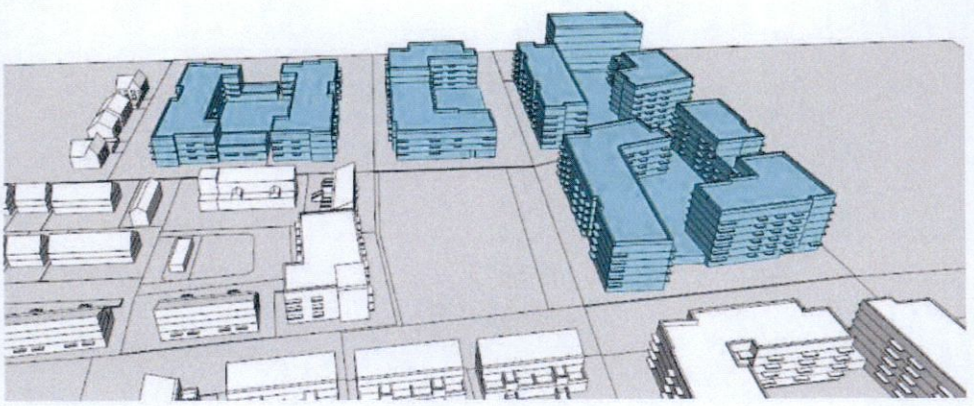
Clonburris T2 – Additional Apartments

Daylight and Sunlight Study



Report For: Cairn Homes Properties Ltd

Project No: 16263

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1 Executive Summary

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed additional 13 apartments in the residential development Clonburris T2 located in Co. Dublin, Ireland. The report focuses on measuring the daylight and sunlight performance within the added apartments in the proposed development.

1.1 Planning Authority Guidelines

The Sustainable Urban Housing: Design Standards for New Apartments December 2022 states the following in Section 6.6:

"Planning authorities should avail of appropriate expert advice where necessary and have regard to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2018 and the associated BRE guide 209 2022 Edition (June 2022) or any relevant future standards or guidance specific to the Irish context, when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."

On reviewing the Dublin City Development Plan 2022-2028, it is noted that at the time it was published, the new European standard for daylight (EN 17037:2018) had just been introduced and there was lack of clarity regarding the methods that need to be implemented. However, Appendix 16: Sunlight and Daylight of the Dublin City Development Plan states the following in Section 3.6:

"As such, both for clarity and as an interim measure during this transition period, the planning authority will look to receive relevant metrics from BR 209, BS 8206-2 and BS 17037. If, over the coming years, a revised version of BR 209 is to be issued, the guidance within this new version will take precedence."

This is supported further in Section 5.0 (Assessment Methodologies) of the same Appendix:

"Until such time when BR 209 is updated and all relevant and required information is included (i.e. removal of reference to BS 8206-2 and inclusion of metrics within BS EN 17037), the planning authority will request metrics from both BS 8206-2 and BS EN 17037."

Based on this evidence it should be noted that the current BRE Guide 209 3rd Edition (June 2022) has been updated and refers directly to the new British Standard *Daylight in Buildings*, BS EN 17037. However, the metrics of BS 8206-2 and BS EN 17037 have been implemented in order to update the overall totals from the previous report issued at the time when BS 8206-2 was prevailing.

With regards to interior daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all methodologies have been employed for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards. For clarity these are listed below and the following Section 1.2 denotes which standard is applicable for each assessment type:

- BRE Guide – 2nd Edition/3rd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- BS 8206-2:2008 – Lighting for Buildings – Part 2: Code of Practice for Daylighting
- IS EN 17037:2018 – Daylight in Buildings
    - This is the Irish implementation of the European EN 17037:2018 standard
- BS EN 17037:2018 – Daylight in Buildings
    - This is the UK implementation of the European EN 17037:2018 standard. It supersedes BS 8206-2:2008 which is withdrawn in the UK. The BS EN standard includes a National Annex which addresses daylight requirements specific to dwellings which is notable as Ireland's climate matches closely with the UK.

1.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Sunlight to Amenity Spaces**
    - Assessed using annual Solar Exposure calculations to determine any impact to existing amenities and the sunlight received and also to assess the proposed developments amenity spaces to derive how much sunlight they can expect to receive in accordance with the BRE Guide (2nd and 3rd Editions).
- **Sunlight to Proposed Buildings**
    - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition)
    - Assessed using Solar Exposure calculations in accordance with IS EN 17037:2018 (BRE Guide 3rd Edition)
    - In both assessments above the aim is to derive how much sunlight proposed development can expect to receive.
- **Daylight to Proposed Development**
    - Assessed using the Average Daylight Factor (ADF) method in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition)
    - Assessed in accordance with IS EN 17037:2018 Method 2 (BRE Guide 3rd Edition)
    - Assessed in accordance with BS EN 17037:2018 National Annex Method 2 (BRE Guide 3rd Edition)

- In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.

The following can be concluded based on the assessments undertaken:

1.3 Sunlight to Amenity Spaces

The BRE Guide (2nd and 3rd Editions) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st.

Proposed Amenity Spaces

On March 21st, 95% of the proposed amenity area will receive at least 2 hours of sunlight over its total area.

1.4 Sunlight to Proposed Development

For the sunlight to proposed development assessment, two standards have been analysed: BS 8206-2:2008 (BRE Guide 2nd Edition) and IS EN 17037:2018 (BRE Guide 3rd Edition). The results under each standard are summarised below.

BRE Guide 2nd Edition / BS 8206-2:2008

Within the BS 8206-2:2008 standard (BRE Guide 2nd Edition), when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

"The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

This is also reflected in the BRE Guide (2nd Edition) which states:

"The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 13 no. points tested, 9 no. points (69%) meet the BRE recommended values over the annual period, this increases to 100% (13 no. points) meeting the recommended values over the winter period when the sun is the most valuable. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building achieving in the region of 75% to 80% for this assessment would be considered very high and factors such site constraints and ultimately orientation play a huge part to the outcome of this assessment. In some instance and particularly a scheme like this where you have apartments on either side of a rectangular block, 50% would be as highest percentage achievable with the apartments on one side not able meet requirements purely on orientation as noted and the inclusion of balconies within the design scheme (as a requirement).

BRE Guide 3rd Edition / IS EN 17037:2018

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide 2nd Edition / BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 13 no. points tested, 13 no. points (100%) meet the BRE Guide 3rd Edition / IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered excellent.

Note, the sunlight exposure results are visually represented in Appendix B.

1.5 Daylight to Proposed Development

For the daylight to proposed development assessment, three standards have been analysed: BS 8206-2:2008 (BRE Guide 2nd Edition), IS EN 17037:2018 and BS EN 17037:2018 National Annex (BRE Guide 3rd Edition). The results under each standard are summarised below.

BRE Guide 2nd Edition / BS 8206-2:2008

77% of the new spaces tested achieve Average Daylight Factors (ADF) in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition) when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target and Bedrooms against a 1% ADF target.

Across the proposed development as a whole, 84% of the rooms are achieving Average Daylight Factors (ADF) in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition). The majority of rooms that are below the recommendations are located on the lower floors. However, overall the quality of daylight provision across the development can be considered high given the height and density achieved within the development.

BRE Guide 3rd Edition / IS EN 17037:2018

The proposed development has also been assessed using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018. 83% of the new spaces tested achieve the recommended daylight levels with regards to this standard. Across the proposed development as a whole, 95% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037:2018 using Method 2.

BRE Guide 3rd Edition / BS EN 17037:2018 National Annex

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". 97% of the new spaces tested achieve the recommended daylight levels with regards to this standard. Across the proposed development as a whole, 99% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037:2018 using Method 2.

Compensatory Measures

Where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against, the design features found in the table in appendix A section 8 help to balance off and compensate the lower levels of daylight measured in the applicable spaces.

1.6 Observations

The daylight results for the 13 apartments added are consistent with the figures achieved for the granted apartments on the same levels and overall the figures are typical for apartments situated on lower levels within apartment developments such as these. All apartments have been added to the outward facing facades of the blocks and benefit from being south or east facing and receiving the minimum recommendation for sunlight as a result.

It is important to note that the recommendations within the BRE Guide (2nd and 3rd Editions) itself states *"although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design"*, Although this is true appropriate and reasonable regard has still been taken to the BRE guide.

Whilst the results shown relate to the criteria as laid out in the BRE Guide (2nd and 3rd Editions), it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites.

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development continues to perform well with the inclusion of these 13 additional apartments, when compared to the recommendations in the BRE Guide 2nd Edition/ BS 8206-2:2008 and the BRE Guide 3rd Edition / IS EN 17037:2018 /BS EN 17037:2018 National Annex.

2 Introduction

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed additional 13 apartments in the residential development Clonburris T2 located in Co. Dublin, Ireland. The report focuses on measuring the daylight and sunlight performance within the these added apartments in the proposed development.

2.1 Development Description

3 BRE – Site Layout Planning for Daylight and Sunlight (2nd and 3rd Editions)

Access to daylight and sunlight is a vital part of a healthy environment. Sensitive design should provide sufficient daylight and sunlight to new residential developments while not obstructing light to existing homes nearby.
The 2nd and 3rd Editions of the BR 209 BRE Site Layout Planning for Daylight and Sunlight, advise on planning developments for good access to daylight and sunlight and is widely used by local authorities to help determine the performance of new developments.

3.1 Impact Classification Discussion

BRE guidance in Appendix I (BRE Guide 2nd Edition) and Appendix H (BRE Guide 3rd Edition) – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria summarised in the table below.
Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide (2nd and 3rd Editions), the impact is assessed as negligible or minor adverse. Where the loss of skylight or sunlight does not meet the BRE guidelines, the impact is assessed as minor, moderate or major adverse.

Impact	Description
Negligible adverse impact	• *Loss of light well within guidelines,* ***or*** • *only a small number of windows losing light (within the guidelines)* ***or*** *limited area of open space losing light (within the guidelines)*

Minor adverse impact (a)	• *Loss of light only just within guidelines* ***and***
	  ○ *a larger number of windows are affected* ***or***
	  ○ *larger area of open space is affected (within the guidelines)*

Minor adverse impact (b)	• *only a small number of windows or limited open space areas are affected* • *the loss of light is only marginally outside the guidelines* • *an affected room has other sources of skylight or sunlight* • *the affected building or open space only has a low-level requirement for skylight or sunlight* • *there are particular reasons why an alternative, less stringent, guideline should be applied*
Major adverse impact	• *large number of windows or large open space areas are affected* • *the loss of light is substantially outside the guidelines* • *all the windows in a particular property are affected* • *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)*

4 Methodology

4.1 Planning Authority Guidelines

The Sustainable Urban Housing: Design Standards for New Apartments December 2022 states the following in Section 6.6:

"Planning authorities should avail of appropriate expert advice where necessary and have regard to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2018 and the associated BRE guide 209 2022 Edition (June 2022) or any relevant future standards or guidance specific to the Irish context, when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."

On reviewing the Dublin City Development Plan 2022-2028, it is noted that at the time it was published, the new European standard for daylight (EN 17037:2018) had just been introduced and there was lack of clarity regarding the methods that need to be implemented. However, Appendix 16: Sunlight and Daylight of the Dublin City Development Plan states the following in Section 3.6:

"As such, both for clarity and as an interim measure during this transition period, the planning authority will look to receive relevant metrics from BR 209, BS 8206-2 and BS 17037. If, over the coming years, a revised version of BR 209 is to be issued, the guidance within this new version will take precedence."

This is supported further in Section 5.0 (Assessment Methodologies) of the same Appendix:

"Until such time when BR 209 is updated and all relevant and required information is included (i.e. removal of reference to BS 8206-2 and inclusion of metrics within BS EN 17037), the planning authority will request metrics from both BS 8206-2 and BS EN 17037."

Based on this evidence it should be noted that the current BRE Guide 209 3rd Edition (June 2022) has been updated and refers directly to the new British Standard *Daylight in Buildings*, BS EN 17037. However, the metrics of BS 8206-2 and BS EN 17037 have been implemented in order to update the overall totals from the previous report issued at the time when BS 8206-2 was prevailing.

With regards to interior daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all methodologies have been employed for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards. For clarity these are listed below and the following Section 1.2 denotes which standard is applicable for each assessment type:

- BRE Guide – 2nd Edition/3rd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight

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4.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Sunlight to Amenity Spaces**
    - Assessed using annual Solar Exposure calculations to determine any impact to existing amenities and the sunlight received and also to assess the proposed developments amenity spaces to derive how much sunlight they can expect to receive in accordance with the BRE Guide (2nd and 3rd Editions).
- **Sunlight to Existing Buildings**
    - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2nd & 3rd Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
    - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition)
    - Assessed using Solar Exposure calculations in accordance with IS EN 17037:2018 (BRE Guide 3rd Edition)
    - In both assessments above the aim is to derive how much sunlight proposed development can expect to receive.

- **Daylight to Existing Buildings**
    - Assessed using the Vertical Sky Component (VSC) method in accordance with the BS 8206-2:2008 (BRE Guide 2nd & 3rd Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
    - Assessed using the Average Daylight Factor (ADF) method in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition)
    - Assessed in accordance with IS EN 17037:2018 Method 2 (BRE Guide 3rd Edition)

- Assessed in accordance with BS EN 17037:2018 National Annex Method 2 (BRE Guide 3rd Edition)
- In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.

4.3 Orientation

The model orientation has been taken from drawings provided by the Architect with the resulting angle shown below used in the analysis.

Orientation	
	
	

5 Sunlight to Amenity Spaces

5.1 Guidance Requirements

The impact of the proposed development on the sunlight availability to the amenity spaces will be considered to determine how the amenity spaces perform when assessed against the BRE Guide (2nd and 3rd Editions) which states the following in Section 3.3.17:

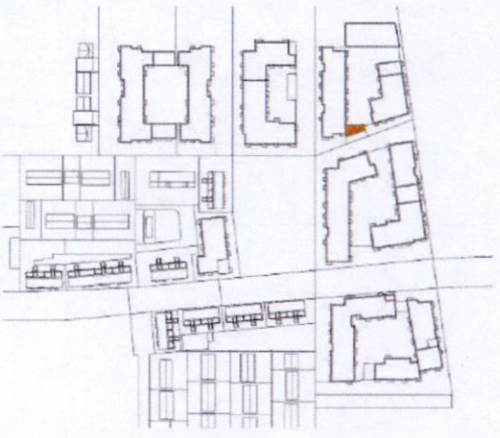
> **Summary**
>
> 3.3.17 It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March.

The BRE Guide (2nd and 3rd Editions) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st.

5.1.1 Proposed and Existing Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide (2nd and 3rd Editions), for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity space should receive at least 2 hours of sunlight on March 21st.

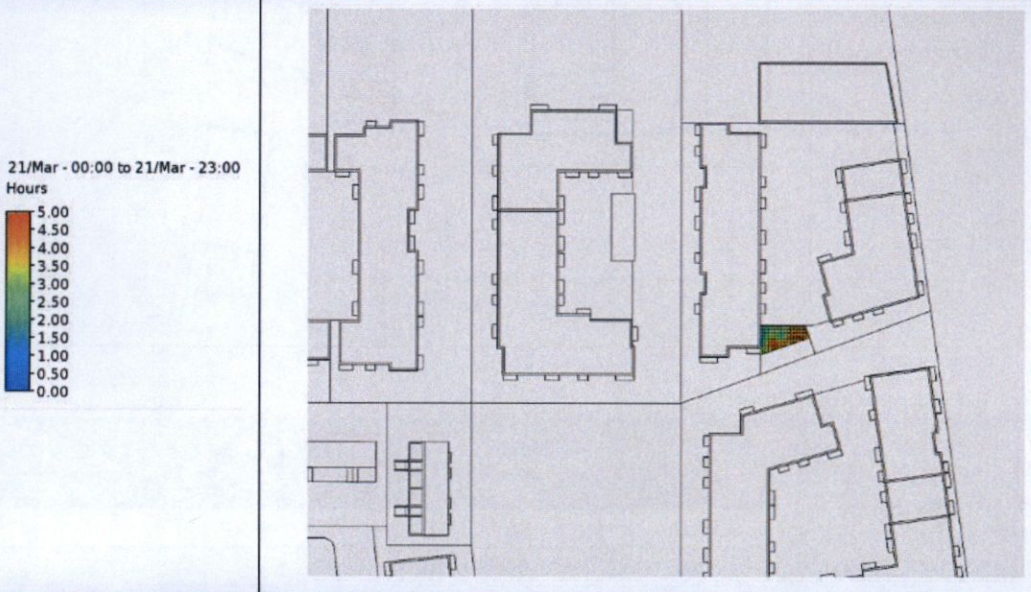
This analysis will be performed on the amenity space illustrated in the image below.

Amenity Spaces	
Proposed Communal Space	

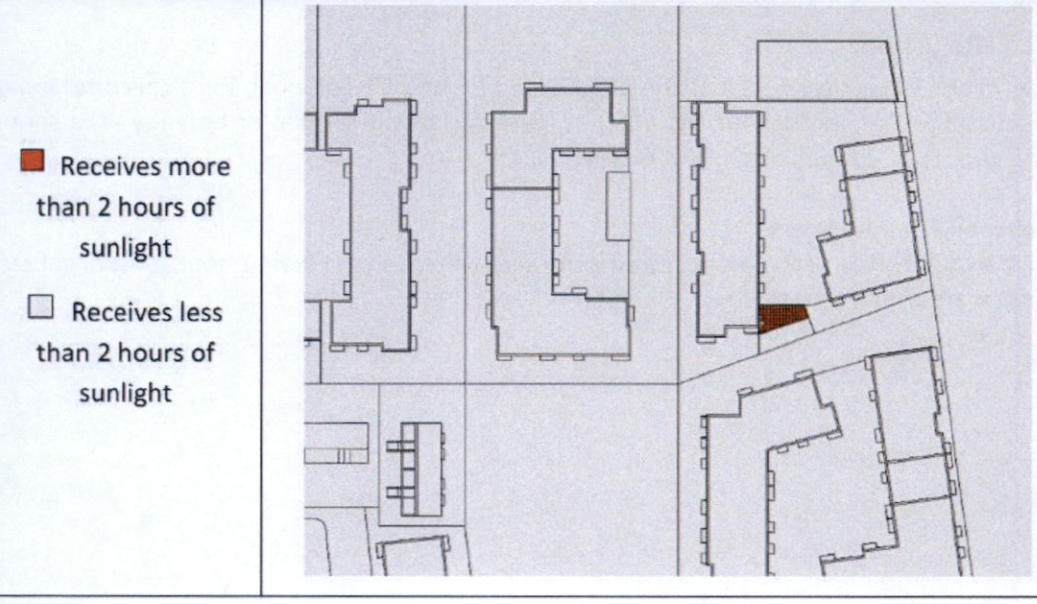
The following images illustrate the predicted results with respect to this space receiving at least 2 hours of sunlight on March 21st. Any areas that receive less than 2 hours of sunlight are colour-coded in grey.

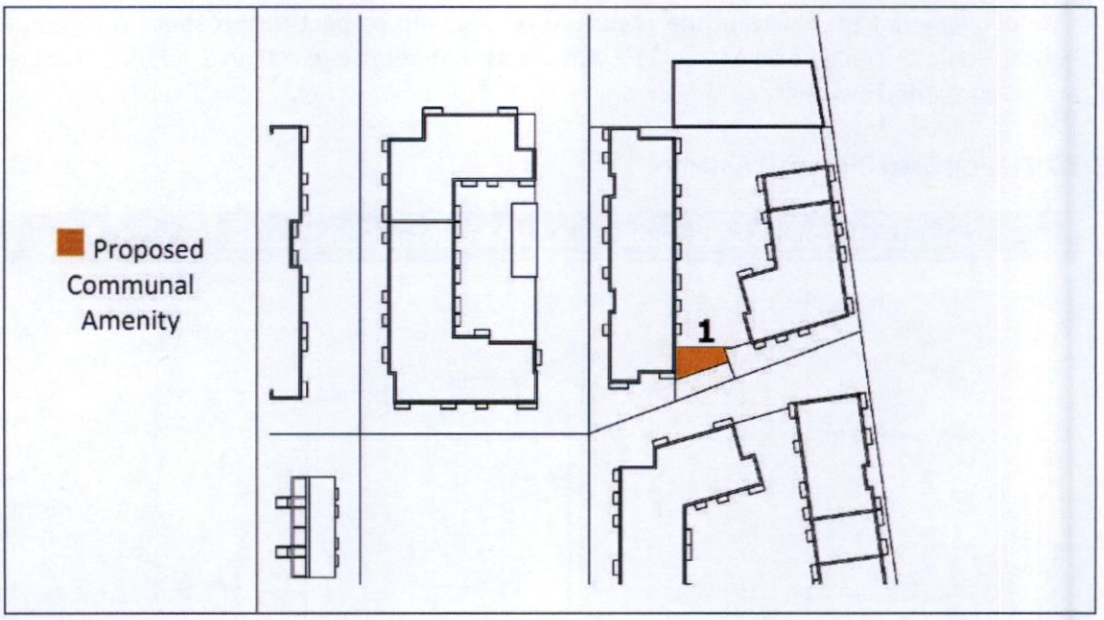
5.1.2 Proposed Block B-D Amenity

Absolute Scale Showing All Hours of Sunlight Received



Area Showing >2 Hours





Block B-D Communal Amenity:

Ref.	Total Area (m2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
1 (Courtyard)	101	96	95%	✓
Total	**101**	**96**	**95%**	✓

5.2 Discussion

As outlined in Section 3.3.17 of the BRE Guide (2nd and 3rd Editions), for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on March 21st.

Proposed Amenity Spaces

On March 21st, 95% of the proposed amenity area will receive at least 2 hours of sunlight over its total area.

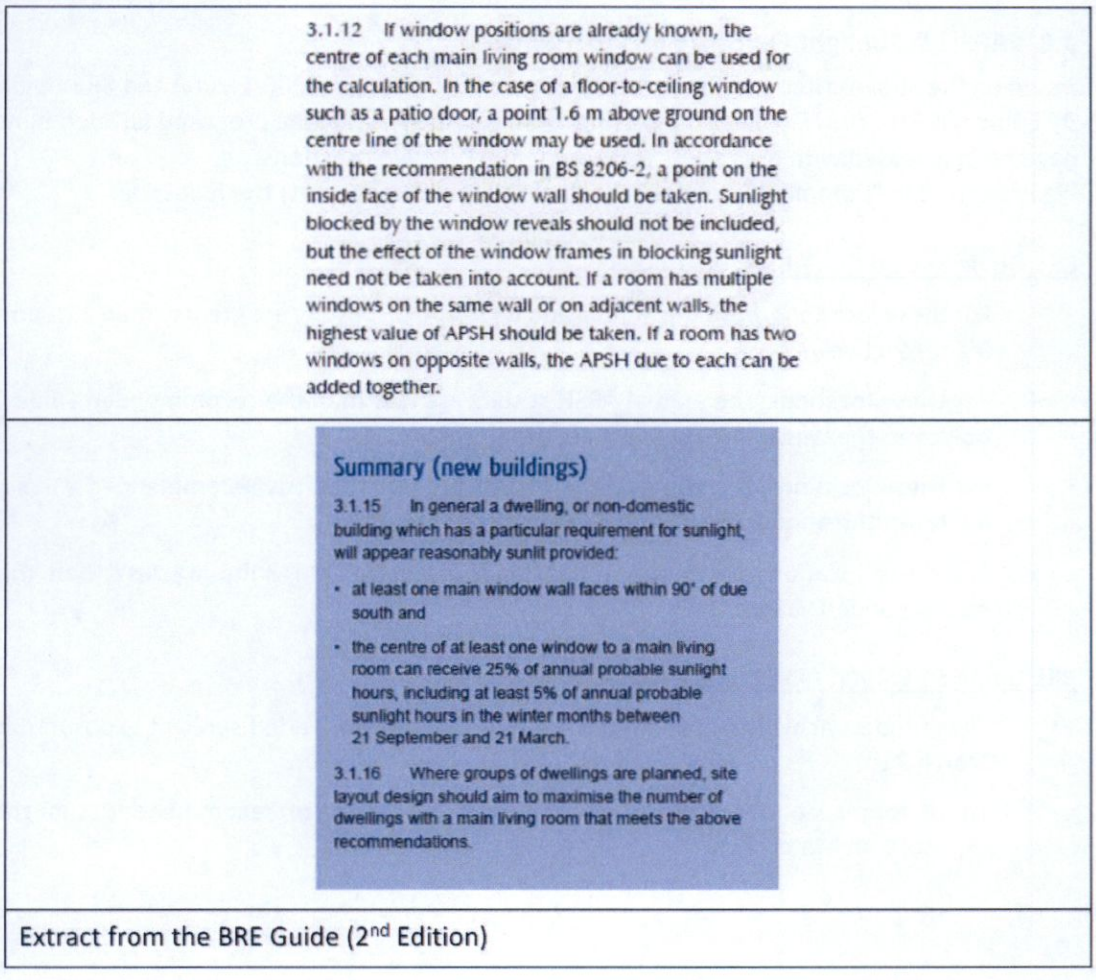
6 Sunlight to Proposed Development

6.1 Guidance – BRE Guide (2nd Edition) / BS8206-2:2008

The British Standard BS 8206-2:2008 recommends that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months, between 21st September and 21st March. Here 'probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

If a window reference point can receive more than one quarter of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months between 21st September and 21st March, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

As stated in Section 3.1.12 of the BRE Guide (2nd Edition), "If window positions are already known, the centre of each main living room window can be used for the calculation".



3.1.12 If window positions are already known, the centre of each main living room window can be used for the calculation. In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground on the centre line of the window may be used. In accordance with the recommendation in BS 8206-2, a point on the inside face of the window wall should be taken. Sunlight blocked by the window reveals should not be included, but the effect of the window frames in blocking sunlight need not be taken into account. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken. If a room has two windows on opposite walls, the APSH due to each can be added together.

Summary (new buildings)

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.

Extract from the BRE Guide (2nd Edition)

6.2 Guidance – BRE Guide 3rd Edition / IS EN 17037:2018

Section 5.3.1 of IS EN 17037:2018 states that *"exposure to sunlight is an important quality criterion of an interior space and can contribute to human well-being."* Table A.6 from IS EN 17037:2018 summarises the recommendation for daily sunlight exposure.

Table A.6 — Recommendation for daily sunlight exposure

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1,5 h
Medium	3,0 h
High	4,0 h

Within the context of a domestic property, BRE Guide 3rd Edition/IS EN 17037:2018 states that at least one habitable space within a dwelling should receive the recommended minimum value of 1.5 hours of sunlight on the 21st of March. The test is carried out on a clear, cloud free day.

6.3 APSH & Sunlight Exposure Assessment

Based on the above criteria for both the BRE Guide 2nd Edition/BS8206-2:2008 and BRE Guide 3rd Edition/IS EN 17037:2018, all main living room windows within the proposed development have been assessed with the results included in the following sections.
Please note, the "Comment" symbol in each of the tables represents the following:

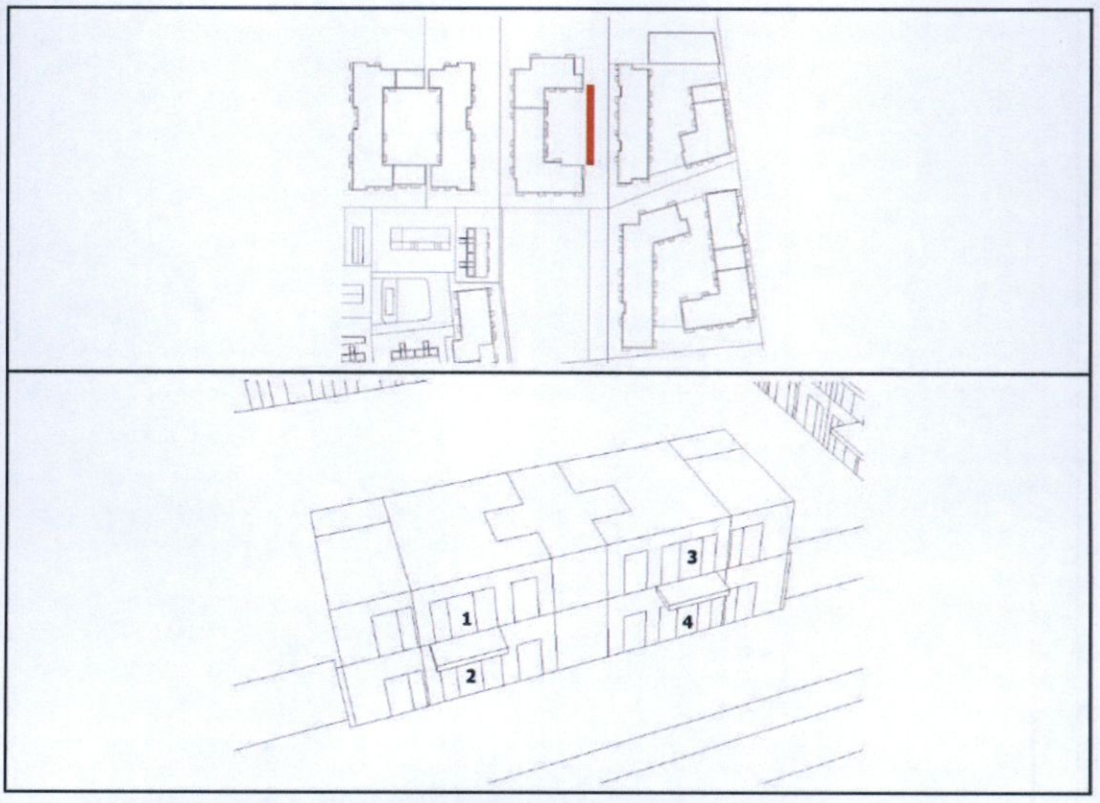
BRE Guide 3nd Edition / BS 8206-2:2008

- ✓/✓ For these locations, both the annual and winter APSH results are greater than 25% and 5% respectively.
- x /✓ For these locations, the annual APSH results are less than the recommended values, however, the winter APSH results are greater than 5%.
- ✓ / x For these locations, the winter APSH results are less than the recommended values, however, the annual APSH results are greater than 25%.
- x / x For these locations, both the annual and winter APSH results are less than the recommended values.

BRE Guide 3rd Edition / IS EN 17037:2018

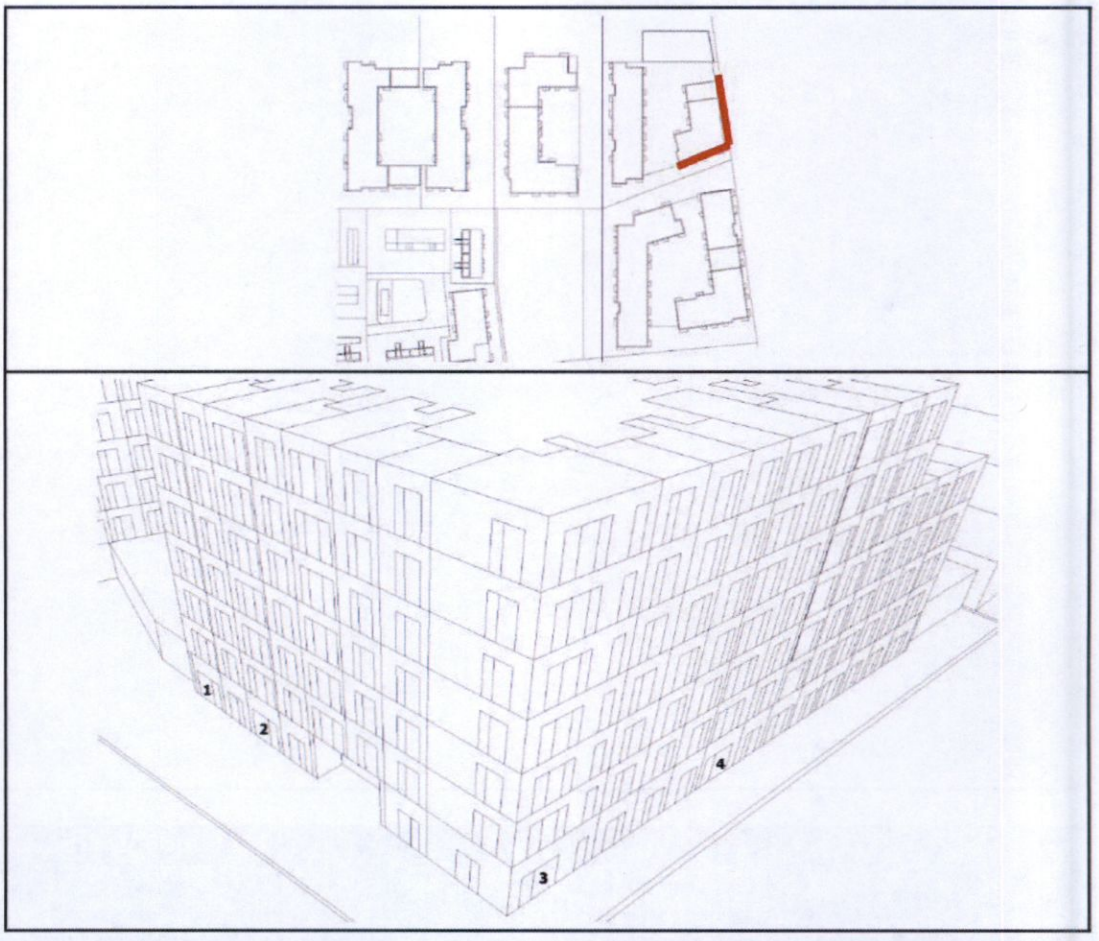
- ✓ These rooms achieve the minimum 1.5 hours of recommended sunlight exposure on March 21st.
- x These rooms do not achieve the minimum 1.5 hours of recommended sunlight exposure on March 21st.

6.3.1 View 01 – Block A



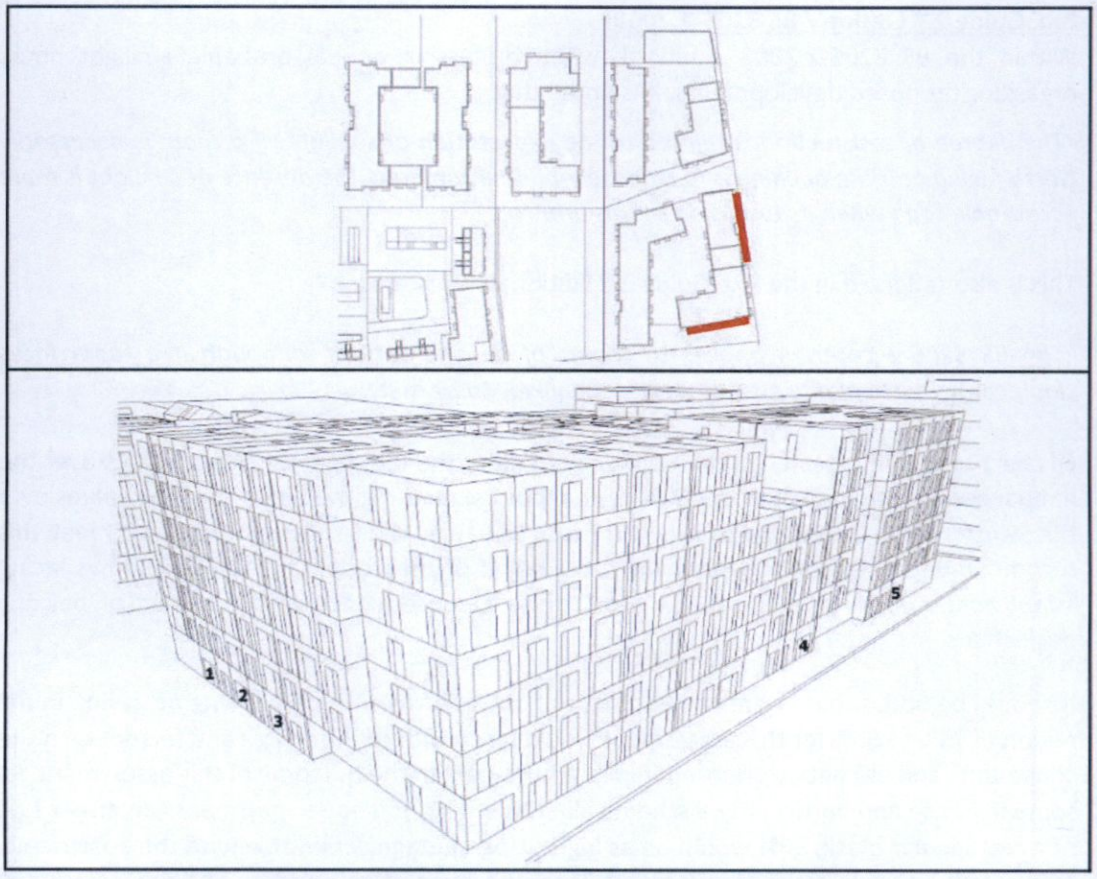
Ref.	BRE Guide 2nd Edition / BS 8206:2008 APSH Assessment			BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	22.66	7.58	x/✓	✓
2	19.26	6.93	x/✓	✓
3	23.39	8.42	x/✓	✓
4	17.67	5.42	x/✓	✓

6.3.2 View 02 – Block B-D



Ref.	BRE Guide 2nd Edition / BS 8206:2008 APSH Assessment			BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	38.98	8.61	✓/✓	✓
2	38.46	9.53	✓/✓	✓
3	36.10	15.24	✓/✓	✓
4	37.81	15.20	✓/✓	✓

6.3.3 View 03 – Block E-F



Ref.	BRE Guide 2nd Edition / BS 8206:2008 APSH Assessment			BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	54.77	21.39	✓/✓	✓
2	49.29	23.90	✓/✓	✓
3	49.85	25.56	✓/✓	✓
4	32.78	13.44	✓/✓	✓
5	34.39	14.60	✓/✓	✓

6.4 Discussion

BRE Guide 2nd Edition / BS 8206-2:2008

Within the BS 8206-2:2008 standard, when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

"The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

This is also reflected in the BRE Guide 2nd Edition which states:

"The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 13 no. points tested, 9 no. points (69%) meet the BRE recommended values over the annual period, this increases to 100% (13 no. points) meeting the recommended values over the winter period when the sun is the most valuable. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building achieving in the region of 75% to 80% for this assessment would be considered very high and factors such site constraints and ultimately orientation play a huge part to the outcome of this assessment. In some instance and particularly a scheme like this where you have apartments on either side of a rectangular block, 50% would be as highest percentage achievable with the apartments on one side not able meet requirements purely on orientation as noted and the inclusion of balconies within the design scheme (as a requirement).

BRE Guide 3rd Edition / IS EN 17037:2018

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide 2nd Edition / BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 13 no. points tested, 13 no. points (100%) meet the BRE Guide 3rd Edition / IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered excellent.

7 Daylight to Proposed Development

This section addresses daylight provision to the proposed 13 additional apartments within the development. The purpose of the calculations is to quantify an overall percentage of units which exceeds the daylight provision recommendations. The objective of the design team is to maximise the number of units which exceed the minimum recommendations.

7.1 Reference Standards

The daylight provision to the proposed development was assessed against the following standards for completeness:

- BRE Guide (2nd Edition) / BS 8206-2:2008
- BRE Guide (3rd Edition) / IS EN 17037:2018
- BRE Guide (3rd Edition) / BS EN 17037:2018

The following sections summarise the various requirements of each standard.

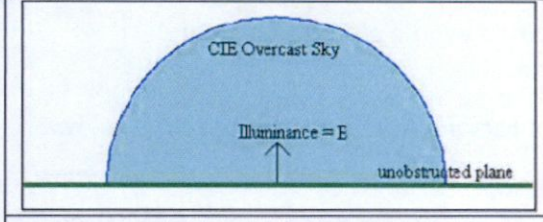
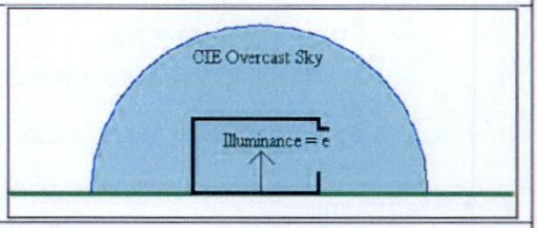
7.1.1 BRE Guide (2nd Edition) / BS 8206-2:2008

The BRE Guide (2nd Edition) states that the *"advice is not mandatory and that the guide should not be seen as an instrument of planning policy"*. It should be noted when trying to achieve height and density within a development where deep plan, single aspect, combined living, kitchen and dining spaces exist (in some situations with a balcony in place as well), it is very difficult to achieve good levels of daylight across the whole space. Therefore, when considering the modelling approach noted above, results should be interpreted with flexibility as noted in the BRE guide (2nd Edition):

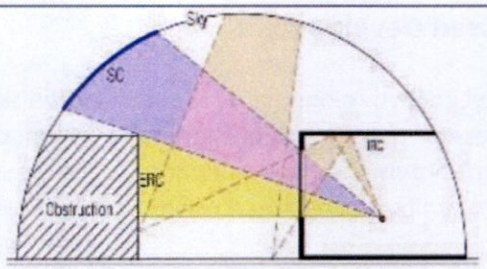
"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."

7.1.1.1 Introduction to ADF

Daylight is constantly changing, so its level at a point in a building is usually defined as an average daylight factor (ADF).
This is the ratio of the indoor illuminance at the point in question to the outdoor unobstructed horizontal illuminance.

<table>
<tr><td colspan="2">Daylight Factor Methodology</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>E = illuminance on unobstructed plane</td><td>e = illuminance at point in interior</td></tr>
<tr><td colspan="2">Daylight Factor = e/E (often expressed as a percentage)</td></tr>
</table>

SC – Sky Component
ERC – Externally Reflected Component
IRC – Internally Reflected Component



Sources of Daylight at a Point Within a Room

Both illuminances are measured under the same standard sky, a CIE overcast sky. Since the sun is in a particular position for only a short period each day, direct sunlight is excluded. Instead diffuse sunlight is used for average daylight calculations. Diffuse sunlight describes the sunlight that has been scattered by molecules and particles in the atmosphere but has still made it down to surface of the earth.

For average daylight factor there are three possible paths along which diffuse light can get into a room through glazed windows.

1. Light from the patch of sky visible at the point considered, is expressed as the sky component.
2. Light reflected from opposing exterior surfaces and then reaches the point, is expressed as the externally reflected component.
3. Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

Average Daylight Factor is an average of all measured points within the space.

7.1.1.2 ADF Requirements

The BRE Guide (2nd Edition) states the following in Appendix C with respect to Average Daylight Factors (ADF):

> C4 If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable.

Therefore, the recommended Average Daylight Factors (ADF) are summarized as follows:

- Bedrooms – 1.0%
- Living Rooms – 1.5%
- Kitchens – 2.0%

The BRE Guide (2nd Edition) does not provide explicit guidance for an open space that is a combination of Living/Kitchen/Dining (LKD) functions. However, the BS 8206-2:2008 standard states:

"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%."

Although the above target is referenced within BS 8206-2:2008, it also states, *"The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement should be exercised when using the criteria given in the standard for other purposes, particularly town planning."*

For the purposes of clarity, we have assessed all LKDs against the 2% ADF target.

7.1.2 BRE Guide (3rd Edition) / IS EN 17037:2018

As outlined in Section 5.1.2 of the IS EN 17037:2018 standard:

"A space is considered to provide adequate daylight if a target illuminance level is achieved across a fraction of the reference plane within a space for at least half of the daylight hours. In addition, for spaces with vertical or inclined daylight openings, a minimum target illuminance level is also to be achieved across the reference plane".

Annex A of IS EN 17037:2018 gives three levels of recommendation for the assessment of daylight provision in interior spaces which are summarised as follows:

"The three levels are: minimum, medium and high, and the minimum recommendation should be provided."

It is important to note that IS EN 17037:2018 does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

Table A.1 of IS EN 17037:2018 (included below) provides recommendations for daylight provision by daylight openings in vertical and inclined surfaces. Note, Table A.2 provides similar recommendations for daylight openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.2 are not followed.

To achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.1, the following must be achieved:

- A target illuminance (E_T) of 300 lux must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target illuminance (E_{TM}) of 100 lux must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

Table A.1 — Recommendations of daylight provision by daylight openings in vertical and inclined surface

Level of recommendation for vertical and inclined daylight opening	Target illuminance E_T lx	Fraction of space for target level $F_{plane,\%}$	Minimum target illuminance E_{TM} lx	Fraction of space for minimum target level $F_{plane,\%}$	Fraction of daylight hours $F_{time,\%}$
Minimum	300	50 %	100	95 %	50 %
Medium	500	50 %	300	95 %	50 %
High	750	50 %	500	95 %	50 %
NOTE Table A.3 gives target daylight factor (D_T) and minimum target daylight factor (D_{TM}) corresponding to target illuminance level and minimum target illuminance, respectively, for the CEN capital cities.					

The recommendations in Table A.1 can also be expressed in terms of a daylight factor "D". Table A.3 provides the corresponding daylight factor (D) relative to a recommended target illuminance E_T (lx) and target minimum illuminance E_{TM} (lx) depending on the location for daylight openings in vertical and inclined surfaces. Note, Table A.4 provides similar target values for openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.4 are not followed.

The extract from Table A.3 below is for Dublin with the daylight factor targets highlighted, i.e. to achieve the target illuminance (E_T) of 300 lux outlined in Table A.1, an equivalent target daylight factor is 2.0%. Furthermore, to achieve the minimum target illuminance (E_{TM}) of 100 lux outlined in Table A.1, an equivalent target daylight factor is 0.7%.

Table A.3 — Values of *D* for daylight openings to exceed an illuminance level of 100, 300, 500 or 750 lx for a fraction of daylight hours $F_{time,\%}$ = 50 % for 33 capitals of CEN national members

Nation	Capital [a]	Geographical latitude φ [°]	Median External Diffuse Illuminance $E_{v,d,med}$	*D* to exceed 100 lx	*D* to exceed 300 lx	*D* to exceed 500 lx	*D* to exceed 750 lx
Ireland	Dublin	53,43	14 900	0,7 %	2,0 %	3,4 %	5,0 %

Therefore, to achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.3, the following must be achieved:

- A target daylight factor (D_T) of 2.0% must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target daylight factor (D_{TM}) of 0.7% must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3. The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1. The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*
Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.
The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

7.1.3 BRE Guide 3rd Edition / BS EN 17037:2018 National Annex

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". However, a "National Annex NA" was included which states:
"The UK committee supports the recommendations for daylight in buildings given in BS EN 17037:2018; however, it is the opinion of the UK committee that the recommendations for daylight provision in a space (see Clause A.2) may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings. This National Annex therefore provides the UK committee's guidance on minimum daylight provision in all UK dwellings."

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 below. It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

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 BS National Annex also states:

"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."

Therefore, combined LKDs are to be assessed using a 200 lux target illuminance (E_T).

Finally, the BS National Annex also states that:

"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."

Therefore, when assessing the daylight provisions in residential dwellings in accordance with BS EN 17037:2018, only the target illuminance (E_T) or target daylight factor (D_T) will be assessed for Bedrooms, Living Rooms, Kitchens (or combined LKDs) on over 50% of the floor area over 50% of the available daylight hours. The minimum target illuminance (E_{TM}) or minimum target daylight factor (D_{TM}) will not be assessed.

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table NA.1 of BS EN 17037:2018.

7.2 Daylight Model Inputs

The following inputs were used in the study:

BRE Guide (2nd Edition) / BS 8206-2:2008

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September

BRE Guide (3rd Edition) / IS EN / BS EN 17037:2018

- Weather File: Dublin.epw (15 year average)

Common Inputs to all Standards

- Working Plane Height: 0.85m
- Glazing Light Transmittance: 70%
- Window Frame thickness: 50 mm

The following surface reflectance values are used in the study:

Material Surface	Reflectance
External Wall	0.20/0.60
Internal Partition	0.80
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.40
Floor/Ceiling (Ceiling)	0.80

7.3 Daylight Results

The following tables summarise the daylight provision results for the 13 addition apartments within the development. Individual room results can be viewed in Appendix A.

The purpose of the calculations is to quantify an overall percentage of rooms which exceed the recommendations. The objective of the design team is to maximise the number of units which exceed the recommendations.

As outlined previously in Section 7.1.1.2, where there are combined Living/Kitchen/Dining areas (LKDs) within the development, these have been assessed as whole spaces against an initial 2% ADF target. The results are summarised in the following tables:

Block A

The daylight provision results for the additional apartments within Block A under the various standards are summarised below. A 50% compliance rate is achieved in accordance with the BRE Guide 2nd Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 a compliance rate of 75% is achieved, this increased to 88% under the BS EN 17037:2018 Method 2 National Annex.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	4
Total No. LKDs Tested	4
Total No. Spaces Tested	**8**

BRE Guide 2nd Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	4	100%	0	0%
No. LKDs	0	0%	4	100%
Total No.	**4**	**50%**	**4**	**50%**

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	4	100%	0	0%
No. LKDs	2	50%	2	50%
Total No.	**6**	**75%**	**2**	**0%**

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	4	100%	0	0%
No. LKDs	3	75%	1	25%
Total No.	**7**	**88%**	**1**	**12%**

Blocks B & D

The daylight provision results for Blocks B and D under the various standards are summarised below. An 80% compliance rate is achieved in accordance with the BRE Guide 2nd Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 a compliance rate of 80% is achieved, this increases to 100% under the BS EN 17037:2018 Method 2 National Annex.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	6
Total No. LKDs Tested	4
Total No. Spaces Tested	10

BRE Guide 2nd Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	6	100%	0	0%
No. LKDs	2	50%	2	50%
Total No.	8	80%	2	20%

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	6	100%	0	0%
No. LKDs	2	50%	2	50%
Total No.	8	80%	2	20%

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	6	100%	0	0%
No. LKDs	4	100%	0	0%
Total No.	10	100%	0	0%

Blocks E & F

The daylight provision results for Blocks E and F under the various standards are summarised below. A 92% compliance rate is achieved in accordance with the BRE Guide 2nd Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3rd Edition / IS EN 17037:2018 Method 2, a compliance rate of 92% is achieved, this increases to 100% under the BS EN 17037:2018 Method 2 National Annex.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	7
Total No. LKDs Tested	5
Total No. Spaces Tested	12

BRE Guide 2nd Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	7	100%	0	0%
No. LKDs	4	80%	1	20%
Total No.	11	92%	1	8%

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	7	100%	0	0%
No. LKDs	4	75%	1	25%
Total No.	11	92%	1	8%

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	7	100%	0	0%
No. LKDs	5	100%	0	0%
Total No.	12	100%	0	0%

Total for The Additional Apartments within the Development

The overall daylight provision results for the additional 13 apartments within the development under the various standards are summarised below. A 77% compliance rate is achieved in accordance with the BRE Guide 2nd Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 a compliance rate of 83% is achieved, this increases to 97% under the BS EN 17037:2018 Method 2 National Annex.

Rooms Tested	No. Rooms
Total No. Bedrooms Tested	17
Total No. LKDs Tested	13
Total No. Spaces Tested	30

BRE Guide 2nd Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	17	100%	0	0%
No. LKDs	6	46%	7	54%
Total No.	23	77%	7	23%

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	17	100%	0	0%
No. LKDs	8	62%	5	38%
Total No.	25	83%	5	17%

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	17	100%	0	0%
No. LKDs	12	92%	1	8%
Total No.	29	97%	1	3%

Total for the Development

The overall daylight provision results for the total of the development including the additional 13 apartments under the various standards are summarised below. An 84% compliance rate is achieved in accordance with the BRE Guide 2nd Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 a compliance rate of 95% is achieved, this increases to 99% under the BS EN 17037:2018 Method 2 National Annex.

Rooms Tested	No. Rooms
Total No. Bedrooms Tested	979
Total No. LKDs Tested	604
Total No. Spaces Tested	**1,583**

BRE Guide 2nd Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	977	99%	2	1%
No. LKDs	347	57%	257	43%
Total No.	**1,324**	**84%**	**259**	**16%**

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	955	98%	24	2%
No. LKDs	549	91%	55	9%
Total No.	**1,505**	**95%**	**79**	**5%**

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	979	100%	0	0%
No. LKDs	594	98%	10	2%
Total No.	**1,573**	**99%**	**10**	**1%**

7.4 Compensatory Measures

7.4.1.1 Irish Standards and Design Development

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2022, states the following:

"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 specifics. 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."

Having regard to the statements above, it should be noted that throughout the design process the design team worked hard to optimise the whole development to maximise the daylight within the proposed scheme. Where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against, the design features found in the table in appendix A section 9.2 help to balance off and compensate the lower levels of daylight measured in the applicable spaces.

8 Conclusion

The following can be concluded based on the assessments undertaken:

8.1 Sunlight to Amenity Spaces

The BRE Guide (2nd and 3rd Editions) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st.

Proposed Amenity Spaces

On March 21st, 95% of the proposed amenity area will receive at least 2 hours of sunlight over its total area.

8.2 Sunlight to Proposed Development

For the sunlight to proposed development assessment, two standards have been analysed: BS 8206-2:2008 (BRE Guide 2nd Edition) and IS EN 17037:2018 (BRE Guide 3rd Edition). The results under each standard are summarised below.

BRE Guide 2nd Edition / BS 8206-2:2008

Within the BS 8206-2:2008 standard (BRE Guide 2nd Edition), when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

"The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

This is also reflected in the BRE Guide (2nd Edition) which states:

"The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 13 no. points tested, 9 no. points (69%) meet the BRE recommended values over the annual period, this increases to 100% (13 no. points) meeting the recommended values over the winter period when the sun is the most valuable. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building achieving in the region of 75% to 80% for this assessment would be considered very high and factors such site constraints and ultimately orientation play a huge part to the outcome of this assessment. In some instance and particularly a scheme like this where you have apartments on either side of a rectangular block, 50% would be as highest percentage achievable with the apartments on one side not able meet requirements purely on orientation as noted and the inclusion of balconies within the design scheme (as a requirement).

BRE Guide 3rd Edition / IS EN 17037:2018

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide 2nd Edition / BS

8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 13 no. points tested, 13 no. points (100%) meet the BRE Guide 3rd Edition / IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered excellent.

Note, the sunlight exposure results are visually represented in Appendix B.

8.3 Daylight to Proposed Development

For the daylight to proposed development assessment, three standards have been analysed: BS 8206-2:2008 (BRE Guide 2nd Edition), IS EN 17037:2018 and BS EN 17037:2018 National Annex (BRE Guide 3rd Edition). The results under each standard are summarised below.

BRE Guide 2nd Edition / BS 8206-2:2008

77% of the new spaces tested achieve Average Daylight Factors (ADF) in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition) when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target and Bedrooms against a 1% ADF target.

Across the proposed development as a whole, 84% of the rooms are achieving Average Daylight Factors (ADF) in accordance with the BS 8206-2:2008 (BRE Guide 2nd Edition). The majority of rooms that are below the recommendations are located on the lower floors. However, overall the quality of daylight provision across the development can be considered high given the height and density achieved within the development.

BRE Guide 3rd Edition / IS EN 17037:2018

The proposed development has also been assessed using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018. 83% of the new spaces tested achieve the recommended daylight levels with regards to this standard. Across the proposed development as a whole, 95% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037:2018 using Method 2.

BRE Guide 3rd Edition / BS EN 17037:2018 National Annex

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". 97% of the new spaces tested achieve the recommended daylight levels with regards to this standard. Across the proposed development as a whole, 99% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037:2018 using Method 2.

Compensatory Measures

Where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against, the design features found in the table in appendix A section 8 help to balance off and compensate the lower levels of daylight measured in the applicable spaces.

8.4 Observations

The daylight results for the 13 apartments added are consistent with the figures achieved for the granted apartments on the same levels and overall the figures are typical for apartments situated on lower levels within apartment developments such as these. All apartments have been added to the outward facing facades of the blocks and benefit from being south or east facing and receiving the minimum recommendation for sunlight as a result.

It is important to note that the recommendations within the BRE Guide (2nd and 3rd Editions) itself states *"although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design"*, Although this is true appropriate and reasonable regard has still been taken to the BRE guide.

Whilst the results shown relate to the criteria as laid out in the BRE Guide (2nd and 3rd Editions), it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites.

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development continues to perform well with the inclusion of these 13 additional apartments, when compared to the recommendations in the BRE Guide 2nd Edition/ BS 8206-2:2008 and the BRE Guide 3rd Edition / IS EN 17037:2018 /BS EN 17037:2018 National Annex.

9 Appendix A – Daylight Provision Results

The tables in the following sections summarise the daylight provision results for the rooms that were assessed in the proposed development. Note, within the tables the code "LKD" equates to combined Living, Kitchen, Dining area.
The results for the following daylight standards are included in each table:

- BRE Guide (2nd Edition) / BS 8206-2:2008
- BRE Guide (3rd Edition) / IS EN 17037:2018
- BRE Guide (3rd Edition) / BS EN 17037:2018 National Annex

Please note, the "Comment" symbol in each of the tables represents the following:

BRE Guide (2nd Edition) / BS 8206-2:2008

✓ These rooms have an ADF greater than the recommended minimum values (2.0% for combined L/K/Ds and 1.0% for bedrooms) as stated within the BRE Guide.

x The ADF in these rooms falls below the BRE recommendation for a L/K/D when the whole space is assessed against the 2% ADF design value or in the case of Bedrooms, is less than the 1% ADF target.

BRE Guide (3rd Edition) / IS EN 17037:2018

✓ These rooms achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements, i.e. 300 lux for over 50% of their floor area (E_T) and 100 lux for over 95% of their floor area (E_{TM}).

x These rooms do not achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements.

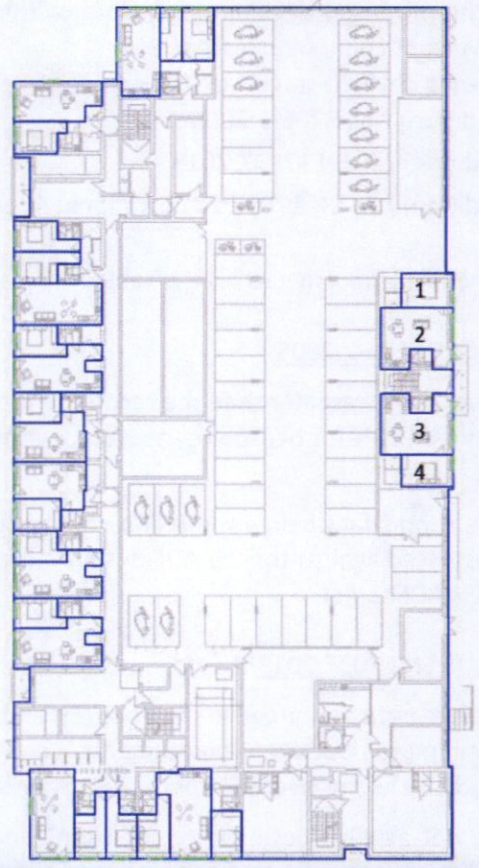
BRE Guide (3rd Edition) / BS EN 17037:2018 National Annex

✓ These rooms achieve the target illuminance (E_T) over the minimum floor area requirements, i.e. 100 lux for over 50% of bedroom floor areas, and 200 lux for over 50% of LKD floor areas.

x These rooms do not achieve the target illuminance (E_T) over the minimum floor area requirements.

9.1 Daylight Provision Results

9.1.1 Block A – Level 0

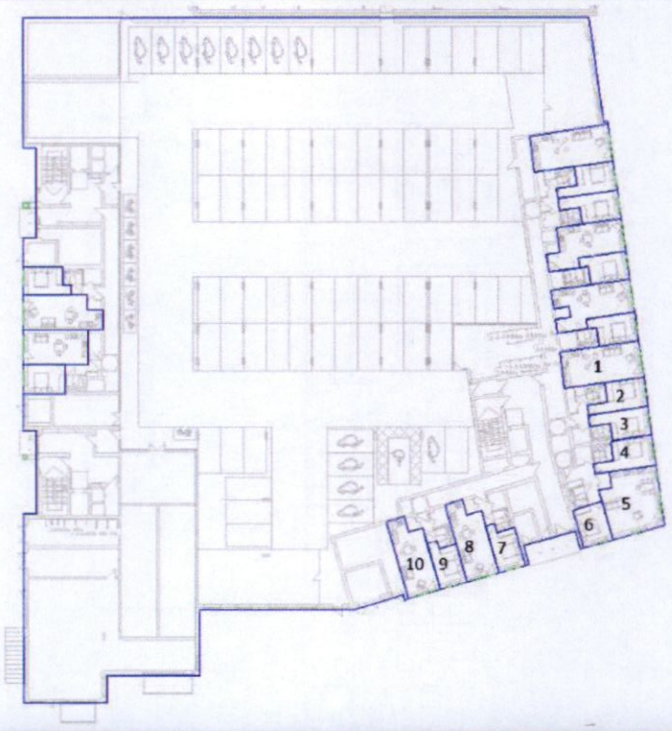


Ref.	Room Activity	BRE Guide 2nd Edition BS 8206:2008		BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	Bedroom	1.10	✓	100	100	✓	100	✓
2	LKD	1.00	x	31.09	100	x	69.75	✓
3	LKD	1.00	x	25.11	82.38	x	34.80	x
4	Bedroom	1.09	✓	100	100	✓	100	✓

9.1.2 Block A – Level 1

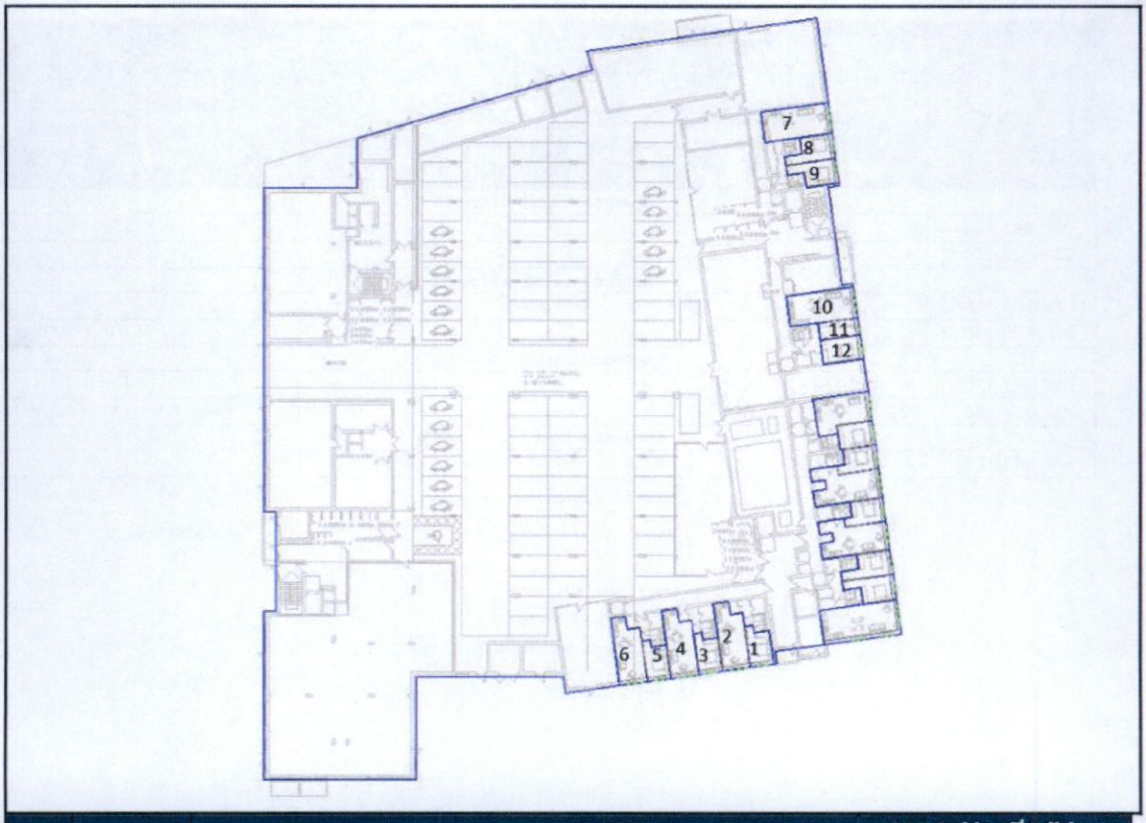
Ref.	Room Activity	BRE Guide 2nd Edition BS 8206:2008		BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	Bedroom	1.69	✓	100	100	✓	100	✓
2	LKD	1.69	x	100	100	✓	100	✓
3	LKD	1.69	x	75.38	100	✓	89.74	✓
4	Bedroom	1.71	✓	100	100	✓	100	✓

9.1.3 Blocks B & D – Level 0



Ref.	Room Activity	BRE Guide 2nd Edition BS 8206:2008		BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.07	✓	100	100	✓	100	✓
2	Bedroom	3.15	✓	100	100	✓	100	✓
3	Bedroom	3.20	✓	100	100	✓	100	✓
4	Bedroom	3.08	✓	100	100	✓	100	✓
5	LKD	3.46	✓	100	100	✓	100	✓
6	Bedroom	1.85	✓	100	100	✓	100	✓
7	Bedroom	1.42	✓	100	100	✓	100	✓
8	LKD	1.18	x	31.58	100	x	52.63	✓
9	Bedroom	1.61	✓	100	100	✓	100	✓
10	LKD	1.20	x	38.37	100	x	59.88	✓

9.1.4 Blocks E & F – Level 0



Ref.	Room Activity	BRE Guide 2nd Edition BS 8206:2008		BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	Bedroom	2.79	✓	100	100	✓	100	✓
2	LKD	2.02	✓	100	100	✓	100	✓
3	Bedroom	2.75	✓	100	100	✓	100	✓
4	LKD	1.88	x	38.46	92.90	x	55.03	✓
5	Bedroom	2.78	✓	100	100	✓	100	✓
6	LKD	2.21	✓	100	100	✓	100	✓
7	LKD	2.11	✓	100	100	✓	100	✓
8	Bedroom	3.31	✓	100	100	✓	100	✓
9	Bedroom	3.38	✓	100	100	✓	100	✓
10	LKD	2.07	✓	100	100	✓	100	✓
11	Bedroom	1.58	✓	100	100	✓	100	✓
12	Bedroom	2.83	✓	100	100	✓	100	✓

9.2 Compensatory Measures Table

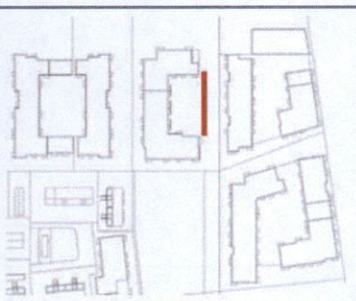
Unit	IES Ref	Unit GIA (m2)	Compensatory Measures					
			Unit floor area > minimum standard	Unit floor area > 10% minimum standard	Private amenity area ≥ minimum standard	Unit has direct access/own door entry	Unit benefits from tall flor to ceiling glass	Floor to ceiling height ≥ 2.4m
Apartment Block A - Level 0								
L00: A-11_LKD	2	54.06	✓	✓	✓	✓	✓	✓
L00: A-10_LKD	3	54.06	✓	✓	✓	✓	✓	✓
Apartment Block A - Level 1								
L01: A-11_LKD	2	54.06	✓	✓	✓		✓	✓
L01: A-10_LKD	3	54.06	✓	✓	✓		✓	✓
Apartment Block B & D - Level 0								
L00: D-07_LKD	8	50.58	✓	✓	✓		✓	✓
L00: D-06_LKD	10	50.58	✓	✓	✓		✓	✓
Apartment Block E & F - Level 0								
L00: F-12_LKD	4	50.58	✓	✓	✓		✓	✓

10 Appendix B – Sunlight Exposure Results

10.1 Sunlight Exposure Results

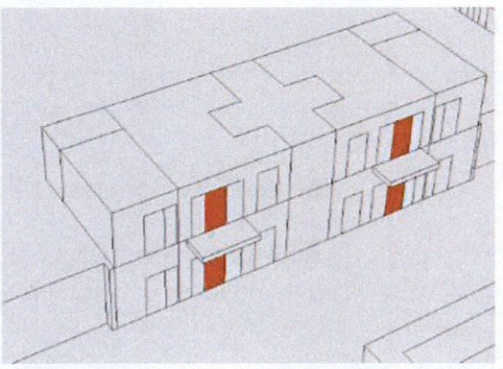
The IS EN 17037:2018 (BRE Guide 3rd Edition) sunlight exposure results tabulated in Section 8.2 for the additional 13 apartments within the proposed development are visually represented in the following images. The windows highlighted in "red" achieve the minimum 1.5 hours of recommended sunlight on March 21st, while the windows highlighted in "blue" do not achieve the recommended value.

10.1.1 View 01 – Block A



Receives more than 1.5 hours of sunlight

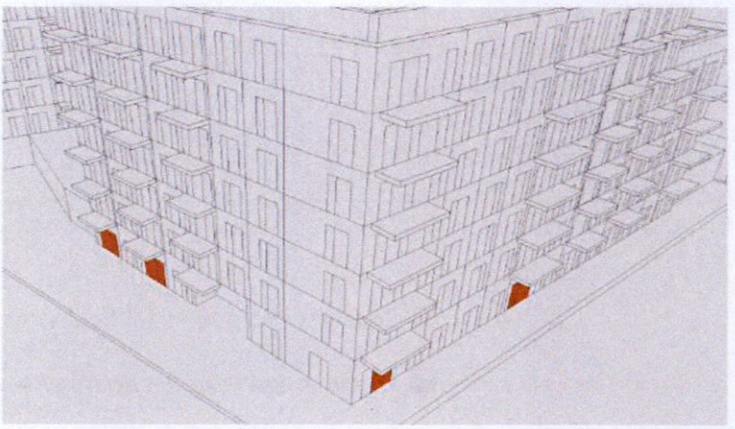
Receives less than 1.5 hours of sunlight



4 out of 4 windows passing

10.1.2 View 02 – Block B-D

	Receives more than 1.5 hours of sunlight Receives less than 1.5 hours of sunlight

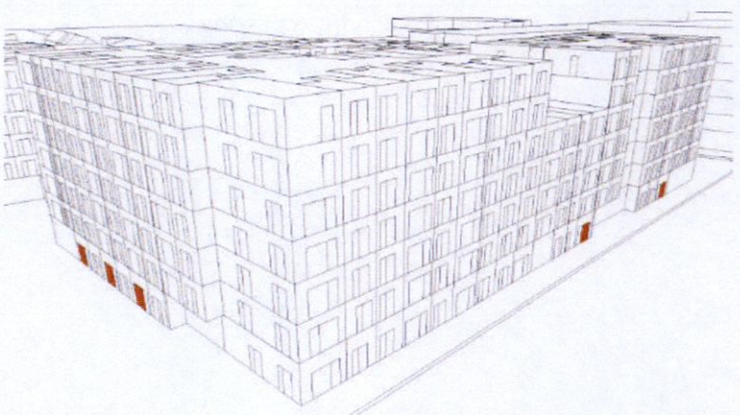


4 out of 4 windows passing

10.1.3 View 03 – Block E-F

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight



5 out of 5 windows passing