Pass | Rooms | |
| AB | 9 | 9 | | | 8 | 9 | |
| CD | 28 | 31 | | | 28 | 31 | |
| DE | 28 | 32 | | | 29 | 32 | |
| G | 10 | 10 | | | 10 | 10 | |
| | | | | | | | |
| **Total** | **75** | **82** | **91%** | | **75** | **82** | **91%** |

82 rooms were tested at GFL floor level
**91%** pass the BRE requirements and most of those that don't are marginal.
Given the scale of the project this represents careful design which.
These results will only improve at higher floor levels.

## Target Illuminance Check - Summary

Target Illuminance – GFL Floor (worst case floor)

**91%** comply with the BRE v3 requirements as defined in Annex NA BS/EN 17037

The development shows excellent results.

**The proposed development generally complies with the requirements of the BRE guidelines in relation to Target Illuminance.**

## Development Performance - Sunlight to rooms (living spaces)

**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**

> *3.1.15 In general a dwelling, or non-domestic building that has a particular requirement for sunlight, will appear reasonably sunlit provided:*
> *- at least one main window wall faces within 90° of due south and*
> *- a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. This is assessed at the inside centre of the window(s); sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted.*

> *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*

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 note that:

> *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…….*

A view or similar may be considered a compensating factor to North facing windows

> *3.1.7 …. compensating factor such as an appealing view to the north.*

It then follows with an example of a careful layout for a relatively 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 careful layout design.

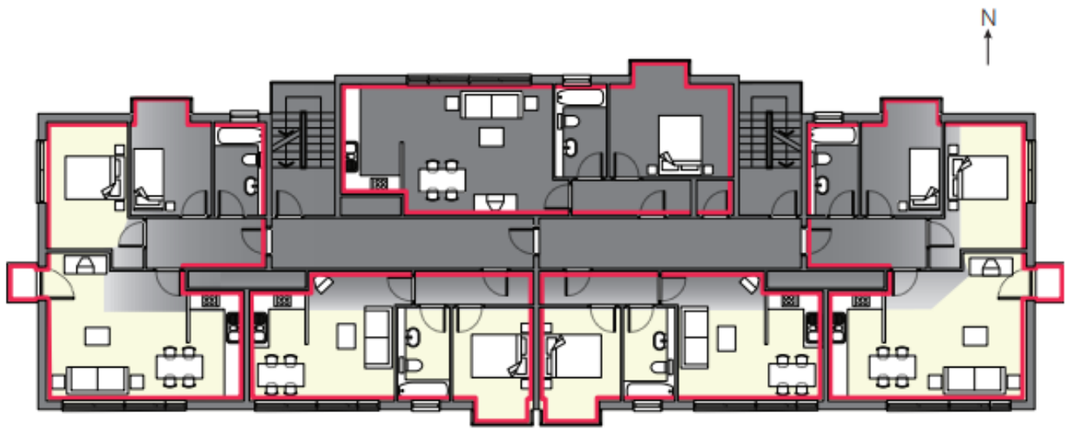



**Figure 26: Careful layout design means that four out of the five flats shown have a south-facing living room**

Quality of light minimum/medium/high is defined in clause 3.1.10

> *3.1.10 … For interiors, access to sunlight can be quantified. BS EN 17037 recommends that a space should receive a minimum of 1.5 hours of direct sunlight on a selected date between 1 February and 21 March with cloudless conditions. It is suggested that 21 March (equinox) be used. The medium level of recommendation is three hours and the high level of recommendation four hours. For dwellings, at least one habitable room, preferably a main living room, should meet at least the minimum criterion. …..*

## Tabulated results

### Sunlight to rooms

**Receives 1.5 hours of sunlight on 21st March**

**1st Floor**

| Block | Floor | Window/Room | Ref | Hrs of Sun | Pass | | | Quality | |
|---|---|---|---|---|---|---|---|---|---|
| AB | F1 | A2 | AB.1.2 | 6.6 | Pass | | | | *High* |
| AB | F1 | A5 | AB.1.5 | 3.8 | Pass | | | *Medium* | |
| AB | F1 | A7 | AB.1.7 | 5.9 | Pass | | | | *High* |
| AB | F1 | A9 | AB.1.9 | 2.6 | Pass | | *Min* | | |
| AB | F1 | A11 | AB.1.11 | 4.7 | Pass | | | | *High* |
| AB | F1 | A12 | AB.1.12 | 3.4 | Pass | | | *Medium* | |
| AB | F1 | A15 | AB.1.15 | 2.8 | Pass | | *Min* | | |
| AB | F1 | A17 | AB.1.17 | 1.1 | Fail | | | | |
| AB | F1 | A21 | AB.1.21 | 2.3 | Pass | | *Min* | | |
| AB | F1 | A28 | AB.1.28 | 0.7 | Fail | | | | |
| AB | F1 | A31 | AB.1.31 | 5.3 | Pass | | | | *High* |
| CD | F1 | A2 | CD.1.2 | 6.8 | Pass | | | | *High* |
| CD | F1 | A4 | CD.1.4 | 1.3 | Marginal | | | | |
| CD | F1 | A6 | CD.1.6 | 0.9 | Fail | | | | |
| CD | F1 | A9 | CD.1.9 | 2.1 | Pass | | *Min* | | |
| CD | F1 | A11 | CD.1.11 | 0.3 | Fail | | | | |
| CD | F1 | A14 | CD.1.14 | 0.0 | Fail | | | | |
| CD | F1 | A16 | CD.1.16 | 0.4 | Fail | | | | |
| CD | F1 | A19 | CD.1.19 | 1.5 | Pass | | | | |
| CD | F1 | A21 | CD.1.21 | 1.2 | Marginal | | | | |
| CD | F1 | A24 | CD.1.24 | 2.3 | Pass | | *Min* | | |
| CD | F1 | A27 | CD.1.27 | 2.6 | Pass | | *Min* | | |
| CD | F1 | A31 | CD.1.31 | 0.8 | Fail | | | | |
| CD | F1 | A34 | CD.1.34 | 1.5 | Pass | | *Min* | | |
| CD | F1 | A37 | CD.1.37 | 5.7 | Pass | | | | *High* |
| EF | F1 | A2 | EF.1.2 | 7.4 | Pass | | | | *High* |
| EF | F1 | A4 | EF.1.4 | 2.9 | Pass | | *Min* | | |
| EF | F1 | A6 | EF.1.6 | 0.8 | Fail | | | | |
| EF | F1 | A9 | EF.1.9 | 0.8 | Fail | | | | |
| EF | F1 | A15 | EF.1.15 | 1.9 | Pass | | *Min* | | |
| EF | F1 | A18 | EF.1.18 | 2.8 | Pass | | *Min* | | |
| EF | F1 | A22 | EF.1.22 | 1.1 | Fail | | | | |
| EF | F1 | A23 | EF.1.23 | 1.6 | Pass | | *Min* | | |
| EF | F1 | A26 | EF.1.26 | 1.8 | Pass | | *Min* | | |
| EF | F1 | A29 | EF.1.29 | 4.3 | Pass | | | | *High* |
| EF | F1 | A32 | EF.1.32 | 3.2 | Pass | | | *Medium* | |
| EF | F1 | A33 | EF.1.33 | 1.3 | Marginal | | | | |
| EF | F1 | A35 | EF.1.35 | 0.4 | Fail | | | | |
| EF | F1 | A38 | EF.1.38 | 1.8 | Pass | | *Min* | | |
| EF | F1 | A41 | EF.1.41 | 2.4 | Pass | | *Min* | | |
| G | F1 | A2 | G.1.2 | 5.8 | Pass | | | | *High* |
| G | F1 | A4 | G.1.4 | 1.8 | Pass | | *Min* | | |
| G | F1 | A6 | G.1.6 | 1.6 | Pass | | *Min* | | |
| G | F1 | A8 | G.1.8 | 3.2 | Pass | | | *Medium* | |
| G | F1 | A11 | G.1.11 | 4.9 | Pass | | | | *High* |

### Sunlight to rooms

**Receives 1.5 hours of sunlight on 21st March**

**3rd Floor**

| Block | Floor | Window/Room | Ref | Hrs of Sun | Pass | | | Quality | |
|---|---|---|---|---|---|---|---|---|---|
| AB | F3 | A2 | AB.3.2 | 10.6 | Pass | | | | *High* |
| AB | F3 | A5 | AB.3.5 | 4.2 | Pass | | | | *High* |
| AB | F3 | A7 | AB.3.7 | 5.9 | Pass | | | | *High* |
| AB | F3 | A9 | AB.3.9 | 2.8 | Pass | | *Min* | | |
| AB | F3 | A11 | AB.3.11 | 5.0 | Pass | | | | *High* |
| AB | F3 | A12 | AB.3.12 | 3.7 | Pass | | | *Medium* | |
| AB | F3 | A15 | AB.3.15 | 2.8 | Pass | | *Min* | | |
| AB | F3 | A17 | AB.3.17 | 2.0 | Pass | | *Min* | | |
| AB | F3 | A21 | AB.3.21 | 3.3 | Pass | | | *Medium* | |
| AB | F3 | A28 | AB.3.28 | 1.3 | Marginal | | | | |
| AB | F3 | A31 | AB.3.31 | 7.3 | Pass | | | | *High* |
| CD | F3 | A2 | CD.3.2 | 3.1 | Pass | | | *Medium* | |
| CD | F3 | A4 | CD.3.4 | 10.8 | Pass | | | | *High* |
| CD | F3 | A6 | CD.3.6 | 1.3 | Marginal | | | | |
| CD | F3 | A9 | CD.3.9 | 1.8 | Pass | | *Min* | | |
| CD | F3 | A11 | CD.3.11 | 1.2 | Marginal | | | | |
| CD | F3 | A14 | CD.3.14 | 0.8 | Fail | | | | |
| CD | F3 | A16 | CD.3.16 | 0.4 | Fail | | | | |
| CD | F3 | A19 | CD.3.19 | 1.5 | Pass | | | | |
| CD | F3 | A21 | CD.3.21 | 2.1 | Pass | | *Min* | | |
| CD | F3 | A24 | CD.3.24 | 3.0 | Pass | | | *Medium* | |
| CD | F3 | A27 | CD.3.27 | 3.6 | Pass | | | *Medium* | |
| CD | F3 | A31 | CD.3.31 | 1.6 | Pass | | *Min* | | |
| CD | F3 | A34 | CD.3.34 | 2.8 | Pass | | *Min* | | |
| CD | F3 | A37 | CD.3.37 | 7.4 | Pass | | | | *High* |
| EF | F3 | A2 | EF.3.2 | 11.0 | Pass | | | | *High* |
| EF | F3 | A4 | EF.3.4 | 3.0 | Pass | | | *Medium* | |
| EF | F3 | A6 | EF.3.6 | 0.8 | Fail | | | | |
| EF | F3 | A9 | EF.3.9 | 2.8 | Pass | | *Min* | | |
| EF | F3 | A15 | EF.3.15 | 2.9 | Pass | | *Min* | | |
| EF | F3 | A18 | EF.3.18 | 3.7 | Pass | | | *Medium* | |
| EF | F3 | A22 | EF.3.22 | 1.7 | Pass | | *Min* | | |
| EF | F3 | A23 | EF.3.23 | 2.0 | Pass | | | *Medium* | |
| EF | F3 | A26 | EF.3.26 | 2.4 | Pass | | *Min* | | |
| EF | F3 | A29 | EF.3.29 | 5.1 | Pass | | | | *High* |
| EF | F3 | A32 | EF.3.32 | 3.9 | Pass | | | *Medium* | |
| EF | F3 | A33 | EF.3.33 | 1.3 | Marginal | | | | |
| EF | F3 | A35 | EF.3.35 | 1.2 | Marginal | | | | |
| EF | F3 | A38 | EF.3.38 | 2.0 | Pass | | *Min* | | |
| EF | F3 | A41 | EF.3.41 | 4.6 | Pass | | | | *High* |
| G | F3 | A2 | G.3.2 | 10.8 | Pass | | | | *High* |
| G | F3 | A4 | G.3.4 | 2.3 | Pass | | *Min* | | |
| G | F3 | A6 | G.3.6 | 2.4 | Pass | | *Min* | | |
| G | F3 | A8 | G.3.8 | 3.2 | Pass | | | *Medium* | |
| G | F3 | A11 | G.3.11 | 7.4 | Pass | | | | *High* |

## Comparison

Practically all windows receive some sunlight on the 21st March and the number that face North are small.
The orientation of these blocks is set by the granted Phase 1 design.

The results on these higher floors are compatible with the guidelines example of “careful layout” design 80%.

Results are comparable with the BRE v2 analysis APSH and WPSH results presented previously

### BRE v2 Analysis

If we include the marginal results, then:

1st Floor **58%** pass the Annual APSH requirements and **56%** pass the WPSH
3rd Floor **71%** pass the Annual APSH requirements and **80%** pass the WPSH

The results on these higher floors are closer to the guidelines example of “careful layout” design 80%.

### BRE v3 Analysis

1st Floor **69%** pass the 21st March check, **76%** if we include Marginals
3rd Floor **82%** pass the 21st March check, **93%** if we include Marginals

## Sunlight to Living rooms - Summary

Practically all windows receive some sunlight on the 21st March and the number that face North are small.

1st Floor **69%** pass the 21st March check, **76%** if we include Marginals
3rd Floor **82%** pass the 21st March check, **93%** if we include Marginals

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 Illuminance results achieved throughout.

**The proposed development generally complies with the requirements of the BRE guidelines in relation to Sunlight availability and careful layout design.**

## Conclusion

The analysis shas been undertaken against the BRE v2 and checked against the new BRE v3 guidelines.

The results and levels of compliance show similar results.

The scheme tested represents a well-developed and considered design where sunlight, daylight and shadow have been taken into account throughout the design process.