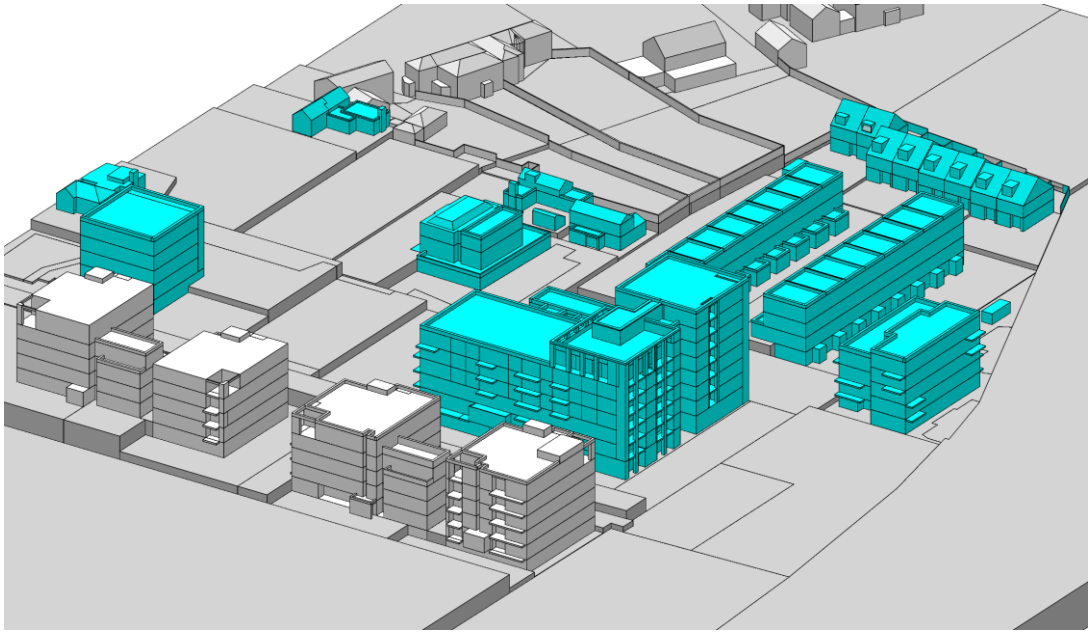
Knockrabo Phase 2 - LRD

Daylight, Sunlight and Overshadowing Study



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As part of his remit Douglas has been leading the management and delivery of daylight simulation analysis with a focus on supporting design teams to optimise designs and submit for planning applications for large scale projects across UK & Ireland.

Projects that the team have assessed previously include Parkside and St Joseph's in Dublin, Rahoon in Galway and the Railyard in Cork.

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1 Executive Summary

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Knockrabo Phase 2 development located in Dublin 14, Ireland. The report focuses on measuring the daylight and sunlight impact to the existing surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

1.1 Planning Authority Guidelines

The Dun Laoghaire Rathdown County (DLRC) Development Plan 2022-2028 states the following in Section 12.3.4.2, Habitable Rooms:

"All habitable rooms within new residential units shall have access to appropriate levels of natural/daylight and ventilation. Development shall be guided by the principles of Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, in this regard. A daylight analysis will be required for all proposed developments of 50+ units, or as otherwise required by the Planning Authority. The impact of any development on existing habitable rooms should also be considered."

The same document states the following in Section 12.8.5.3, Communal Open Space – Quality:

"Communal amenity space within apartment and/or housing developments should be provided as a garden within the courtyard of a perimeter block or adjoining a linear apartment block. Designers must ensure that the heights and orientation of adjoining blocks permit adequate levels of sunlight to reach communal amenity space throughout the year in accordance with BRE 209 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice', (2011). The communal open space should be visible from, and accessible to, the maximum number of units within the proposed scheme. Inaccessible, hidden or otherwise back land communal open space, and narrow linear strips of communal open space will not be acceptable."

In the same document, Section 4.4.1.8 'Policy Objective PHP42: Building Design & Height, Appendix 5' outlines a detailed set of performance based-criteria that align with the objectives established in the Building Height Strategy (BHS):

"3. At site/building scale

a. *Proposed design should maximise access to natural daylight, ventilation and views and minimise overshadowing.*
b. *Proposal should demonstrate how it complies with quantitative performance standards on daylight and sunlight asset out in BRE guidance "Site Layout Planning for Daylight and Sunlight" (2nd Edition).*
c. *Proposal should ensure no significant adverse impact on adjoining properties by way of overlooking and/or overshadowing."*

In all criteria regarding daylight and sunlight the DLRC Development Plan refers to guidelines set out in BRE Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, which in this case refers to the BRE Guide 209, 2022 Edition (June 2022).

The Sustainable Urban Housing: Design Standards for New Apartments 2023 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."

With regards to 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 –3rd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- BS EN 17037-2018+A1-2021 – Daylight in Buildings
    - This is the UK implementation of the European EN 17037-2018+A1-2021 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.

According to the BRE 3 Guidelines presentation given by the Dun Laoghaire Rathdown consultant, Chris Shackleton, BS EN 17037-2018+A1-2021 National Annex is the appropriate assessment methodology to satisfy minimum standards of daylight provision.

- For completeness, IS EN 17037-2018+A1-2021 – Daylight in Buildings has been assessed and results included in Appendix C for information only.

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):

- **Shadow Analysis**
  - Assessed using shadow images cast at key times throughout the year, i.e. March 21st, June 21st and December 21st to determine if any overshadowing impact occurs and to what extent to any existing neighbouring dwellings in accordance with the BRE Guide (3rd Edition).
- **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 (3rd Edition).
- **Sunlight to Existing Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BRE Guide (3rd Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
  - Assessed using Solar Exposure calculations in accordance with BS EN 17037-2018+A1-2021 (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 BRE Guide (3rd Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
  - Assessed in accordance with BS EN 17037-2018+A1-2021 National Annex Method 2 (BRE Guide 3rd Edition)
  - According to the BRE 3 Guidelines presentation given by the Dun Laoghaire Rathdown consultant, Chris Shackleton, BS EN 17037-2018+A1-2021 National Annex is the appropriate assessment methodology to satisfy minimum standards of daylight provision. For completeness, IS EN 17037 non-annex results have been included in Appendix C.
  - In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.
- **View Out**
  - Assessed in accordance with BS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)
- **Glare**
  - Assessed in accordance with BS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)

The following can be concluded based on the assessments undertaken:

1.3 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

Blocks A & B of Knockrabo Apartments

Minimal additional shading visible from the proposed development during March 1400-1600, June 1800 and *December 1200-1400. No additional shading is observed from the proposed development on these neighbouring properties at any other period.

Blocks C & D of Knockrabo Apartments

No additional shading visible from the proposed development on these properties at any period throughout the year.

Existing Homes on Mount Anville Road

No additional shading visible from the proposed development on these properties at any period throughout the year.

Public Playground (North of Block F)

Additional shading visible from the proposed development in March 1000-1400 and in *December for the majority of the day. In June there is only minor overshadowing in early mornings at 1000 with the majority of overshadowing from the permitted Blocks A and B at 0800. No additional shading is observed from the proposed development on this play area at any other period and the sunlight hours assessment (section 6) highlights that the proposed paly area meets BRE recommendations and will receive adequate sunlight throughout the year.

*Overshadowing is showing in December when the sun is lower in the sky and shadows cast are much longer. Although this is the case, overshadowing is least noticeable during the winter months as there is a lot less sunlight available at this time of year and so the overall impact is vastly reduced.

Overall, the proposed development is considered to have a negligible adverse impact on the surrounding/existing properties.

The potential shading impact is quantified via the “Sunlight to Amenity Spaces” and “Daylight to Existing Buildings” sections of this report.

1.4 Sunlight to Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide (3rd Edition), 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. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the existing situation.

Existing Amenity Spaces

On March 21st 100% (6 out of 6) of the existing amenity spaces will receive similar levels of sunlight with the proposed development in place when compared to the existing situation, thus complying with the BRE recommendations. The proposed development is considered to have a negligible adverse impact on the existing amenities.

Proposed Amenity Spaces

On March 21st, 99% of the proposed public amenity areas, 95% of the communal amenity areas, 74% of the rooftop amenity area and 84% of the creche play area situated within the development site will receive at least 2 hours of sunlight over its total area. All spaces complying with the BRE recommendations. When considered individually, all amenity spaces are performing to a very high standard and exceeding the BRE Guide recommendations of a 50% target minimum.

Public Playground (North of Block F)

The Public Playground situated to the north of Block F receives at least 2 hours of sunlight across its whole area thus exceeding the BRE recommendations for sunlight across at least 50% of the area.

Private Garden Spaces

Finally, all individual private back-garden areas tested are achieving at least 2 hours of sunlight over 50% of their area on the 21st of March and complying with the BRE recommendations.

1.5 Sunlight to Existing Buildings

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place or the reduction in sunlight across the year is less than 4% with the proposed development in place.

Based on the criteria outlined in Section 3.2.9 of the BRE Guide 3rd Edition, only one of the neighbouring elevations fit the requirements to be assessed and as such the APSH assessment was not conducted for the rest of the properties to the south of the proposed development. The BRE guide (3rd Edition) notes that there should be no impact to sunlight for these properties "It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted."

Given the statement above, the surrounding dwellings adjacent to the proposed development to the south were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development.

As per Section 2.2.4 of the BRE Guide (3rd Edition), the residential dwellings located to the North of the proposed development do not need to be included in the assessment based on the height/distance rule, which states the following:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases the loss of light will be small. "

The proposed development facing these dwellings is 16.75m tall, and a typical existing ground floor window would be 1.5m above the ground. In this case, the effect on existing buildings more than 3 x (16.75 - 1.5) = 45.75 meters away need not to be analysed, and the nearest dwelling facing the development from the North is 65m away (from the project boundary, therefore more than that from the proposed development) as per the following screenshot, therefore these existing properties have been excluded from this assessment.

Only the neighbouring building to the east, the phase 1 development, required to be included within the assessment. When compared to the Existing Situation, out of the 23 no. tested points, 87% (20 no.) meet the BRE recommended values over both the annual and winter periods. It is worth noting that the 3 no. points that are below the recommendations are dual aspect and have large windows to the opposite side facing away from the development and will retain good levels of sunlight. The proposed development is considered to have a negligible adverse impact on the surrounding/existing properties.

1.6 Sunlight to Proposed Development

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 considers the orientation of the rooms the following should be noted from section 3.1.11 of the guide.

"The BS EN 17037 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 113 no. points tested in the apartment blocks, 87% (98 no.) meet the BRE Guide 3rd Edition / BS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Of the 40 no. points tested in the houses and duplexes, 100% (40 no.) meet the BRE Guide 3rd / BS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Where windows do not meet this recommendation, this is predominantly as a result of their orientation, or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building in particular, 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 that is constrained by the site orientation, 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).

Overall, the sunlight provision results to the proposed development in accordance with BS EN 17037:23018 are considered very good due to the fact that not all living rooms can face south and the inclusion of balconies.

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

1.7 Daylight to Existing Buildings

This study considers the Proposed Scheme and tests if the VSC results are greater than 27% or not less than 0.8 times the value of the Existing Situation.

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (2nd and 3rd Editions), only the neighbouring buildings (From existing Phase 1 to the east) required to be assessed as the rest of the properties to the south of the proposed development did not meet the criterion as laid out within the BRE guide which is as follows.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

As outlined above, the daylight impact will be unnoticeable to the other neighbouring building occupants situated to the south of the proposed development.

With regards to those residential dwellings located to the North of the proposed development, as per Section 2.2.4 of the BRE Guide (3rd Edition), they do not need to be included in the assessment based on the height/distance rule, which states the following:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases the loss of light will be small. "

The proposed development facing these dwellings is 16.75m tall, and a typical existing ground floor window would be 1.5m above the ground. In this case, the effect on existing buildings more than 3 x (16.75 - 1.5) = 45.75 meters away need not to be analysed, and the nearest dwelling facing the development from the North is 65m away (from the project boundary, therefore more than that from the proposed development) as per the following screenshot, therefore these existing properties have been excluded from this assessment.

The Existing Phase 1 buildings have been included in the Internal Daylight Assessment in Section 10 of this report.

1.8 Existing Phase 1 – Internal Daylight

The purpose of the daylight calculations is to quantify the overall percentage of units which exceeds the BRE recommendations under the BS EN–17037 and the BS 8206-2:2008 standards. This illustrates the impact of the proposed development on the neighbouring Blocks A, B, C, and D of Knockrabo Phase 1. To note the previous BS 8206 standard assessment have been included to allow comparison to the results that would have been conducted at the time of design. Although true a before and after analysis has also been included.

It can be concluded that the proposed development has a negligible adverse impact on the existing units in Block C & D as only 1 room out of 42 rooms tested under the BS 8206-22008 standard has a resultant ADF below the BRE recommended guidelines with the proposed development in place. Under the BS EN - 17037 standard, all rooms meet the daylight recommendations with the proposed development in place.

Individual room results under the IS EN – 17037 Standard can be viewed in Appendix C for information only.

1.9 Daylight to Proposed Development

For the daylight to proposed development assessment, one standard has been analysed: BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition). For completeness, IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition) non-annex results have been included in Appendix C for information only.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.3 or Table NA.1 of BS EN 17037-2018+A1-2021 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). 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 NA.1 (refer to Section 10.1.2 of this report). 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 of the standard, 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 NA.1 of BS EN 17037-2018+A1-2021.

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.

BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 National Annex

In the UK, EN 17037-2018+A1-2021 was adopted to form "BS EN 17037-2018+A1-2021". A National Annex 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."

BS EN 17037-2018+A1-2021 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 11.1 of this report). 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.

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 were assessed using a 200 lux target illuminance (E_T).

Across the proposed development, 98% of the tested spaces within the apartment blocks, 100% of the tested spaces in the houses and 100% of the tested spaces in the duplexes within the proposed development are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037-2018+A1-2021 using Method 2.

Compensatory Measures

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments 2023, 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.

The inclusion of the design solutions produced a high standard of daylight results under BS-EN 17037-2018+A1-2021 using Method 2, 95% for the tested spaces in the apartment blocks and 95% for the sampled houses and duplexes.

In addition to this, design features have been incorporated into the development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. These design features again help to balance off and compensate the lower levels of daylight measured in the applicable spaces and are summarised as follows:

- 80% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (2023). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 59.8% of the apartment units are dual aspect which is above the 50% minimum requirement as required by the Design Standards (2023). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- The proposed scheme provides 1,323sq.m of communal amenity space, thus exceeding the 982sq.m required pursuant to the Design Standards (2023)

In addition to this, specific compensatory measures for each space below the recommendations can be found in the table within Appendix A Section 13.2.

1.10 View Out

The View Out assessment is related to buildings such as offices or schools where seating layouts are typically fixed compared to domestic settings where an occupant can move around the space freely. In their own home occupants can choose to sit near to or even at a window which will inevitably provide the varying layers of a 'View Out' such as the ground, landscape or sky. This ability to choose their position within a domestic setting means they would always have access to a position in the apartment with the minimum requirements of 'View Out'. Therefore, all the properties would meet the minimum requirement as outlined in BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition).

1.11 Glare

As outlined in BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition), a Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

1.12 Observations

The Dun Laoghaire Rathdown County (DLRC) Development Plan 2022-2028 states the following in Section 12.3.4.2, Habitable Rooms:

"All habitable rooms within new residential units shall have access to appropriate levels of natural/daylight and ventilation. Development shall be guided by the principles of Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, in this regard. A daylight analysis will be required for all proposed developments of 50+ units, or as otherwise required by the Planning Authority. The impact of any development on existing habitable rooms should also be considered."

The same document also states the following in Section 12.8.5.3, Communal Open Space – Quality:

"Communal amenity space within apartment and/or housing developments should be provided as a garden within the courtyard of a perimeter block or adjoining a linear apartment block. Designers must ensure that the heights and orientation of adjoining blocks permit adequate levels of sunlight to reach communal amenity space throughout the year in accordance with BRE 209 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice', (2011). The communal open space should be visible from, and accessible to, the maximum number of units within the proposed scheme. Inaccessible, hidden or otherwise back land communal open space, and narrow linear strips of communal open space will not be acceptable."

Finally, Section 4.4.1.8 'Policy Objective PHP42: Building Design & Height, Appendix 5' outlines a detailed set of performance based-criteria that align with the objectives established in the Building Height Strategy (BHS):

"3. At site/building scale

a. *Proposed design should maximise access to natural daylight, ventilation and views and minimise overshadowing.*
b. *Proposal should demonstrate how it complies with quantitative performance standards on daylight and sunlight asset out in BRE guidance "Site Layout Planning for Daylight and Sunlight" (2nd Edition).*
c. *Proposal should ensure no significant adverse impact on adjoining properties by way of overlooking and/or overshadowing."*

In all criteria regarding daylight and sunlight the DLRC Development Plan refers to guidelines set out in BRE Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, which in this case refers to the BRE Guide 209, 2022 Edition (June 2022).

It is important to note that the recommendations within the BRE Guide (3rd Edition) 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 (3rd Edition), 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.

In addition, BRE Guide 3rd Edition also notes:

"This report is a comprehensive revision of the 2011 edition of Site layout planning for daylight and sunlight: a guide to good practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide 3rd Edition and BS EN 17037-2018+A1-2021 National Annex. With regards to the existing properties there is a negligible impact when considering sunlight and daylight as a result of the proposed development and the proposed development itself performs very well with the same regard.

2 Introduction

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Knockrabo Phase 2 development located in Dublin 14, Ireland. The report focuses on measuring the daylight and sunlight impact to the existing surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

2.1 Development Description

Knockrabo Investments DAC intend to apply for permission for a Large-scale Residential Development (for a period of 7 years) with a total application site area of c. 2.54 hectares, at Knockrabo, Mount Anville Road, Goatstown, Dublin 14. The proposed development relates to Phase 2 of the development on the 'Knockrabo' lands. Phase 1 of 'Knockrabo' was granted under Dún Laoghaire-Rathdown County Council (DLRCC) Reg. Ref. D13A/0689/An Bord Pleanála (ABP) Ref. PL06D.243799 and DLRCC Reg. Ref. D16A/0821 (Phase 1) and DLRCC Reg. Ref. D16A/0960 (Phase 1A) and comprises a total of 119 No. units.

The site is bounded to the south-east by Mount Anville Road; to the south by 'Mount Anville Lodge' and by the rear boundaries of 'Thendara' (a Protected Structure – RPS Ref. 812), 'The Garth' (a Protected Structure – RPS Ref. 819), 'Chimes', 'Hollywood House' (a Protected Structure – RPS Ref. 829); to the south-west by existing allotments; to the north by the reservation corridor for the Dublin Eastern By-Pass (DEBP); and to the east by the site of residential development 'Knockrabo' (Phase 1, permitted under DLRCC Reg. Ref. D13A/0689 / An Bord Pleanála (ABP) Ref. PL.06D.243799 and DLRCC Reg. Ref. D16A/0821 (Phase 1); and DLRCC Reg. Ref. D16A/0960 (Phase 1A)). The site includes 'Cedar Mount' (a Protected Structure- RPS Ref. 783), 'Knockrabo Gate Lodge (West)' (a Protected Structure RPS Ref. 796), including Entrance Gates and Piers.

The development with total of c.17,312.2 sq.m. gross internal area (GIA) will consist of the construction of 158 No. residential units (12 No. houses and 146 No. apartments (35 No. 1 beds, 81 No. 2 beds, 3 No. 3 beds and 27 No. 3 bed duplex units), a childcare facility (c.400 sq.m. GIA) and Community / Leisure Uses (c. 223 sq.m. GIA), as follows:

- Block E (c.1,077 sq.m. GIA): a 5-storey including semi-basement podium level apartment block, comprising 8 No. apartments (1 No. 1 bed and 7 No. 2 beds);
- Block F: (c.8,390.8 sq.m. GIA): a part 2 to part 8 storeys including semi basement podium apartment block, comprising 84 No. units (31 No. 1 beds, 50 No. 2 beds and 3 No. 3 bed duplex units);
- Block G: (c.2,022.1 sqm GIA): a part 4 to part 5-storey apartment block, comprising 20 No. units (3 No. 1 bed units, 14 No. 2 bed units and 3 No. 3 bed units);
  (with sedum roof/PV panels at roof level of Blocks E, F and G; a communal Roof Terrace of c. 198 sqm on Block F; and balconies/wintergardens on all elevations of Blocks E, F and G);
- Duplex Blocks: (c. 3,292.6 sqm GIA): 1 No. 3 storey and 1 No. 4 storey block, comprising a total of 32 No. units (8 No. 2 bed units and 24 No. 3 bed duplex units);
- 10 No. (new build) houses: 6 No. 4 bed 2.5-3 storey terraced/semi-detached units (ranging in size from c.162.1 sqm GIA to c.174.2 sq.m. GIA); 1 No. 3 bed 2 storey detached unit (126.2 sq.m. GIA); 1 No. 3 bed 2 storey mid terrace unit (c.127.4 sq.m. GIA); 1 No. 3 bed 2 storey end of terrace unit (c.127.9 sq.m. GIA); and 1 No. 1 - 2 storey 'Gate House' (c. 122.6 sq.m. GIA) to the west of proposed repositioned entrance to Cedar Mount from Mount Anville Road;
- The use of existing 'Coach House' as a residential dwelling and for internal / external repair / refurbishment works at ground and first floor levels, including the removal of 3 No. roof lights, 1 No. metal clad dormer roof window and external water tank; the construction of 2 No. single storey flat roof extensions (c.35.5 sq.m. GIA), revisions to the external facade including the addition of 1 No. new

window ope on the south facade and rendered finish to all original facades, solar panels at roof level; removal / re-use of stone to form new garden wall; to provide 1 No. 2 bed house (c. 99.5 sq.m. GIA) with refurbished stone shed (c. 13.9 sq.m. for storage GIA).

- The use of Knockrabo Gate Lodge (West) (a Protected Structure) as a residential dwelling; and for repair / refurbishment works including demolition of existing section of extension on top of stone boundary wall; removal of 1 No. roof light and 1 No. internal partition wall; construction of replacement extension (c.77.5 sq.m. GIA) to provide 1 No. 3-bed unit (c. 128 sq.m. GIA) with solar panels at roof level, bin storage, landscaping, all repair works to the existing Gate and Piers, and all associated internal and external elevational changes.
- The proposed development comprises works to Cedar Mount (a Protected Structure) to provide: 1 No. Childcare Facility at Lower Ground Floor level (c.400 sq.m. GIA) with associated external play and bin storage areas; Community / Leisure Uses at Ground Floor Level (c. 223 sq.m. GIA), comprising Gym / Studio (c.35.6 sq.m. GIA), Library / Office (c. 35.9 sq.m. GIA), Meeting room (c.28.4 sq.m. GIA) and Conservatory room (c. 21.6 sq.m. GIA); and 2 No. 2 bed apartments at 1st floor level, (c.77.6 sq.m. GIA and c.88.2 sq.m. GFA). The works to Cedar Mount to consist of:

  - At lower ground floor/ basement level, the removal of internal walls and sections of external and internal walls and access doors; insertion of openings through external and internal walls; repair of existing "loggia" (covered external corridor) on northern, north-western and north-eastern facades, with revised elevations comprising glazed panels / glazed entrance doors located within loggia opes; the additional area (c. 58 sq.m. GIA) to form part of proposed Childcare Facility;
  - At ground floor level removal of wooden staircase to 1st floor level and replacement with open-tread staircase, and construction of conservatory room (c. 21.6 sqm GIA) with flat roof on south - western side of Cedar Mount with sedum roof; removal of 1 No. WC;
  - At 1st floor level removal of sections of internal walls; insertion of doors through internal walls;
  - Re-instatement of 1 no. new chimney stack on the western end of the existing roof; replacement of rubble masonry finish with lime and sand plaster finish on all elevations relating to sections of original façade; removal of security bars from existing windows in front porch; replacement / reconfiguration of rainwater downpipes, hopper heads and associated roof outlets; Re-modelling of extension on northern side including replacement of timber / pressed metal cladding with brick / zinc cladding and glazing at ground and 1st floor levels, removal / replacement of external doors and windows; replacement of flat roof deck, parapet, eaves and roof-light with flat roof comprising brick / zinc clad parapet and removal of internal link at 1st floor level; repair works to external walls at ground floor level; Construction of rendered blockwork wall and steel handrail to terrace and associated repair works to section of existing parapet wall on eastern side of Cedar Mount; all hard and soft landscaping; revisions to garden wall and pillars on western side of Cedar Mount; and all associated internal and elevational changes; and
  - The repositioning of existing access (including gates and piers) to Cedar Mount (a Protected Structure) on Mount Anville Road to the northeast with associated works to boundary wall to Mount Anville Road.

  The development will also provide 130 No. car parking spaces consisting of 117 No. residential spaces (comprising 54 No. at podium level, 63 No. on-street and on curtilage spaces, 6 No. visitor spaces and 2 No. on-street car sharing spaces); and 5 No. non-residential spaces; provision of 366 No. bicycle parking spaces (consisting of: 288 No. residential spaces, 70 No. (residential) visitor spaces, 6 No. (non-residential) spaces and 2 No. visitor (non-residential) spaces); and 9 No. motorcycle parking spaces.

  All other ancillary site development works to facilitate construction, site services, piped infrastructure, 1 No. sub-station, plant, public lighting, bin stores, bike stores, boundary treatments, provision of public, communal and private open space areas comprising hard and soft landscaping, site services all other associated site excavation, infrastructural and site development works above and below ground. In addition to the repositioned access to Cedar Mount (a Protected Structure) as referenced above, the development will be served by the permitted access road 'Knockrabo Way' (DLRCC Reg. Ref. D13A/0689;

ABP Ref. PL.06D.243799, DLRCC Reg. Ref. D16A/0821 and DLRCC Reg. Ref. D16A/0960). The application does not impact on the future access to the Reservation for the Dublin Eastern Bypass.

3 BRE – Site Layout Planning for Daylight and Sunlight (3rd Edition)

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 3rd Edition 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 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 (3rd Edition), 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 Dun Laoghaire Rathdown County (DLRC) Development Plan 2022-2028 states the following in Section 12.3.4.2, Habitable Rooms:

"All habitable rooms within new residential units shall have access to appropriate levels of natural/daylight and ventilation. Development shall be guided by the principles of Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, in this regard. A daylight analysis will be required for all proposed developments of 50+ units, or as otherwise required by the Planning Authority. The impact of any development on existing habitable rooms should also be considered."

The same document states the following in Section 12.8.5.3, Communal Open Space – Quality:

"Communal amenity space within apartment and/or housing developments should be provided as a garden within the courtyard of a perimeter block or adjoining a linear apartment block. Designers must ensure that the heights and orientation of adjoining blocks permit adequate levels of sunlight to reach communal amenity space throughout the year in accordance with BRE 209 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice', (2011). The communal open space should be visible from, and accessible to, the maximum number of units within the proposed scheme. Inaccessible, hidden or otherwise back land communal open space, and narrow linear strips of communal open space will not be acceptable."

In the same document, Section 4.4.1.8 'Policy Objective PHP42: Building Design & Height, Appendix 5' outlines a detailed set of performance based-criteria that align with the objectives established in the Building Height Strategy (BHS):

"3. At site/building scale

- *d. Proposed design should maximise access to natural daylight, ventilation and views and minimise overshadowing.*
- *e. Proposal should demonstrate how it complies with quantitative performance standards on daylight and sunlight asset out in BRE guidance "Site Layout Planning for Daylight and Sunlight" (2nd Edition).*
- *f. Proposal should ensure no significant adverse impact on adjoining properties by way of overlooking and/or overshadowing."*

In all criteria regarding daylight and sunlight the DLRC Development Plan refers to guidelines set out in BRE Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, which in this case refers to the BRE Guide 209, 2022 Edition (June 2022).

The Sustainable Urban Housing: Design Standards for New Apartments 2023 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."

With regards to 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 –3rd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- BS EN 17037-2018+A1-2021 – Daylight in Buildings
    - This is the UK implementation of the European EN 17037-2018+A1-2021 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.

According to the BRE 3 Guidelines presentation given by the Dun Laoghaire Rathdown consultant, Chris Shackleton, BS EN 17037-2018+A1-2021 National Annex is the appropriate assessment methodology to satisfy minimum standards of daylight provision.

- For completeness and information only, IS EN 17037-2018+A1-2021 – Daylight in Buildings has been assessed and results included in Appendix C. See section 11.1.1 for further information.

Finally, the latest BRE guide 'Site Layout Planning for Daylight and Sunlight' (3rd Edition) was published in June 2022. This now directly links to the new daylighting standards EN 17037-2018+A1-2021. Aside refinements to the BRE guide, the assessments are the same to what is found within the BRE guide 2nd Edition.

Therefore, with regards to interior daylighting in particular, where different methodologies are found in each of the different standards, all have been carried out for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards.

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):

- **Shadow Analysis**
  - Assessed using shadow images cast at key times throughout the year, i.e. March 21st, June 21st and December 21st to determine if any overshadowing impact occurs and to what extent to any existing neighbouring dwellings in accordance with the BRE Guide (3rd Edition).
- **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 (3rd Edition).
- **Sunlight to Existing Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BRE Guide (3rd Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
  - Assessed using Solar Exposure calculations in accordance with BS EN 17037-2018+A1-2021 (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 BRE Guide (3rd Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
  - Assessed in accordance with BS EN 17037-2018+A1-2021 National Annex Method 2 (BRE Guide 3rd Edition)
  - According to the BRE 3 Guidelines presentation given by the Dun Laoghaire Rathdown consultant, Chris Shackleton, BS EN 17037-2018+A1-2021 National Annex is the appropriate assessment methodology to satisfy minimum standards of daylight provision. For completeness, IS EN 17037 non-annex results have been included in Appendix C.
  - In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.
- **View Out**
  - Assessed in accordance with BS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)
- **Glare**
  - Assessed in accordance with BS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)

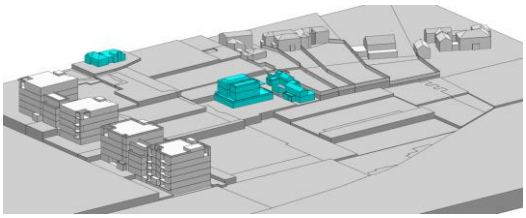
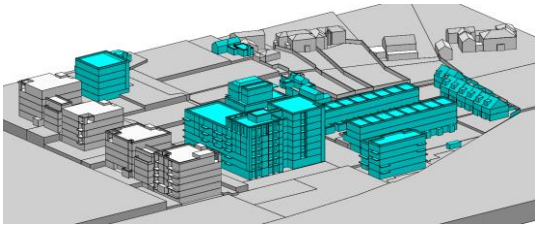
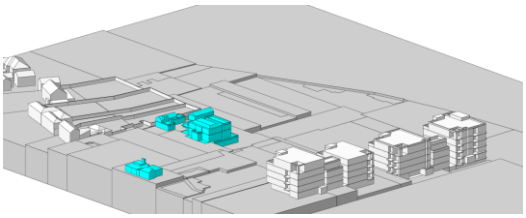
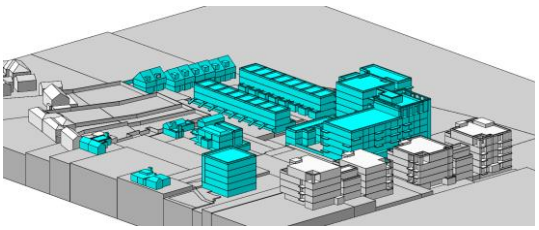
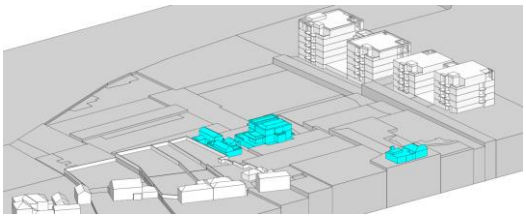
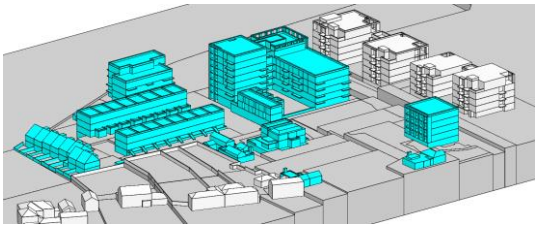
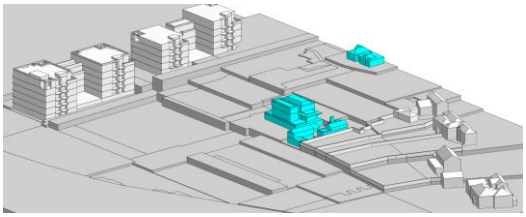
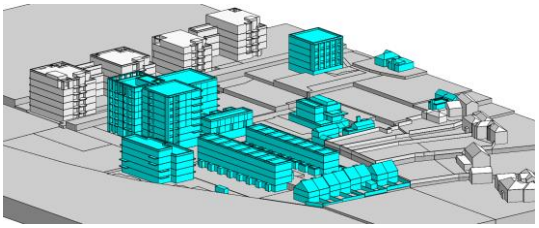
4.3 Orientation

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

Orientation	
	
	

4.4 Proposed Model

The following images illustrate the models created from the architectural information provided and the use of Google/Bing maps where information was absent.

	Existing Situation	Proposed Scheme
View looking from North of Site		
View looking from East of Site		
View looking from South of Site		
View looking from West of Site		

4.5 Potential Sensitive Receptors

To help understand the potential impact to surrounding buildings, potential sensitive receptors were identified as illustrated below.

	Proposed Site (approximate site boundary)
	Blocks A & B of Knockrabo Apartments
	Blocks C & D of Knockrabo Apartments
	Existing Houses on Mount Anville Road

*Properties to the North of the proposed Knockrabo Phase 2 development have been excluded based on the height distance rule from the BRE Guide (3rd Edition), which states the following on Section 2.2.4:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases, the loss of light will be small. "

Please refer to Section 7.5 of this report for a further detail explanation.

5 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that the sunniest months in Ireland are May and June, based on 1991-2020 averages or latest: https://www.met.ie/climate/30-year-averages.

The following can also be shown:

- During December a mean daily duration of 1.7 hours of sunlight out of a potential 7.3 hours sunlight each day is received (i.e. only 23% of potential sunlight hours).
- During June a mean daily duration of 5.8 hours of sunlight out of a potential 15.9 hours sunlight each day is received (i.e. only 36% of potential sunlight hours).

Therefore, the impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months.

According to the BRE (3rd Edition) in Section 3.3.13:

"Where there are existing buildings as well as the proposed one, 'before' and 'after' shadow plots showing the difference that the proposed building makes may be helpful. In interpreting the impact of such differences, it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected."

Section 3.3.14 states:
"If a space is used all year round, the equinox (21 March) is the best date for which to prepare shadow plots as it gives an average level of shadowing"

In Section 3.3.15:
"As an optional addition, plots for summertime (for example 21 June) may be helpful as they will show the reduced shadowing then, although it should be borne in mind that 21 June represents the best case of minimum shadow, and that shadows for the rest of the year will be longer. Conversely if winter shadows (e.g. 21 December) are plotted, even low buildings will cast long shadows."

Based on the above, and for completeness, this section will consider the shadows cast by the proposed development on the following dates:

- March 21st / September 21st (Equinox)
- June 21st (Summer Solstice)
- December 21st (Winter Solstice)

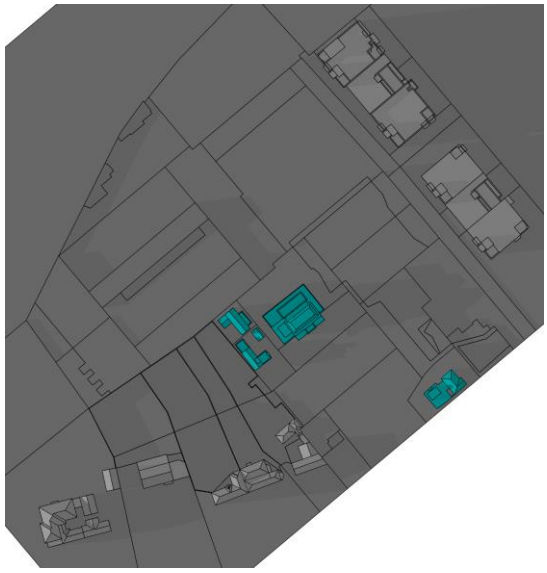
These images illustrate shadows cast for 'perfect sunny' conditions with no clouds and assumed that the sun is shining for every hour shown. Given the discussion above it is important to remember that this is not always going to be the case.

5.1 Plan View

5.1.1 March 21st

	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		

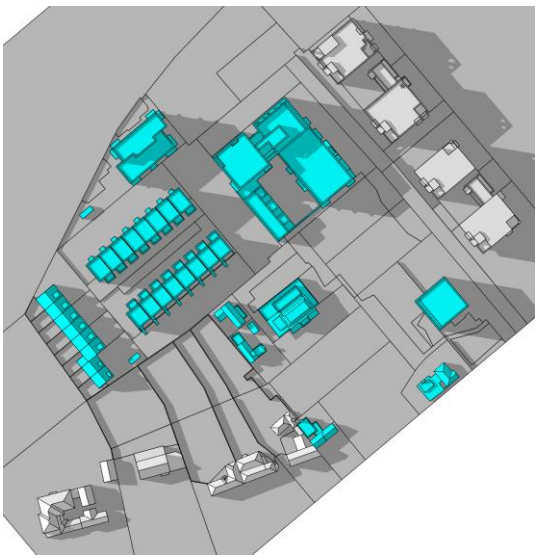
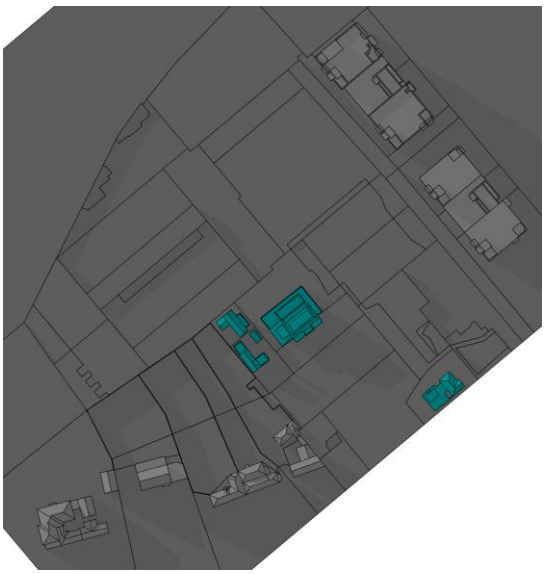
	Existing	Proposed
March 21st - 12:00		
March 21st - 14:00		
March 21st - 16:00		

	Existing	Proposed
March 21st - 18:00		

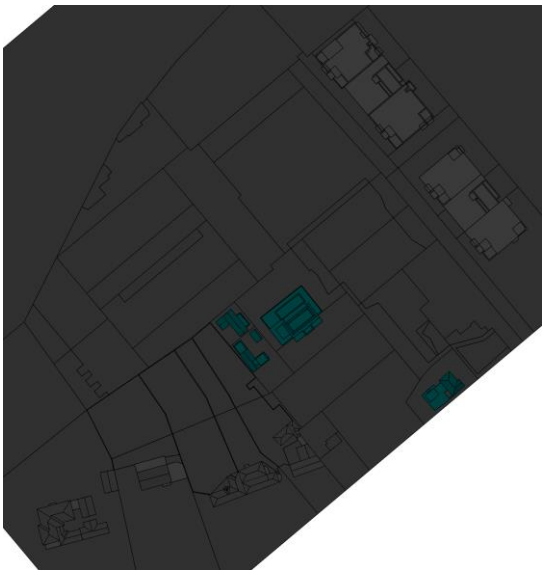
5.1.2 June 21st

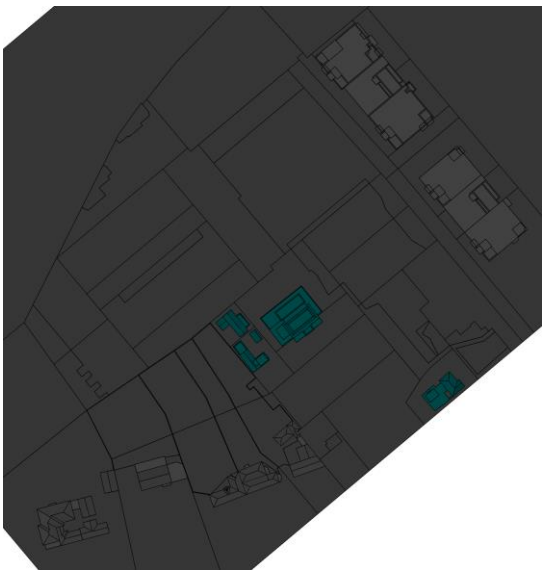
	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		

	Existing	Proposed
June 21st - 12:00		
June 21st - 14:00		
June 21st - 16:00		

	Existing	Proposed
June 21st - 18:00		
June 21st - 20:00		

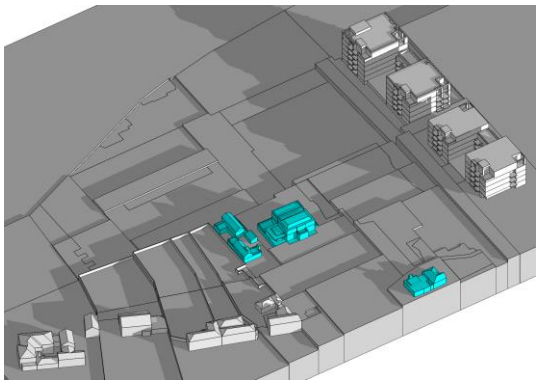
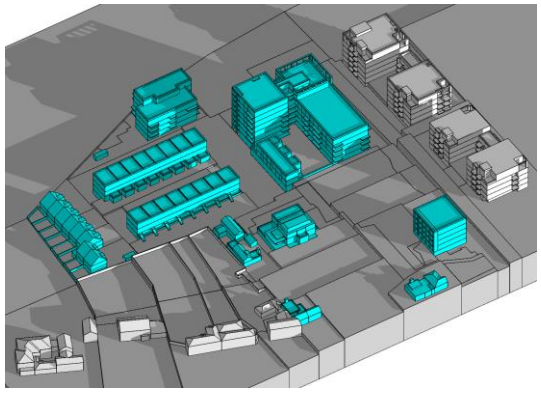
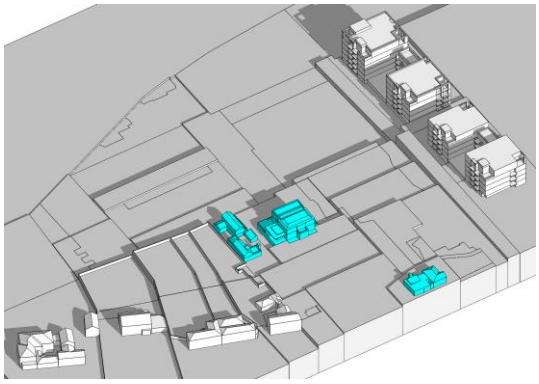
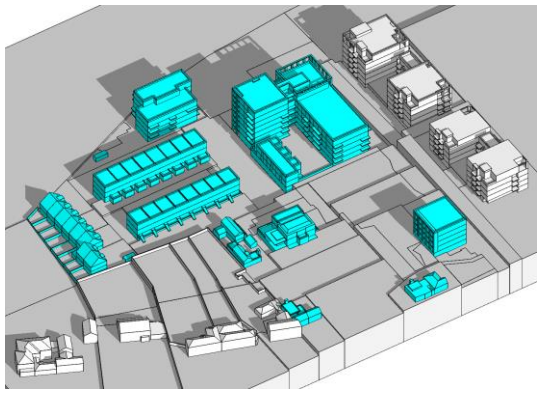
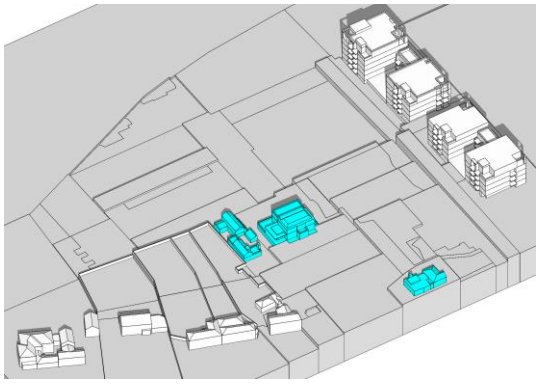
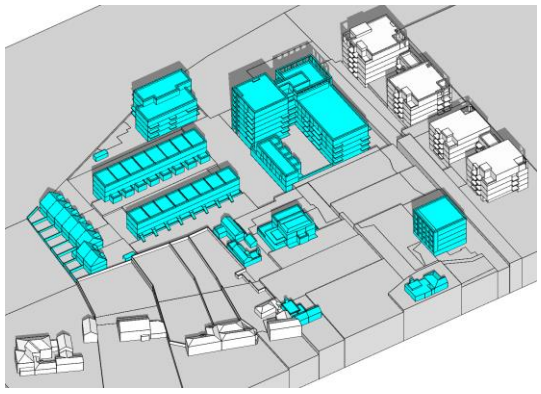
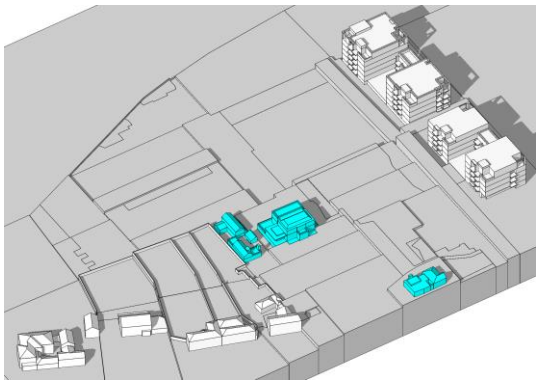
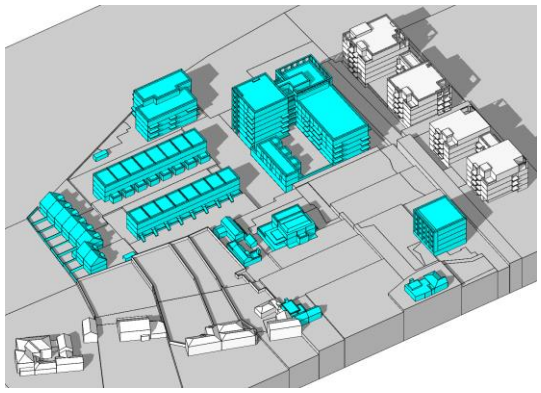
5.1.3 December 21st

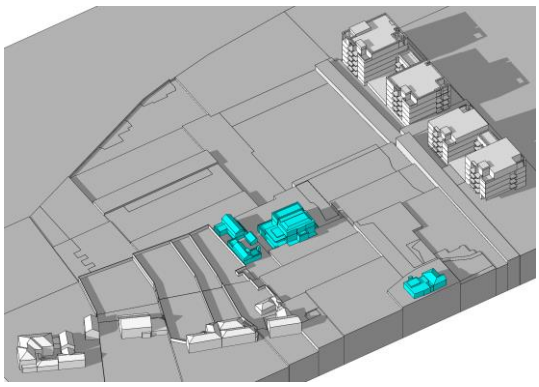
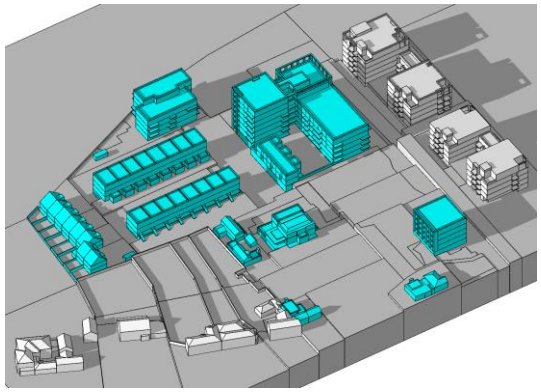
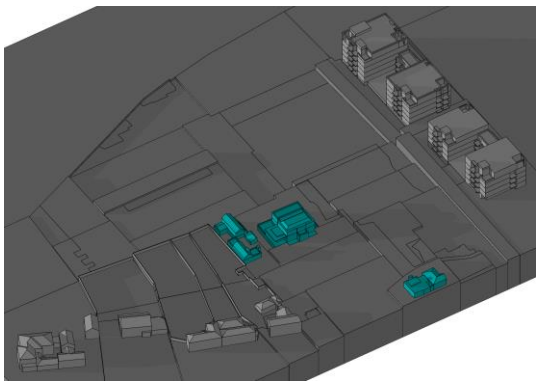
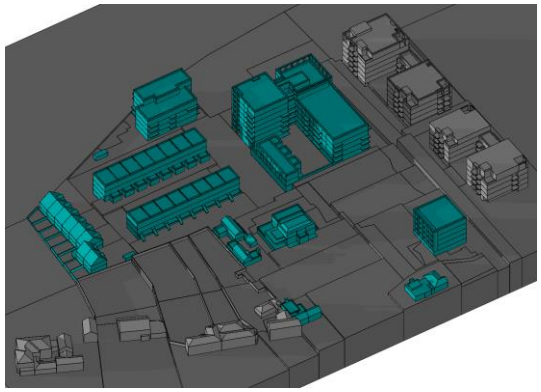
	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		

	Existing	Proposed
December 21st - 12:00		
December 21st - 14:00		
December 21st - 16:00		

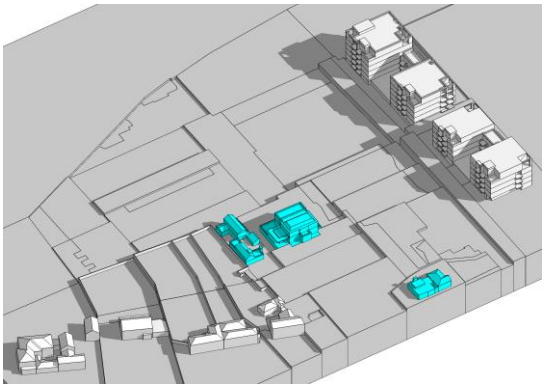
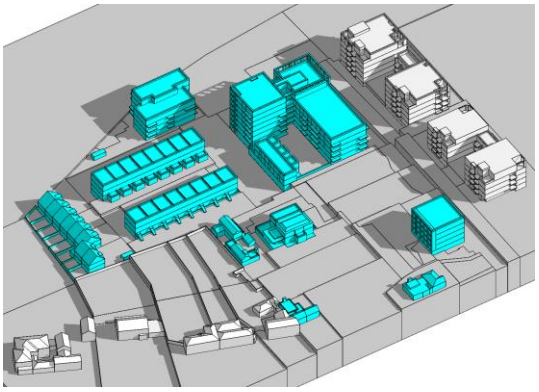
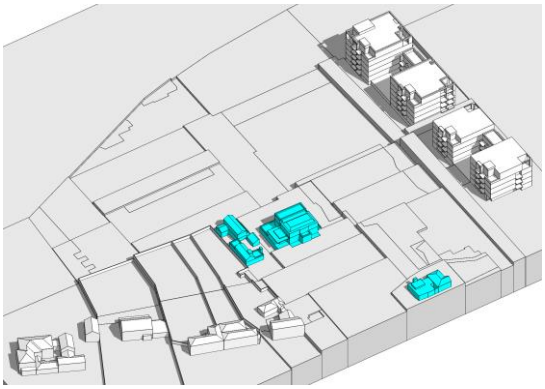
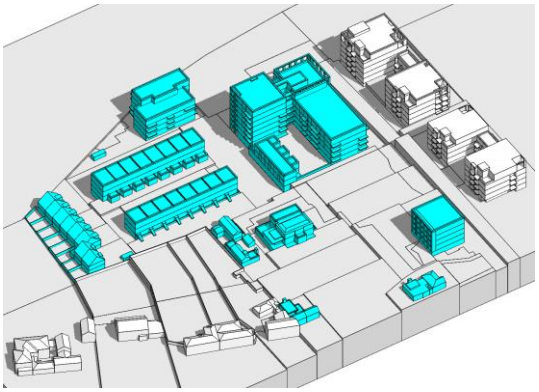
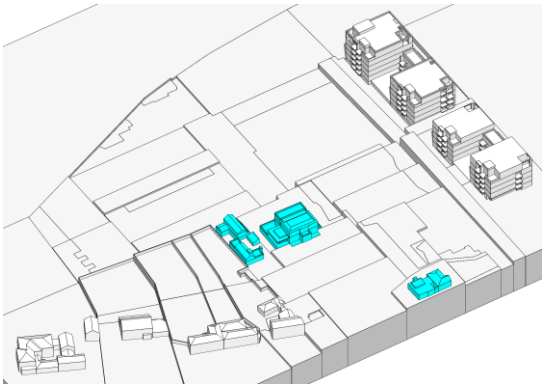
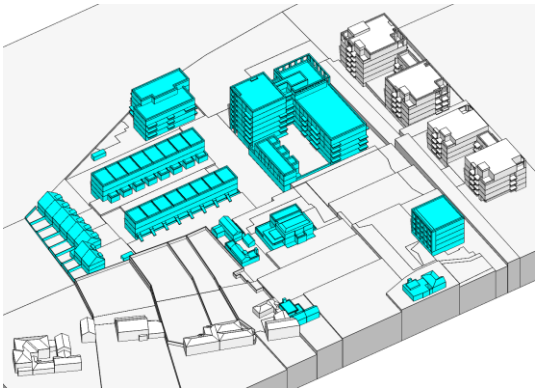
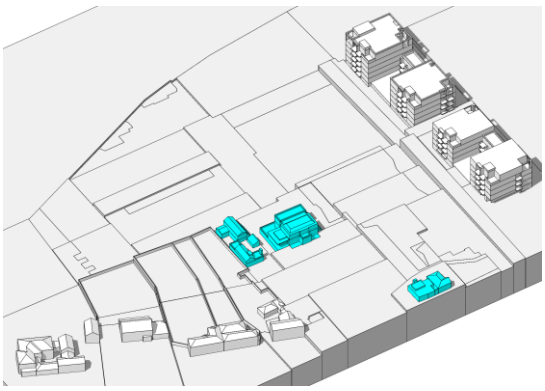
5.2 3D View

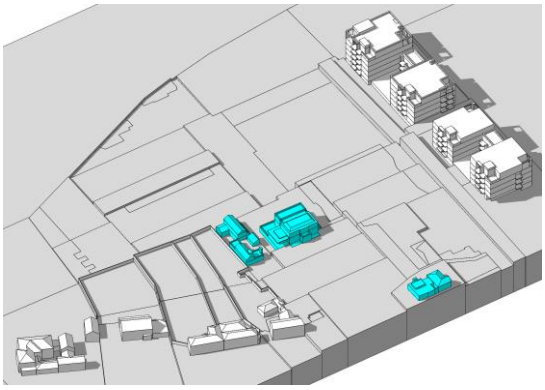
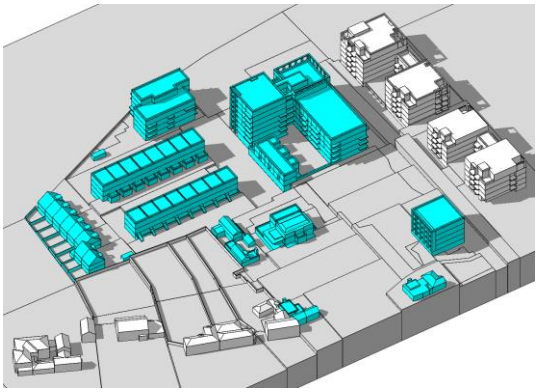
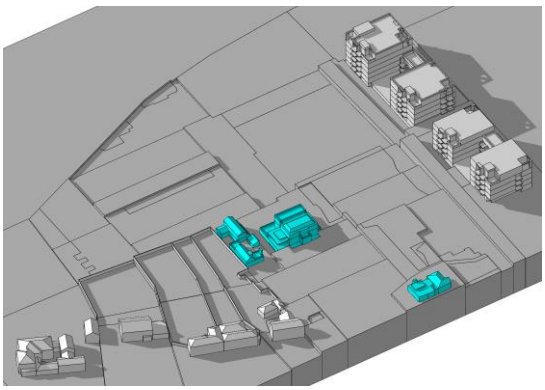
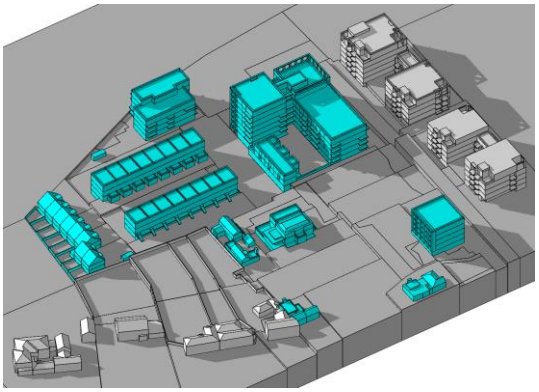
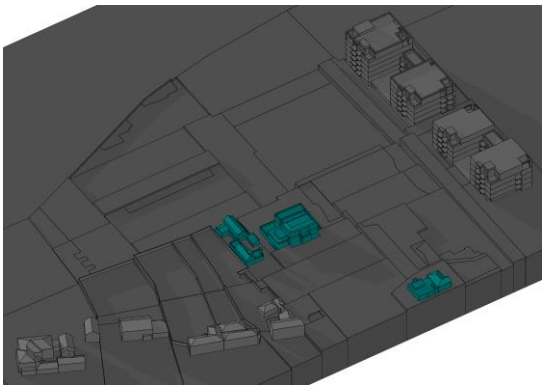
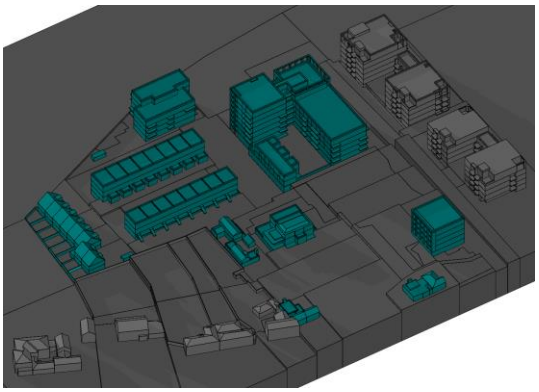
5.2.1 March 21st

	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		
March 21st - 12:00		
March 21st - 14:00		

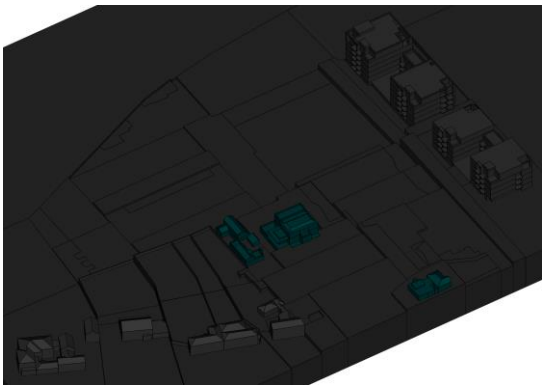
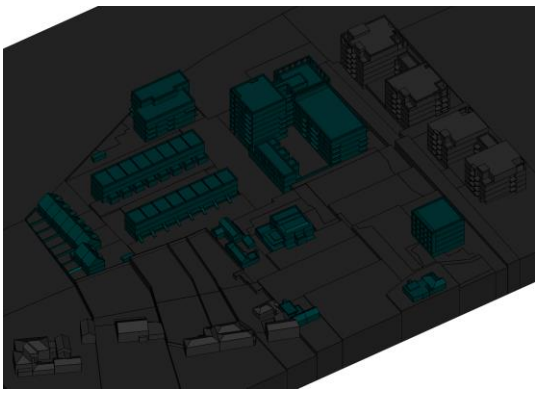
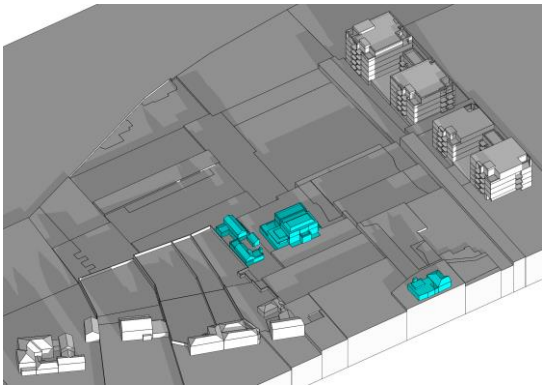
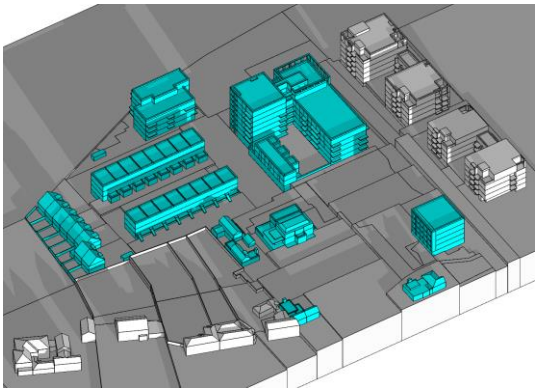
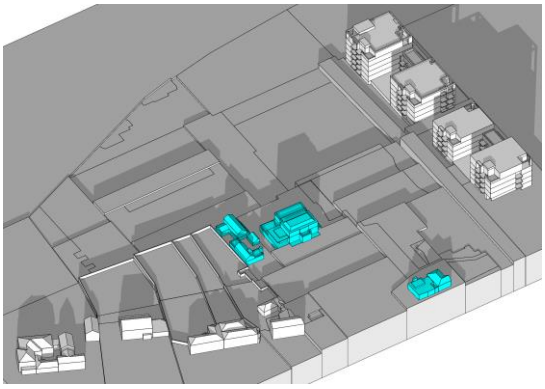
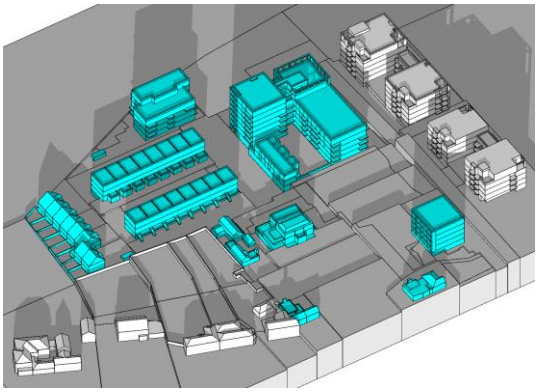
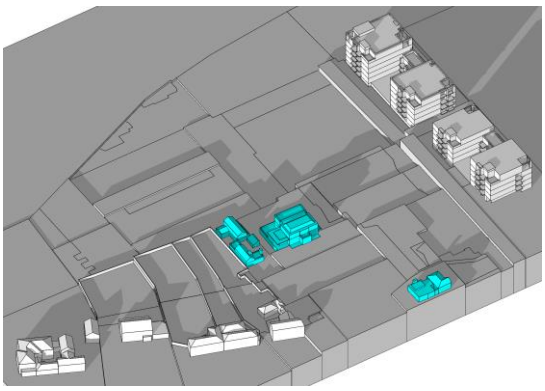
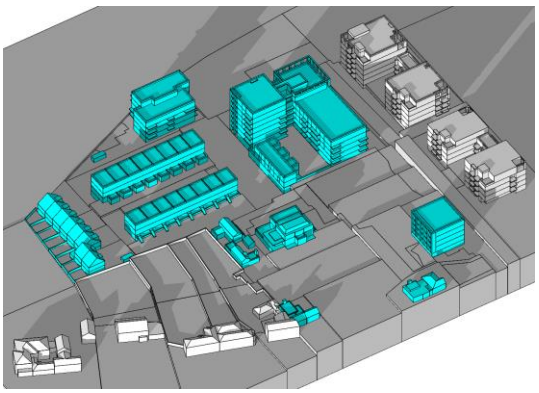
	Existing	Proposed
March 21st - 16:00		
March 21st - 18:00		

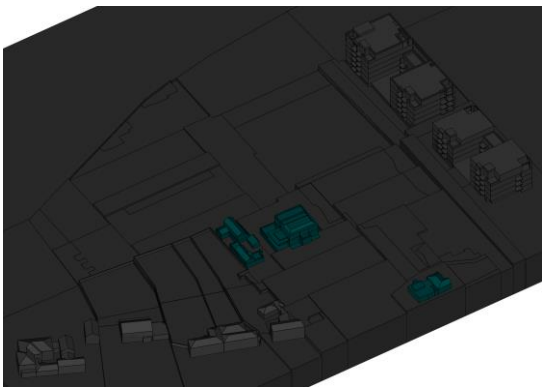
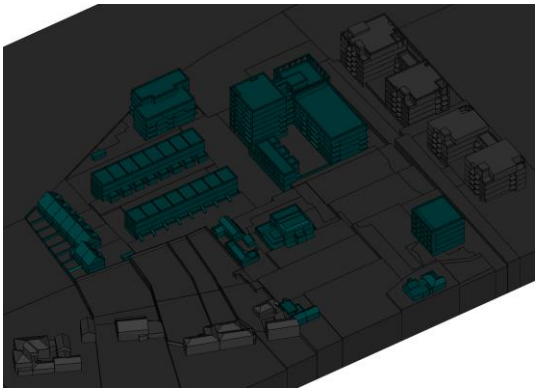
5.2.2 June 21st

	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		
June 21st - 12:00		
June 21st - 14:00		

	Existing	Proposed
June 21st - 16:00		
June 21st - 18:00		
June 21st - 20:00		

5.2.3 December 21st

	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		
December 21st - 14:00		

	Existing	Proposed
December 21st - 16:00		

5.3 Discussion

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

Blocks A & B of Knockrabo Apartments

Minimal additional shading visible from the proposed development during March 1400-1600, June 1800 and *December 1200-1400. No additional shading is observed from the proposed development on these neighbouring properties at any other period.

Blocks C & D of Knockrabo Apartments

No additional shading visible from the proposed development on these properties at any period throughout the year.

Existing Homes on Mount Anville Road

No additional shading visible from the proposed development on these properties at any period throughout the year.

Public Playground (North of Block F)

Additional shading visible from the proposed development in March 1000-1400 and in *December for the majority of the day. In June there is only minor overshadowing in early mornings at 1000 with the majority of overshadowing from the permitted Blocks A and B at 0800. No additional shading is observed from the proposed development on this play area at any other period and the sunlight hours assessment (section 6) highlights that the proposed paly area meets BRE recommendations and will receive adequate sunlight throughout the year.

*Overshadowing is showing in December when the sun is lower in the sky and shadows cast are much longer. Although this is the case, overshadowing is least noticeable during the winter months as there is a lot less sunlight available at this time of year and so the overall impact is vastly reduced.

Overall, the proposed development is considered to have a negligible adverse impact on the surrounding/existing properties.

The potential shading impact is quantified via the “Sunlight to Amenity Spaces” and “Daylight to Existing Buildings” sections of this report.

6 Sunlight to Amenity Spaces

6.1 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 (3rd Edition) 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 that can receive two hours of sun on 21 March is less than 0.80 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 (3rd Edition) 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. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the existing situation.

6.2 Existing Amenity Spaces

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

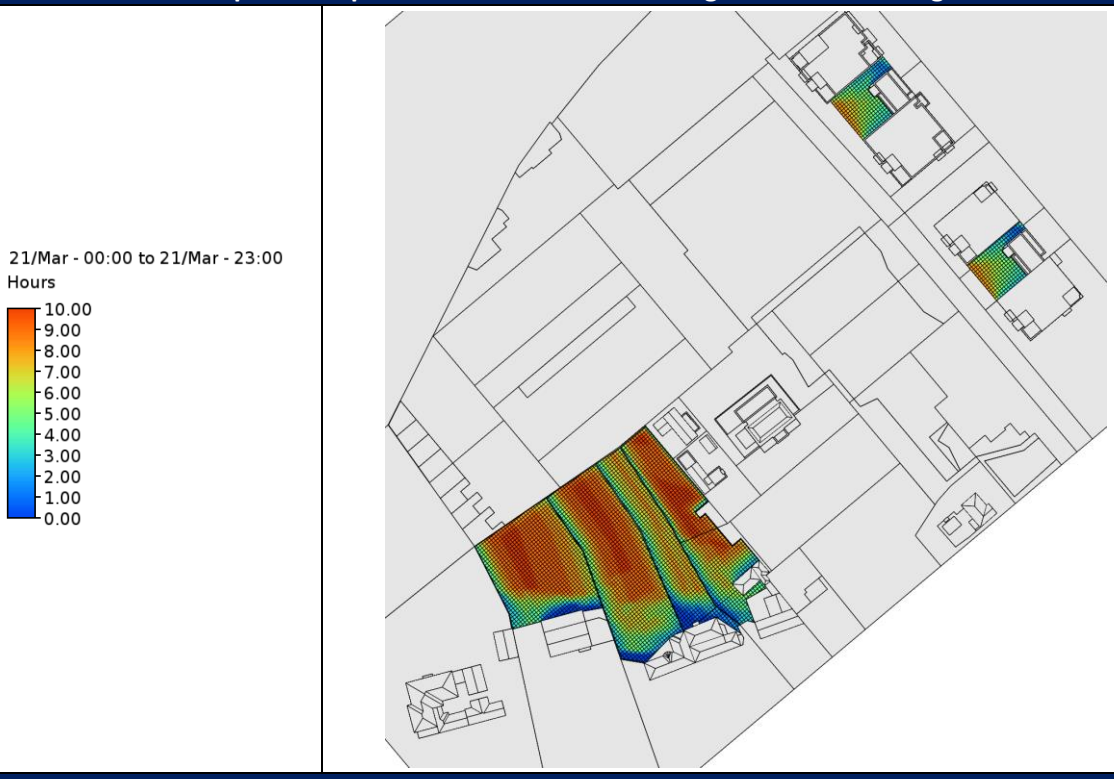
Existing Amenity Spaces

Existing Amenities

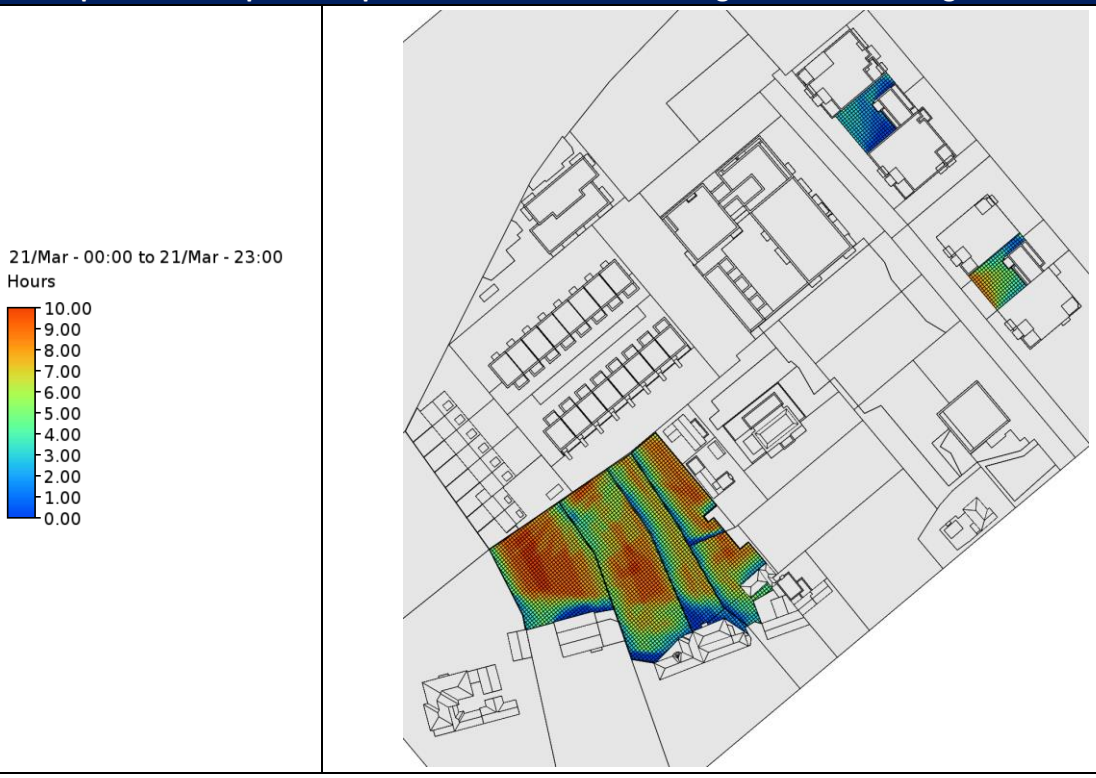
The following images illustrate the predicted results with respect to this space receiving at least 2 hours of sunlight on March 21st. Any areas that receive less than 2 hours of sunlight are colour-coded in grey.

6.2.1 Existing Amenity Spaces Results

Prior to Development in place: Absolute Scale Showing all Hours of Sunlight Received



Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received



Prior to Proposed Development in place: Hours of Sunlight > 2 Illustrated in Red	
Receives more than 2 hours of sunlight Receives less than 2 hours of sunlight	
Proposed Development in place: Hours of Sunlight > 2 Illustrated in Red	
Receives more than 2 hours of sunlight Receives less than 2 hours of sunlight	

6.2.2 Existing Amenity Results

Existing Amenity Results

Ref	Area (m^2)	Existing Area >2 hrs		Existing Area with Proposed Development in Place >2 hrs		Proposed vs Existing (%)	Comment
		(m^2)	(%)	(m^2)	(%)		
1	1,075	1,024	95%	1,024	95%	100%	✓
2	1,335	1,286	96%	1,286	96%	100%	✓
3	699	595	85%	595	85%	100%	✓
4	997	958	96%	958	96%	100%	✓
5	230	214	93%	134	58%	63%	✓
6	263	247	94%	247	94%	100%	✓

6.3 Proposed Amenity Spaces

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

Proposed Amenity Spaces

Proposed Public Open Space

Proposed Rooftop Amenities

Proposed Communal Amenities

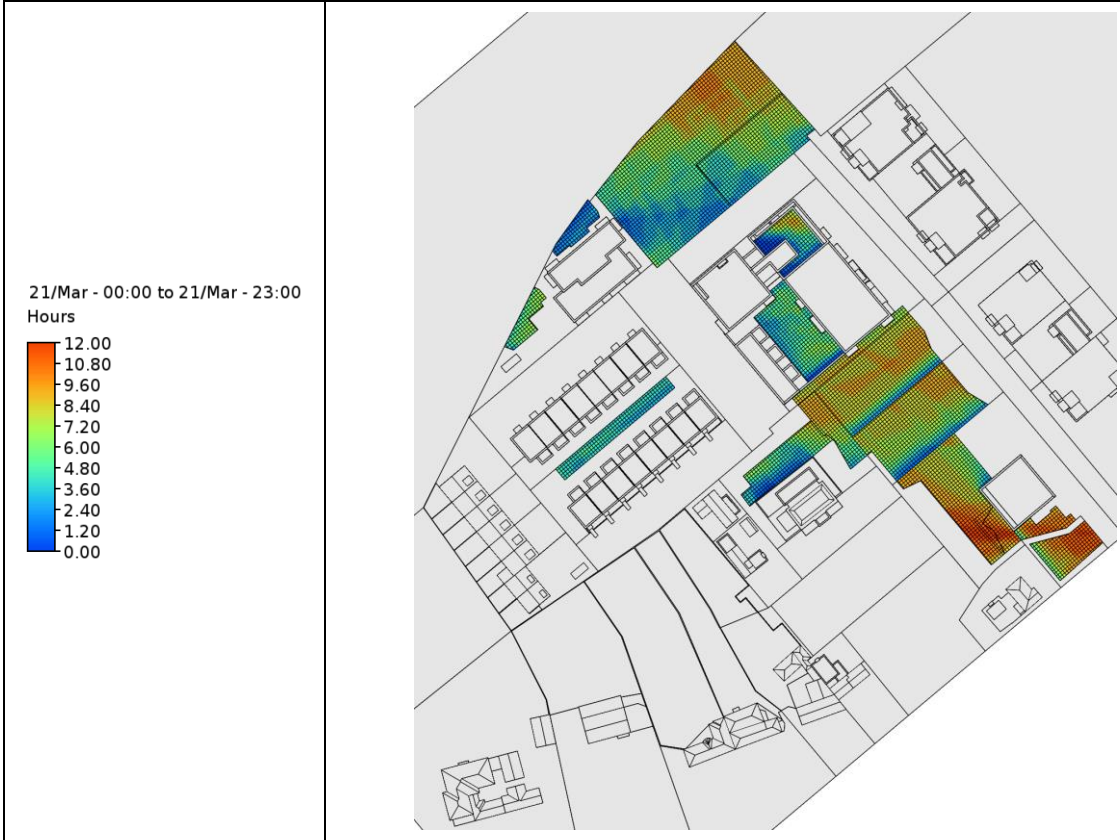
Proposed Back-Gardens

Creche Play Area

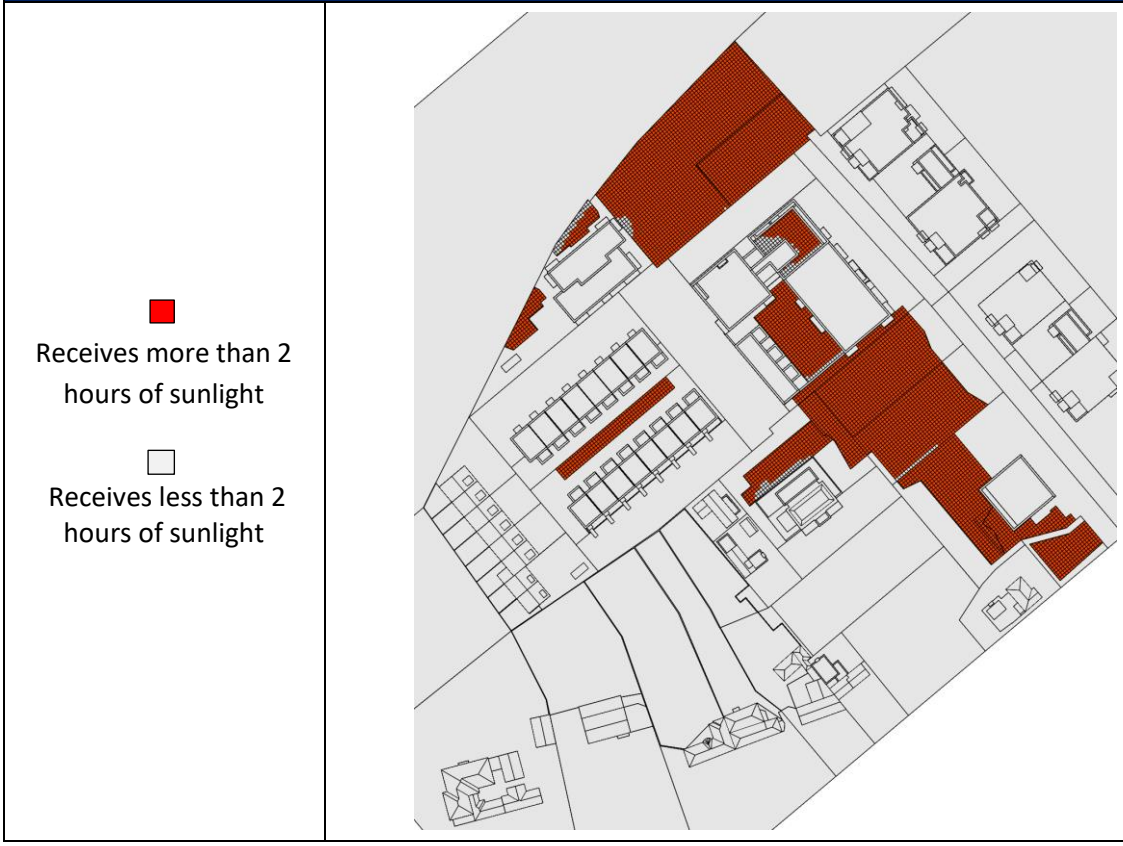
The following images illustrate the predicted results with respect to this space receiving at least 2 hours of sunlight on March 21st. Any areas that receive less than 2 hours of sunlight are colour-coded in grey.

6.3.1 Proposed Public and Communal Amenity Space Results

Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received

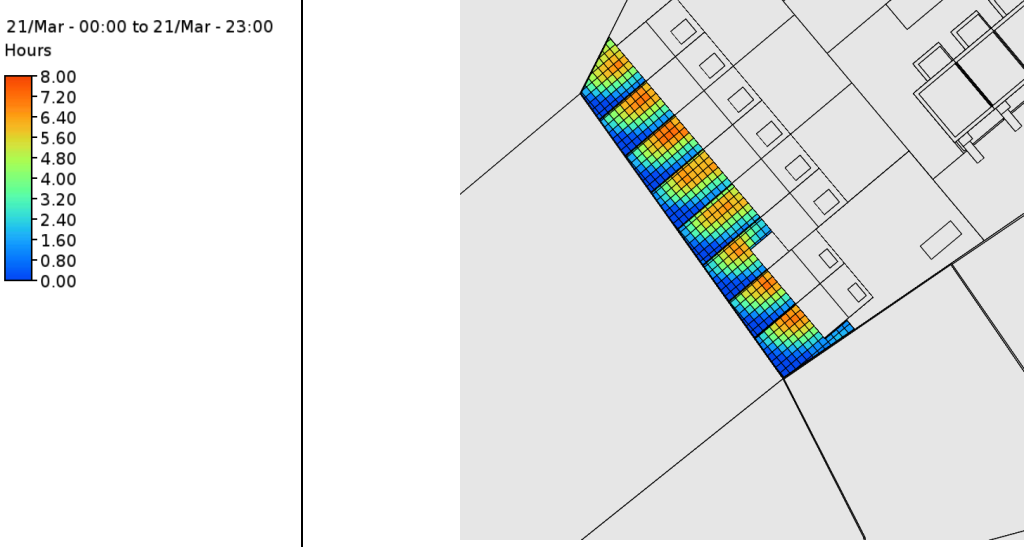


Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received

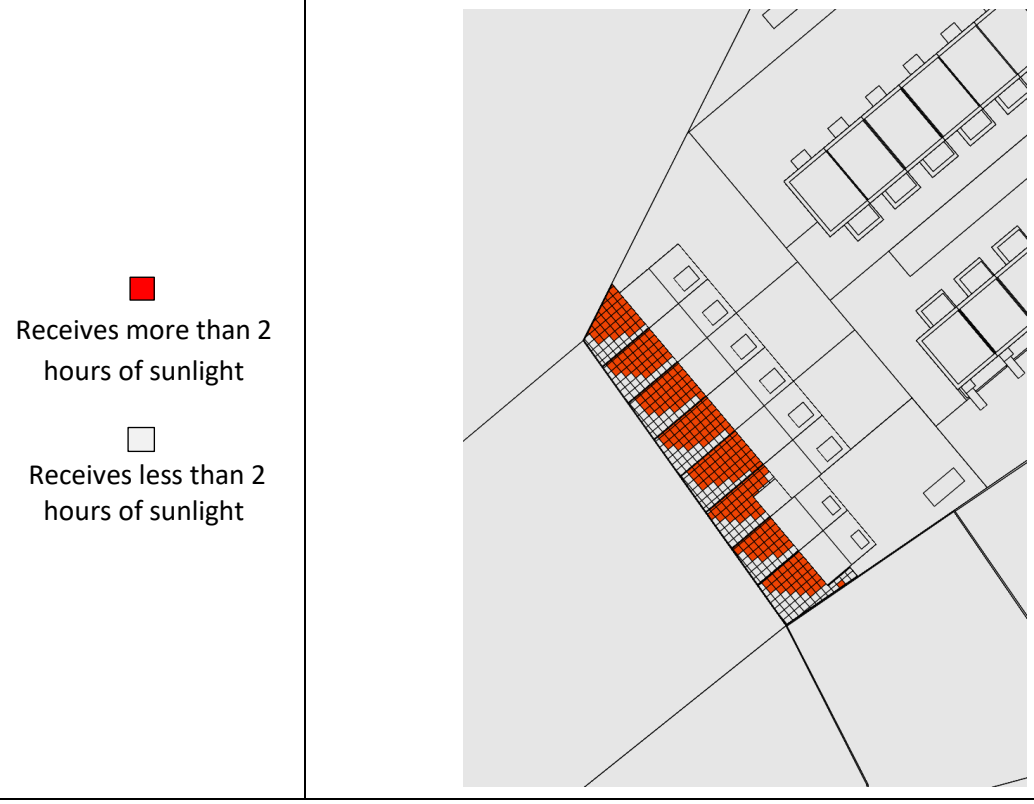


6.3.2 Proposed Private Gardens Amenity Space Results

Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received



Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received



6.3.3 Proposed Amenity Results

Proposed Communal Amenity Results	
Proposed Public Open Space Proposed Rooftop Amenities Proposed Communal Amenities Proposed Back-Gardens Creche Play Area	

Public Open Spaces

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
1 (POS)	101	65	64%	✓
2 (POS)	1,805	1,788	99%	✓
3 (POS – Playground)	640	640	100%	✓
4 (POS)	5,103	5,085	99%	✓
5 (POS)	255	255	100%	✓
Total Public Open Spaces	**7,904**	**7,833**	**99%**	✓

Rooftop Amenities

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
6 (Rooftop Amenity)	200	148	74%	✓
Total Rooftop Amenities	**200**	**148**	**74%**	✓

Communal Open Spaces

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
7 (COS)	237	237	100%	✓
8 (COS)	221	221	100%	✓
9 (COS)	374	322	86%	✓
10 (COS)	177	177	100%	✓
Total Communal Open Spaces	**1,009**	**957**	**95%**	✓

Private Back-Garden Amenities

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
11 (Private)	57	35	61%	✓
12 (Private)	57	35	61%	✓
13 (Private)	58	40	69%	✓
14 (Private)	60	35	58%	✓
15 (Private)	62	44	71%	✓
16 (Private)	50	34	68%	✓
17 (Private)	47	27	57%	✓
18 (Private)	64	33	52%	✓

Creche Play Area

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
19 (Creche Play Area)	274	230	84%	✓
Total Creche Play Area	**274**	**230**	**84%**	✓

6.4 Discussion

As outlined in Section 3.3.17 of the BRE Guide (3rd Edition), 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. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the existing situation.

Existing Amenity Spaces

On March 21st 100% (6 out of 6) of the existing amenity spaces will receive similar levels of sunlight with the proposed development in place when compared to the existing situation, thus complying with the BRE recommendations. The proposed development is considered to have a negligible adverse impact on the existing amenities.

Proposed Amenity Spaces

On March 21st, 99% of the proposed public amenity areas, 95% of the communal amenity areas, 74% of the rooftop amenity area and 84% of the creche play area situated within the development site will receive at least 2 hours of sunlight over its total area. All spaces complying with the BRE recommendations. When considered individually, all amenity spaces are performing to a very high standard and exceeding the BRE Guide recommendations.

Public Playground (North of Block F)

The Public Playground situated to the north of Block F receives at least 2 hours of sunlight across its whole area thus exceeding the BRE recommendations for sunlight across at least 50% of the area.

Private Garden Spaces

Finally, all individual private back-garden areas tested are achieving at least 2 hours of sunlight over 50% of their area on the 21st of March and complying with the BRE recommendations.

7 Sunlight to Existing Buildings

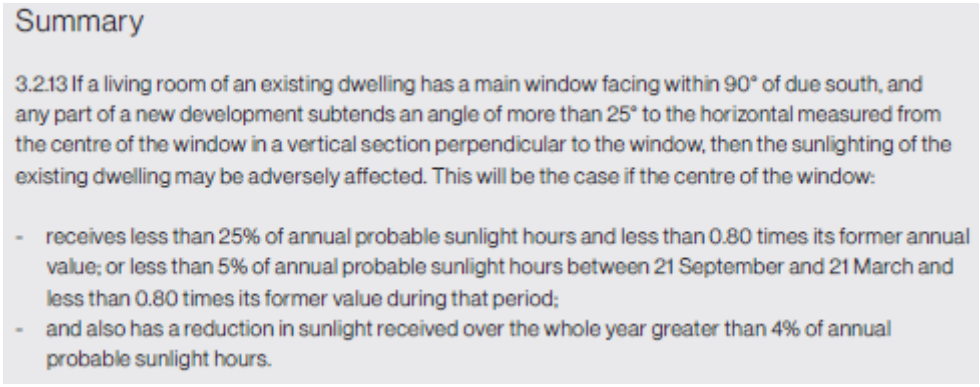
7.1 Guidance – BRE Guide (3rd Edition)

The BRE Guide (3rd Edition) states 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 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, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

If the available sunlight hours are both less than the amount given and less than 0.8 times their former value, either over the whole year or just during the winter months (21st September to 21st March) and reduction in sunlight across the year has a greater reduction than 4%, then the occupants of the existing building will notice the loss of sunlight.



Summary

3.2.13 If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:

- receives less than 25% of annual probable sunlight hours and less than 0.80 times its former annual value; or less than 5% of annual probable sunlight hours between 21 September and 21 March and less than 0.80 times its former value during that period;
- and also has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

BRE 3rd Edition guidance document Site Layout Planning for Daylight and Sunlight

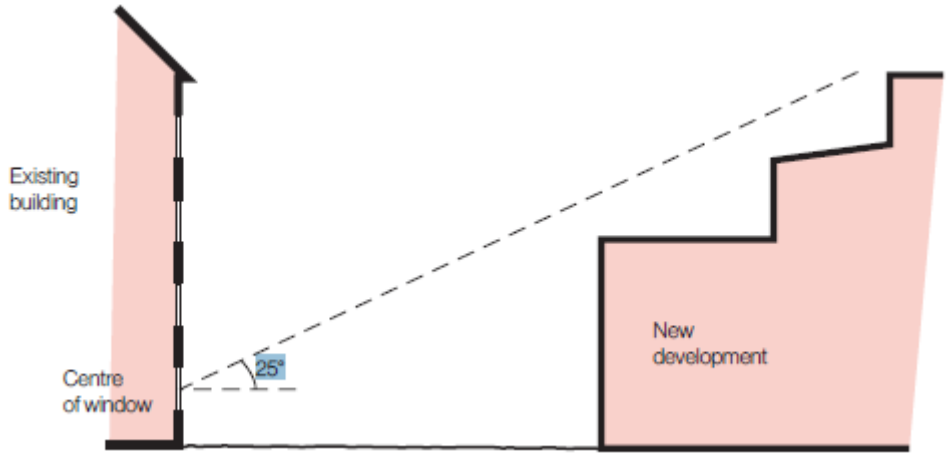
As such this study will compare the Existing Scheme and Proposed Schemes and consider if the values on the existing buildings meet the requirements outlined above when compared to their former value (that of the Existing scheme).

7.2 APSH Exclusions

The BRE recommendations note that if a new development sits within 90° of due south of any main living room window of an existing dwelling, then these should be assessed for APSH. However, there are several exceptional cases in which APSH is not required to be calculated, as indicated below:

3.2.9 It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either of the following is true:

- If the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window (note: obstructions within 90° of due north of the existing window need not count here).
- The window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal (Figure 14 in section 2.2). Again, obstructions within 90° of due north of the existing window need not be counted.
- The window wall faces within 20° of due south and the reference point has a VSC (section 2.1) of 27% or more.



BRE 3rd Edition guidance document Site Layout Planning for Daylight and Sunlight

Consequently, APSH will only be calculated for adjacent windows which meet the following conditions:

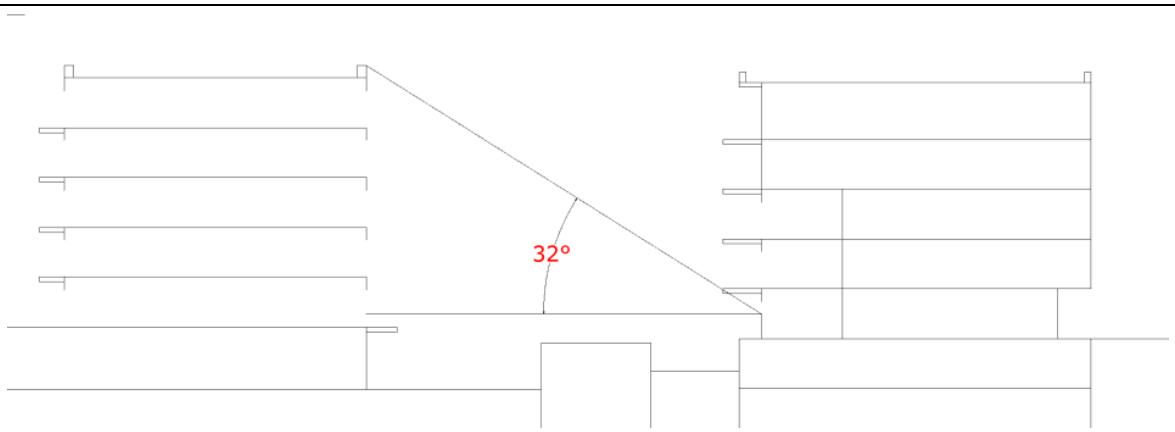
1. The height distance rule it not met and the existing building has living room with a main window which faces within 90 degrees of due south with the 25° rule not being met either.
2. Existing building is located to the North, East, or West of the Proposed Development.
3. The existing main living room window lies within 20 degrees of due south and has a VSC of less than 27%.

Taking the above into consideration, the existing properties located on Mount Anville Road have been excluded from this analysis as they are north facing the development.

7.3 25-Degree Rule

Given the statement above, the surrounding elevations adjacent to the proposed development with windows facing within 90-degree due South were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° in some cases as noted below. One elevation does not fit the criteria and therefore the APSH assessment was conducted for these neighbouring properties.

View 1



Included in the calculations – Angle 32° (over 25°)

7.4 APSH Assessment

Based on the above criteria, the locations in the following sections have been modelled and analysed with the results also included.

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

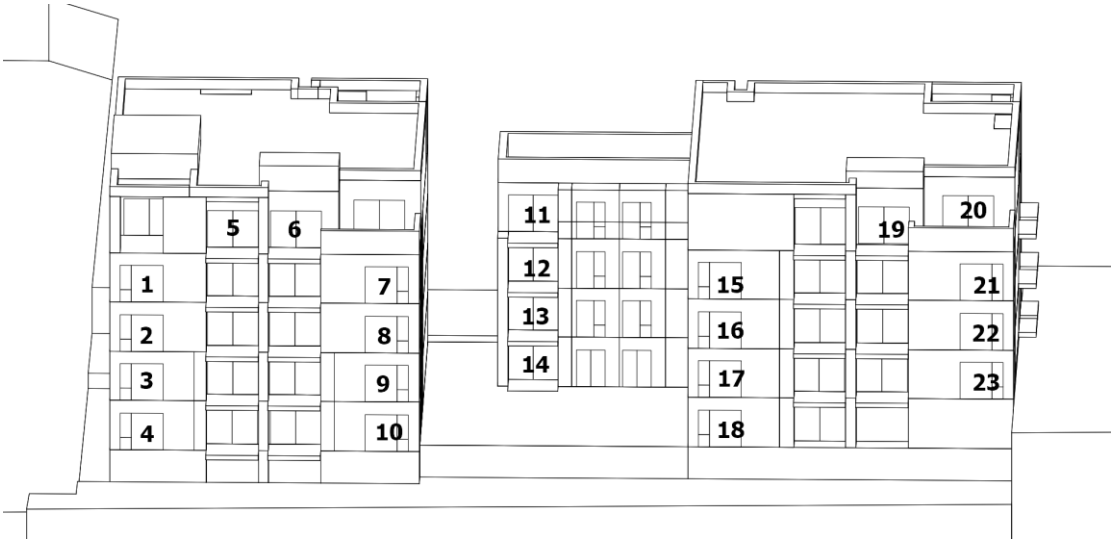
✓/✓ For these locations, both the Proposed Scheme annual and winter APSH results are greater than 25% and 5% respectively, or are greater than 0.8 times their former value or are less than 4% overall annual loss with the proposed development in place.

✓/ x For these locations, the annual APSH results are greater than 25% or are greater than 0.8 times their former value with the proposed development in place, however, the winter results are below the guidelines.

x /✓ For these locations, the annual APSH results are less than the recommended values, however, the winter APSH results are greater than 5% or greater than 0.8 times their former value with the proposed development in place.

x / x For these locations, both the annual and winter APSH results are less than 25% and 5% respectively, and less than 0.8 times their former value or are greater than 4% overall annual loss with the proposed development in place.

7.4.1 View 1: Existing Phase 1



Ref.	Existing Scheme APSH		Proposed Scheme APSH		Proposed Scheme APSH as a % of the Existing Scheme		Comment
	Annual	Winter	Annual	Winter	Annual	Winter	
1	67.3	28.31	59.26	20.27	88%	72%	✓/✓
2	64.87	28.18	53.54	16.85	83%	60%	✓/✓
3	63.88	28.16	48.65	13.63	76%	48%	✓/✓
4	63.88	28.18	46.18	11.55	72%	41%	✓/✓
5	34.48	20.29	29.3	14.86	85%	73%	✓/✓
6	54.86	27.89	53.5	20.98	98%	75%	✓/✓
7	69.23	30.07	56.61	18.1	82%	60%	✓/✓
8	69.23	30.07	51.59	14.53	75%	48%	✓/✓
9	69.23	30.07	47.78	12.18	69%	41%	✓/✓
10	69.2	30.04	44.31	10.47	64%	35%	✓/✓
11	41.44	16.7	35.2	10.46	85%	63%	✓/✓
12	16.18	12.56	8.32	4.76	51%	38%	x / x
13	15.6	12.24	5.4	2.32	35%	19%	x / x
14	15.5	12.41	4.58	2.07	30%	17%	x / x
15	67.78	28.66	54.71	19.21	81%	67%	✓/✓

Ref.	Existing Scheme APSH		Proposed Scheme APSH		Proposed Scheme APSH as a % of the Existing Scheme		Comment
16	66.15	28.51	47.71	16.05	72%	56%	✓/✓
17	64.46	28.5	41.07	13.83	64%	49%	✓/✓
18	63.75	27.79	36.37	11.1	57%	40%	✓/✓
19	53.69	22.99	46.99	22.86	88%	99%	✓/✓
20	53.44	21.36	50.91	21.35	95%	100%	✓/✓
21	69.23	30.07	58.33	24.37	84%	81%	✓/✓
22	69.23	30.07	53.86	22.87	78%	76%	✓/✓
23	69.08	29.92	49.86	21.47	72%	72%	✓/✓

7.5 Discussion

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place or the reduction in sunlight across the year is less than 4% with the proposed development in place.

Based on the criteria outlined in Section 3.2.9 of the BRE Guide 3rd Edition, only one of the neighbouring elevations fit the requirements to be assessed and as such the APSH assessment was not conducted for the rest of the properties to the south of the proposed development. The BRE guide (3rd Edition) notes that there should be no impact to sunlight for these properties "It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted."

Given the statement above, the surrounding dwellings adjacent to the proposed development to the south were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development.

As per Section 2.2.4 of the BRE Guide (3rd Edition), the residential dwellings located to the North of the proposed development do not need to be included in the assessment based on the height/distance rule, which states the following:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases the loss of light will be small. "

The proposed development facing these dwellings is 16.75m tall, and a typical existing ground floor window would be 1.5m above the ground. In this case, the effect on existing buildings more than 3 x (16.75 - 1.5) = 45.75 meters away need not to be analysed, and the nearest dwelling facing the development from the North is 65m away (from the project boundary, therefore more than that from

the proposed development) as per the following screenshot, therefore these existing properties have been excluded from this assessment.

Only the neighbouring building to the east, the phase 1 development, required to be included within the assessment. When compared to the Existing Situation, out of the 23 no. tested points, 87% (20 no.) meet the BRE recommended values over both the annual and winter periods. It is worth noting that the 3 no. points that are below the recommendations are dual aspect and have large windows to the opposite side facing away from the development and will retain good levels of sunlight. The proposed development is considered to have a negligible adverse impact on the surrounding/existing properties.

8 Sunlight to Proposed Development

8.1 Guidance – BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021

Section 5.3.1 of BS EN 17037-2018+A1-2021 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 BS EN 17037-2018+A1-2021 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/ BS 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.

8.2 Sunlight Exposure Assessment

Based on the above criteria for BRE Guide 3rd Edition/BS EN 17037-2018+A1-2021, all main living room windows within the proposed development have been assessed with the results included in the following sections.

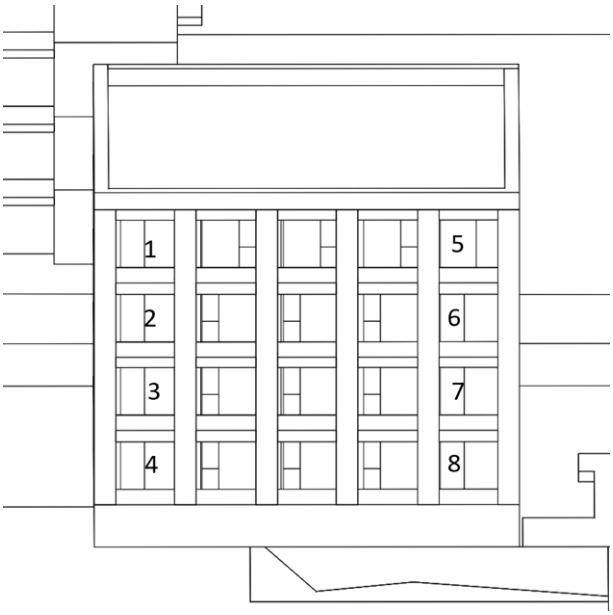
Please note, the "Comment" symbol in each of the tables represents the following:

BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021

✓ 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.

8.2.1 View 01 – Block E



Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	5	✓
2	✓	6	✓
3	✓	7	✓
4	✓	8	✓

8.2.2 View 02 – Block F

Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	25	✓
2	✓	26	✓
3	✓	27	✓
4	✓	28	✓
5	✓	29	✓
6	✓	30	✓
7	✓	31	✓
8	✓	32	✓
9	✓	33	✓

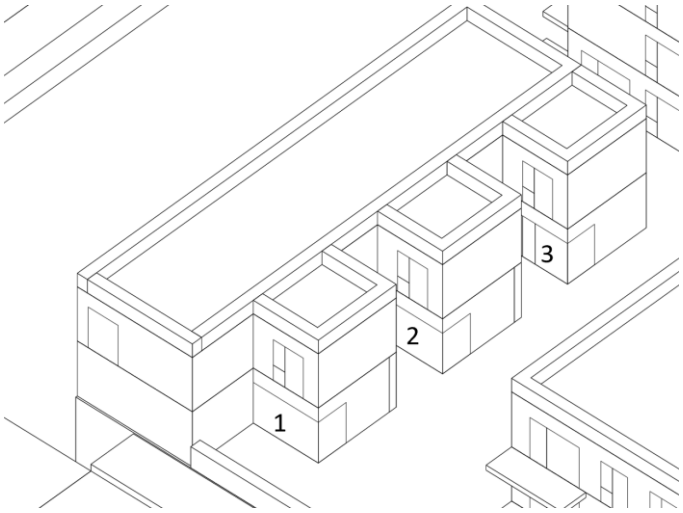
Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
10	✓	34	✓
11	✓	35	✓
12	✓	36	✓
13	✓	37	✓
14	✓	38	✓
15	✓	39	✓
16	✓	40	✓
17	✓	41	✓
18	✓	42	✓
19	✓	43	✓
20	✓	44	✓
21	✓	45	✓
22	✓	46	✓
23	✓	47	✓
24	✓		

8.2.3 View 03 – Block F

Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	19	✓
2	✓	20	✓
3	✓	21	x
4	✓	22	x
5	✓	23	x
6	✓	24	x
7	✓	25	x
8	✓	26	x

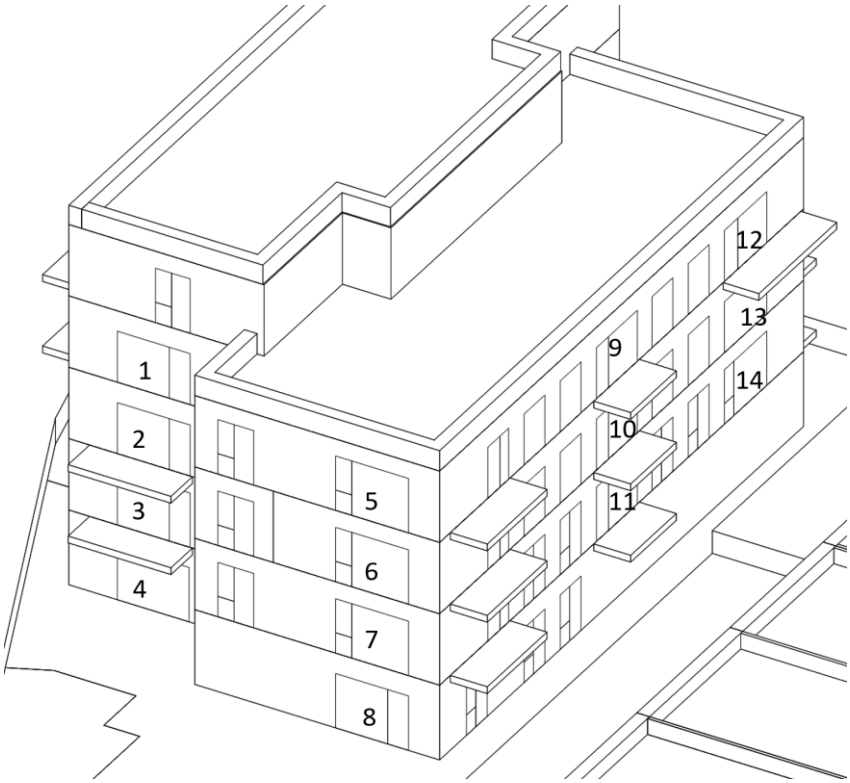
Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
9	x	27	x
10	x	28	x
11	x	29	✓
12	✓	30	✓
13	✓	31	✓
14	✓	32	✓
15	x	33	✓
16	x	34	✓
17	✓	35	✓
18	✓		

8.2.4 View 04 – Block F



Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	2	✓
3	✓		

8.2.5 View 05 – Block G



Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	8	✓
2	✓	9	✓
3	✓	10	✓
4	✓	11	✓
5	✓	12	✓
6	✓	13	✓
7	✓	14	✓

8.2.6 View 06 – Block G

Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	4	✓
2	x	5	✓
3	x	6	✓

8.2.7 View 07 – Houses & Duplexes

Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	21	✓
2	✓	22	✓
3	✓	23	✓
4	✓	24	✓
5	✓	25	✓
6	✓	26	✓
7	✓	27	✓
8	✓	28	✓

Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition BS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
9	✓	29	✓
10	✓	30	✓
11	✓	31	✓
12	✓	32	✓
13	✓	33	✓
14	✓	34	✓
15	✓	35	✓
16	✓	36	✓
17	✓	37	✓
18	✓	38	✓
19	✓	39	✓
20	✓	40	✓

8.3 Discussion

BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 considers the orientation of the rooms the following should be noted from section 3.1.11 of the guide.

"The BS EN 17037 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 113 no. points tested in the apartment blocks, 87% (98 no.) meet the BRE Guide 3rd Edition / BS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Of the 40 no. points tested in the houses and duplexes, 100% (40 no.) meet the BRE Guide 3rd / BS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Where windows do not meet this recommendation, this is predominantly as a result of their orientation, or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building in particular, 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 that is constrained by the site orientation, 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).

Overall, the sunlight provision results to the proposed development in accordance with BS EN 17037:23018 are considered very good due to the fact that not all living rooms can face south and the inclusion of balconies.

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

9 Daylight to Existing Buildings

9.1 Guidance – BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021

When designing a new development, it is important to safeguard the daylight to nearby buildings. The BRE Guide provides numerical values that are purely advisory. Different criteria may be used based on the requirements for daylighting in an area viewed against other site layout constraints. Another issue is whether the existing building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light. Any reduction in the total amount of skylight can be calculated by determining the vertical sky component at the centre of key reference points. The vertical sky component definition from the BRE Guide (3rd Edition) is described below:

Vertical sky component (VSC)	This is a measure of the amount of light reaching a window. It is the ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.

The maximum possible VSC value for an opening in a vertical wall, assuming no obstructions, is 40%. This VSC at any given point can be tested in RadianceIES, a module of IES VE.

For typical residential schemes the BRE Guide (3nd Edition) states the following in Section 2.2.7:

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

As such this study will compare the Existing scheme and Proposed scheme and consider if the values on the existing buildings are above 27% or not less than 0.8 times their former value (that of the Existing scheme).

It is also important to note that Section 2.1.6 of the BRE Guide states that if the VSC is between 15% and 27%, special measures such as larger windows can provide adequate daylight (refer to extract below).

> 2.1.6 The amount of daylight a room needs depends on what it is being used for. But roughly speaking, if θ is:
>
> - greater than 65° (obstruction angle less than 25° or VSC at least 27%) conventional window design will usually give reasonable results.
> - between 45° and 65° (obstruction angle between 25° and 45°, VSC between 15% and 27%) special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight.
> - between 25° and 45° (obstruction angle between 45° and 65°, VSC between 5% and 15%) it is very difficult to provide adequate daylight unless very large windows are used.
> - less than 25° (obstruction angle greater than 65°, VSC less than 5%) it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed.

9.2 25 Degree Rule

Section 2.2.5 of the BRE Guide states that if in a section perpendicular to the window wall, no angle subtended more than 25 degrees, as shown in the image below, it is not necessary to do a full calculation as the daylight impact will be unnoticeable to the occupants. The following screenshots show the section images produced as evidence for each of the qualifying views for the 25-degree rule. One neighbouring elevation did not meet the criteria and have been assessed in the following section.

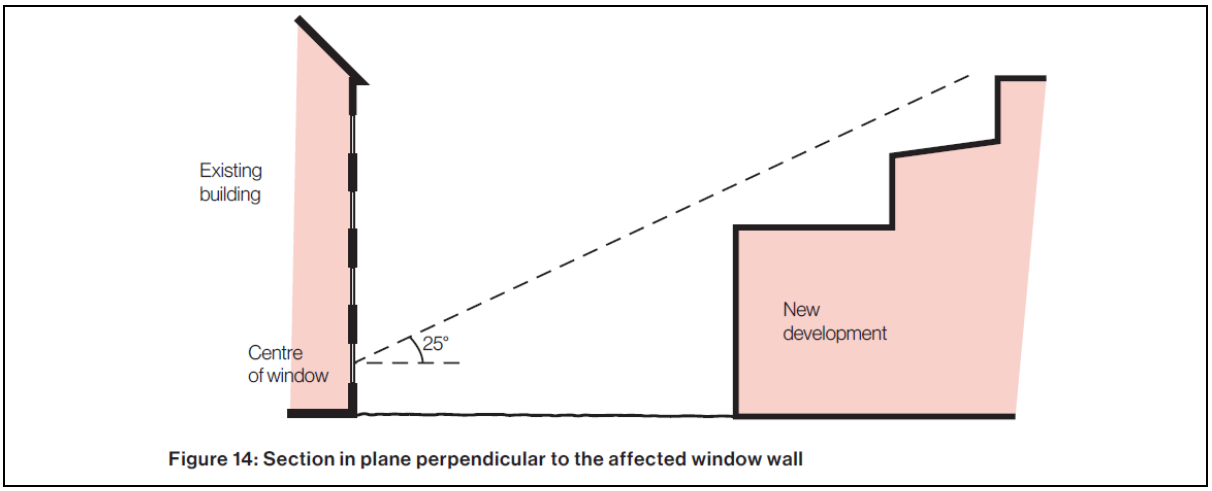
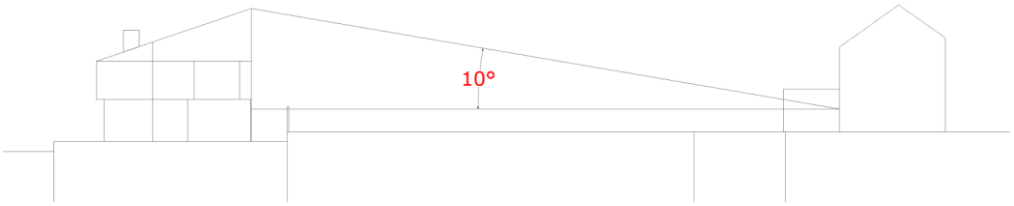


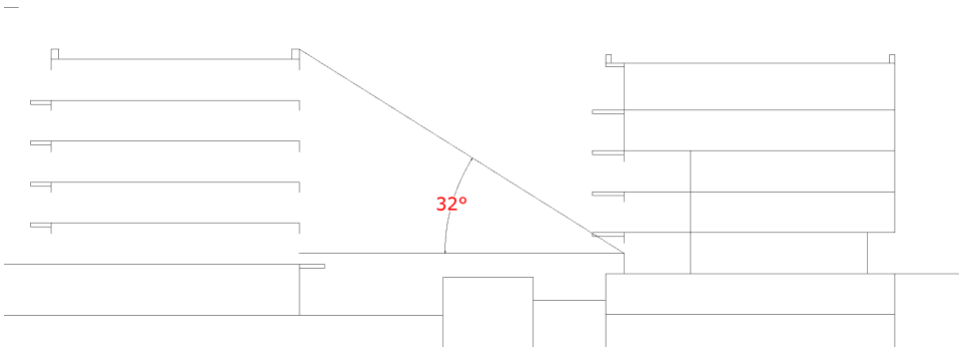
Figure 14: Section in plane perpendicular to the affected window wall

View 1



Can be excluded from the calculations – Angle 10° (less than 25°)

View 2



Angle 32° (over 25°) – Phased Development – Internal Daylight Assessment in Section 10

9.3 Discussion

This study considers the Proposed Scheme and tests if the VSC results are greater than 27% or not less than 0.8 times the value of the Existing Situation.

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (2nd and 3rd Editions), only one of the neighbouring buildings (From existing Phase 1 to the east) required to be assessed as the rest of the properties did not meet the criterion as laid out within the BRE guide which is as follows.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

As outlined above, the daylight impact will be unnoticeable to the other neighbouring building occupants situated to the north and south of the proposed development.

As per Section 2.2.4 of the BRE Guide (3rd Edition), the residential dwellings located to the North of the proposed development do not need to be included in the assessment based on the height/distance rule, which states the following:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases the loss of light will be small. "

The proposed development facing these dwellings is 16.75m tall, and a typical existing ground floor window would be 1.5m above the ground. In this case, the effect on existing buildings more than 3 x (16.75 - 1.5) = 45.75 meters away need not to be analysed, and the nearest dwelling facing the development from the North is 65m away (from the project boundary, therefore more than that from the proposed development) as per the following screenshot, therefore these existing properties have been excluded from this assessment.

10 Existing Phase 1 – Daylight Analysis

The BRE guide states that 'Use of the daylight assessment for loss of light to existing buildings is not generally recommended. However, there are some situations where meeting a set illuminance target value with the new development in place could be appropriate as a criterion for loss of light:'

"Point F9 (i) 'where the existing building is one of a series of new buildings that are being built one after the other, and each building has been designed as part of a larger group."

As such, since the construction details for the Knockrabo Phase 1 (Plans, Elevations & Sections) were available and are part of the wider development, daylight calculations were generated for the neighboring development with the proposed scheme in place. A description of the additional analysis undertaken and the subsequent results are outlined in this section.

A detailed model of Blocks A, B, C and D was created including all Living Rooms and Bedrooms facing the proposed development from Level 0 through to Level 2 which amounts to 80 no. spaces. These spaces were chosen as they are the ones that would notice any change to daylight as a result of the proposed second phase of the development.

The daylight provision to the existing Blocks A, B, C and D as part of Phase 1 were assessed against the following standards:

- BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021
- BRE Guide (2nd Edition) / BS 8206-2:2008

Section 11.1 summarise the various requirements of the BS EN 17037. To match the previous report, the ADF (Average Daylight Factor) assessment was also conducted under the following standard:

10.1 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.

10.2 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 – Red Brick	0.20
Internal Partition – White Paint	0.85
Roof – Default	0.20
Ground – Default	0.20
Floor – Light Veneers	0.40
Ceiling – White Paint	0.85

10.3 Daylight Analysis Results

The tables in the following sections summarise the daylight provision results for the rooms that were assessed in Knockrabo Phase 1 Blocks A, B, C & D. 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) / BS EN 17037-2018+A1-2021

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 / BS 8206-2:2008.

x These rooms have an ADF lower than the recommended minimum values (2.0% for combined L/K/Ds and 1.0% for bedrooms) as stated within the BRE Guide / BS 8206-2:2008.

BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021 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.

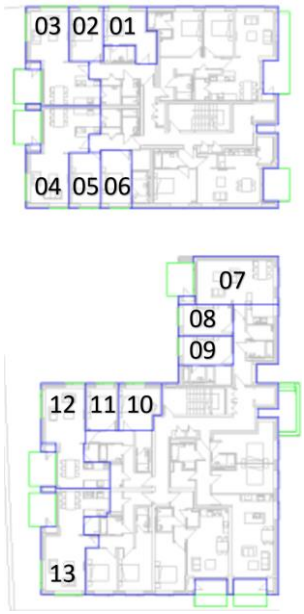
x These rooms do not achieve the target illuminance (E_T) over the minimum floor area requirements.

Refer to Appendix C for the requirements of the BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021 Standard, along with the results of the room assessments in Knockrabo Phase 1, Blocks A, B, C & D under this standard which have been included for information only.

10.3.1 Blocks A & B - Level 00

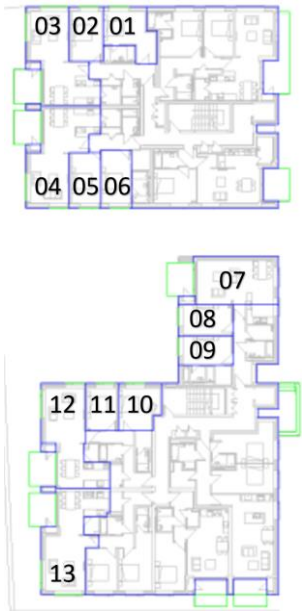
Ref.	Room Activity	BRE Guide 2nd Edition BS 8206-2:2008 Method 2 National Annex			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Existing ADF	Existing with Proposed Dev. ADF	Comment	Floor Area > E_T (%)	Comment
1	Bedroom	2.88	2.95	✓	100	✓
2	Bedroom	3.70	3.77	✓	100	✓
3	LKD	4.74	4.05	✓	100	✓
4	LKD	3.41	2.13	✓	95	✓
5	Bedroom	1.58	1.48	✓	100	✓
6	Bedroom	1.29	1.21	✓	77	✓
7	LKD	3.15	3.21	✓	100	✓
8	Bedroom	2.44	1.67	✓	78	✓
9	Bedroom	2.31	1.61	✓	72	✓
10	Bedroom	1.50	1.23	✓	76	✓
11	Bedroom	2.03	1.50	✓	100	✓
12	LKD	4.48	2.57	✓	93	✓

10.3.2 Blocks A & B - Level 01



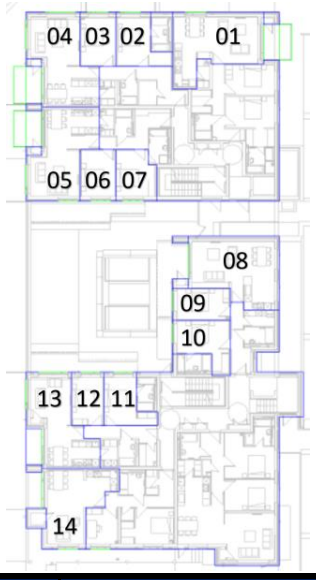
Ref.	Room Activity	BRE Guide 2nd Edition BS 8206-2:2008 Method 2 National Annex			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Existing ADF	Existing with Proposed Dev. ADF	Comment	Floor Area > E_T (%)	Comment
1	Bedroom	3.00	2.98	✓	100	✓
2	Bedroom	3.69	3.37	✓	100	✓
3	LKD	5.42	4.25	✓	100	✓
4	LKD	4.07	2.45	✓	95	✓
5	Bedroom	2.31	1.79	✓	100	✓
6	Bedroom	1.96	1.51	✓	73	✓
7	LKD	3.24	3.39	✓	100	✓
8	Bedroom	2.57	1.92	✓	100	✓
9	Bedroom	2.42	1.84	✓	100	✓
10	Bedroom	1.76	1.53	✓	96	✓
11	Bedroom	2.34	1.84	✓	100	✓
12	LKD	4.20	2.55	✓	90	✓
13	LKD	4.51	3.34	✓	97	✓

10.3.3 Blocks A & B - Level 02



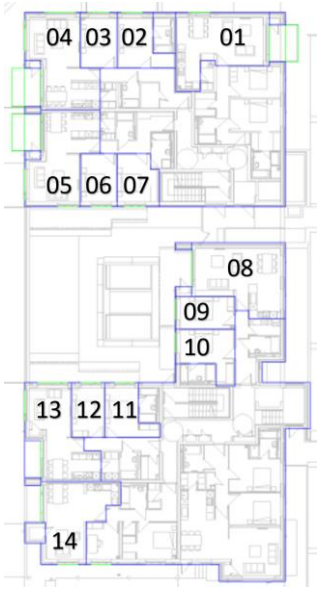
Ref.	Room Activity	BRE Guide 2nd Edition BS 8206-2:2008 Method 2 National Annex			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Existing ADF	Existing with Proposed Dev. ADF	Comment	Floor Area > E_T (%)	Comment
1	Bedroom	3.01	2.98	✓	100	✓
2	Bedroom	3.69	3.37	✓	100	✓
3	LKD	5.41	4.35	✓	100	✓
4	LKD	4.17	2.75	✓	98	✓
5	Bedroom	2.64	2.16	✓	100	✓
6	Bedroom	2.33	1.90	✓	100	✓
7	LKD	3.35	3.02	✓	100	✓
8	Bedroom	2.75	2.20	✓	100	✓
9	Bedroom	2.57	2.08	✓	100	✓
10	Bedroom	2.13	1.95	✓	100	✓
11	Bedroom	2.76	2.32	✓	100	✓
12	LKD	4.40	3.05	✓	92	✓
13	LKD	4.78	3.83	✓	100	✓

10.3.4 Blocks C & D - Level 00



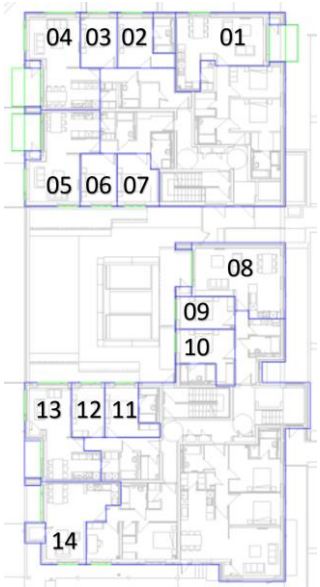
Ref.	Room Activity	BRE Guide 2nd Edition BS 8206-2:2008 Method 2 National Annex			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Existing ADF	Existing with Proposed Dev. ADF	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.24	2.16	✓	90	✓
2	Bedroom	2.46	2.24	✓	100	✓
3	Bedroom	2.83	2.37	✓	100	✓
4	LKD	5.17	4.29	✓	100	✓
5	LKD	3.94	3.25	✓	100	✓
6	Bedroom	1.68	1.22	✓	100	✓
7	Bedroom	1.30	1.03	✓	100	✓
8	LKD	3.64	3.81	✓	90	✓
9	Bedroom	2.20	2.10	✓	100	✓
10	Bedroom	1.65	1.86	✓	100	✓
11	Bedroom	1.49	1.23	✓	100	✓
12	Bedroom	2.07	1.61	✓	100	✓
13	LKD	3.74	3.10	✓	72	✓
14	LKD	2.12	1.78	x	100	✓

10.3.5 Blocks C & D - Level 01



Ref.	Room Activity	BRE Guide 2nd Edition BS 8206-2:2008 Method 2 National Annex			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Existing ADF	Existing with Proposed Dev. ADF	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.38	2.32	✓	91	✓
2	Bedroom	2.78	2.66	✓	100	✓
3	Bedroom	3.17	2.79	✓	100	✓
4	LKD	5.57	4.77	✓	100	✓
5	LKD	4.39	3.72	✓	100	✓
6	Bedroom	2.17	1.74	✓	100	✓
7	Bedroom	1.73	1.49	✓	100	✓
8	LKD	3.64	3.39	✓	100	✓
9	Bedroom	2.75	2.58	✓	100	✓
10	Bedroom	2.06	2.03	✓	100	✓
11	Bedroom	2.02	1.81	✓	100	✓
12	Bedroom	2.80	2.33	✓	100	✓
13	LKD	4.81	4.06	✓	100	✓
14	LKD	4.39	3.45	✓	100	✓

10.3.6 Blocks C & D - Level 02



Ref.	Room Activity	BRE Guide 2nd Edition BS 8206-2:2008 Method 2 National Annex			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Existing ADF	Existing with Proposed Dev. ADF	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.93	2.87	✓	93	✓
2	Bedroom	3.05	2.98	✓	100	✓
3	Bedroom	3.45	3.10	✓	100	✓
4	LKD	5.77	5.03	✓	100	✓
5	LKD	4.61	3.98	✓	100	✓
6	Bedroom	2.59	2.20	✓	100	✓
7	Bedroom	2.19	1.99	✓	100	✓
8	LKD	3.74	3.51	✓	100	✓
9	Bedroom	2.97	2.74	✓	100	✓
10	Bedroom	2.20	2.13	✓	100	✓
11	Bedroom	2.55	2.39	✓	100	✓
12	Bedroom	3.28	2.84	✓	100	✓
13	LKD	5.21	4.55	✓	100	✓
14	LKD	4.24	3.85	✓	100	✓

10.4 Discussion

The purpose of the daylight calculations is to quantify the overall percentage of units which exceeds the BRE recommendations under the BS EN–17037 and the BS 8206-2:2008 standards. This illustrates the impact of the proposed development on the neighbouring Blocks A, B, C, and D of Knockrabo Phase 1. To note the previous BS 8206 standard assessment have been included to allow comparison to the results that would have been conducted at the time of design. Although true a before and after analysis has also been included.

It can be concluded that the proposed development has a negligible adverse impact on the existing units in Block C & D as only 1 room out of 42 rooms tested under the BS 8206-22008 standard has a resultant ADF below the BRE recommended guidelines with the proposed development in place. Under the BS EN - 17037 standard, all rooms meet the daylight recommendations with the proposed development in place.

Individual room results under the IS EN – 17037 Standard can be viewed in Appendix C for information only.

Blocks A & B

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	24
Total No. LKDs Tested	14
Total No. Spaces Tested	**38**

BRE Guide 2nd Edition / BS 8206-2:2008				
Room Type	Existing		Existing with Proposed Dev.	
	Pass (No.)	Pass (%)	Pass (No.)	Pass (%)
No. Bedrooms	24	100%	24	100%
No. LKDs	14	100%	14	100%
Total No.	**38**	**100%**	**38**	**100%**

BRE Guide 3rd Edition / BS EN 17037:2018+A1-2021 Method 2 National Annex Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	24	100%	24	100%
No. LKDs	14	100%	14	100%
Total No.	**38**	**100%**	**38**	**100%**

Blocks C & D

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	24
Total No. LKDs Tested	18
Total No. Spaces Tested	**42**

BRE Guide 2nd Edition / BS 8206-2:2008				
Room Type	Existing		Existing with Proposed Dev.	
	Pass (No.)	Pass (%)	Pass (No.)	Pass (%)
No. Bedrooms	24	100%	24	100%
No. LKDs	18	100%	17	94%
Total No.	**42**	**100%**	**41**	**98%**

BRE Guide 3rd Edition / BS EN 17037:2018+A1-2021 Method 2 National Annex Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	24	100%	0	0%
No. LKDs	18	100%	0	0%
Total No.	**42**	**100%**	**0**	**0%**

11 Daylight to Proposed Development

This section addresses daylight provision to the proposed development. The purpose of the calculations is to quantify an overall percentage of units which exceeds the daylight provision recommendations. Our proposed methodology is to complete the calculations for all of the apartments and duplexes within the development. The objective of the design team is to maximise the number of units which exceed the minimum recommendations.

11.1 Reference Standards

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

- BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021

The following section summarises the requirements of the BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021 Standard, Method 2 was utilised as outlined on the following pages.

See Appendix C for the requirements of the BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021 Standard which had been included for information only. The reasons for this are discussed in the following section.

11.1.1 BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 National Annex

There are two methods to assess daylight provision to the interior which are based on target values in Table A.3 and Table NA.1 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 NA.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 NA.1 of BS EN 17037-2018+A1-2021.

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.

In the UK, EN17037-2018+A1-2021 was adopted to form "BS EN 17037-2018+A1-2021". 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."

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. For these reasons the BS EN National Annex is the more appropriate standard in these circumstances.

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+A1-2021, 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+A1-2021.

11.2 Daylight Model Inputs

The following inputs were used in the study:

BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021

- 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
Internal Partition – White Paint	0.80
Roof – Default	0.20
Ground – Default	0.20
Floor/Ceiling (Floor) – Light Veneers	0.40
Floor/Ceiling (Ceiling) – White Paint	0.80

11.3 Daylight Results

The following tables summarise the daylight provision results for the tested spaces within the apartment blocks and duplexes assessed within the development under the BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 Method 2 National Annex.

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. Individual room results can be viewed in Appendix A.

The results are summarised in the following tables:

Apartment Blocks

A compliance rate of 98% is achieved under BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 Method 2 National Annex for the apartment blocks within the proposed development. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	194
Total No. LKDs Tested	109
Total No. Spaces Tested	**303**

BRE Guide 3rd Edition / BS EN 17037:2018+A1-2021 Method 2 National Annex Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	194	100%	0	0%
No. LKDs	104	95%	5	5%
Total No.	**292**	**98%**	**5**	**2%**

Houses

A compliance rate of 100% is achieved under BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 Method 2 National Annex for the houses within the proposed development. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	30
Total No. LKDs Tested	3
Total No. KDs Tested	5
Total No. Living Rooms Tested	6
Total No. Spaces Tested	**44**

BRE Guide 3rd Edition / BS EN 17037:2018+A1-2021 Method 2 National Annex Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	30	100%	0	0%
No. LKDs	3	100%	0	0%
No. KDs	5	100%	0	0%
No. Living Rooms	6	100%	0	0%
Total No.	**44**	**100%**	**0**	**0%**

Duplexes

A compliance rate of 100% is achieved under BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 Method 2 National Annex for the duplexes within the proposed development. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	80
Total No. LKDs Tested	8
Total No. KDs Tested	24
Total No. Living Rooms Tested	24
Total No. Spaces Tested	**136**

BRE Guide 3rd Edition / BS EN 17037:2018+A1-2021 Method 2 National Annex Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	80	100%	0	0%
No. LKDs	8	100%	0	0%
No. KDs	24	100%	0	0%
No. Living Rooms	24	100%	0	0%
Total No.	**136**	**100%**	**0**	**0%**

11.4 Compensatory Measures

Irish Standards and Design Development

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments 2023, 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.

The inclusion of the design solutions produced a high standard of daylight results under BS-EN 17037-2018+A1-2021 using Method 2.

In addition to this, design features have been incorporated into the development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. These design features again help to balance off and compensate the lower levels of daylight measured in the applicable spaces and are summarised as follows:

- 80% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (2023). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 59.8% of the apartment units are dual aspect which is above the 50% minimum requirement as required by the Design Standards (2023). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- The proposed scheme provides 1,323sq.m of communal amenity space, thus exceeding the 982sq.m required pursuant to the Design Standards (2023)

In addition to this, specific compensatory measures for each space below the recommendations can be found in the table within Appendix A Section 13.2.

12 Conclusion

The following can be concluded based on the assessments undertaken:

12.1 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

Blocks A & B of Knockrabo Apartments
Minimal additional shading visible from the proposed development during March 1400-1600, June 1800 and *December 1200-1400. No additional shading is observed from the proposed development on these neighbouring properties at any other period.

Blocks C & D of Knockrabo Apartments
No additional shading visible from the proposed development on these properties at any period throughout the year.

Existing Homes on Mount Anville Road
No additional shading visible from the proposed development on these properties at any period throughout the year.

Public Playground (North of Block F)
Additional shading visible from the proposed development in March 1000-1400 and in *December for the majority of the day. In June there is only minor overshadowing in early mornings at 1000 with the majority of overshadowing from the permitted Blocks A and B at 0800. No additional shading is observed from the proposed development on this play area at any other period and the sunlight hours assessment (section 6) highlights that the proposed paly area meets BRE recommendations and will receive adequate sunlight throughout the year.

*Overshadowing is showing in December when the sun is lower in the sky and shadows cast are much longer. Although this is the case, overshadowing is least noticeable during the winter months as there is a lot less sunlight available at this time of year and so the overall impact is vastly reduced.

Overall, the proposed development is considered to have a negligible adverse impact on the surrounding/existing properties.

The potential shading impact is quantified via the “Sunlight to Amenity Spaces” and “Daylight to Existing Buildings” sections of this report.

12.2 Sunlight to Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide (3rd Edition), 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. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the existing situation.

Existing Amenity Spaces

On March 21st 100% (6 out of 6) of the existing amenity spaces will receive similar levels of sunlight with the proposed development in place when compared to the existing situation, thus complying with the BRE recommendations. The proposed development is considered to have a negligible adverse impact on the existing amenities.

Proposed Amenity Spaces

On March 21st, 99% of the proposed public amenity areas, 95% of the communal amenity areas, 74% of the rooftop amenity area and 84% of the creche play area situated within the development site will receive at least 2 hours of sunlight over its total area. All spaces complying with the BRE recommendations. When considered individually, all amenity spaces are performing to a very high standard and exceeding the BRE Guide recommendations of a 50% target minimum.

Public Playground (North of Block F)

The Public Playground situated to the north of Block F receives at least 2 hours of sunlight across its whole area thus exceeding the BRE recommendations for sunlight across at least 50% of the area.

Private Garden Spaces

Finally, all individual private back-garden areas tested are achieving at least 2 hours of sunlight over 50% of their area on the 21st of March and complying with the BRE recommendations.

12.3 Sunlight to Existing Buildings

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place or the reduction in sunlight across the year is less than 4% with the proposed development in place.

Based on the criteria outlined in Section 3.2.9 of the BRE Guide 3rd Edition, only one of the neighbouring elevations fit the requirements to be assessed and as such the APSH assessment was not conducted for the rest of the properties to the south of the proposed development. The BRE guide (3rd Edition) notes that there should be no impact to sunlight for these properties "It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted."

Given the statement above, the surrounding dwellings adjacent to the proposed development to the south were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development.

As per Section 2.2.4 of the BRE Guide (3rd Edition), the residential dwellings located to the North of the proposed development do not need to be included in the assessment based on the height/distance rule, which states the following:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases the loss of light will be small. "

The proposed development facing these dwellings is 16.75m tall, and a typical existing ground floor window would be 1.5m above the ground. In this case, the effect on existing buildings more than 3 x (16.75 - 1.5) = 45.75 meters away need not to be analysed, and the nearest dwelling facing the development from the North is 65m away (from the project boundary, therefore more than that from the proposed development) as per the following screenshot, therefore these existing properties have been excluded from this assessment.

Only the neighbouring building to the east, the phase 1 development, required to be included within the assessment. When compared to the Existing Situation, out of the 23 no. tested points, 87% (20 no.) meet the BRE recommended values over both the annual and winter periods. It is worth noting that the 3 no. points that are below the recommendations are dual aspect and have large windows to the opposite side facing away from the development and will retain good levels of sunlight. The proposed development is considered to have a negligible adverse impact on the surrounding/existing properties.

12.4 Sunlight to Proposed Development

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 considers the orientation of the rooms the following should be noted from section 3.1.11 of the guide.

"The BS EN 17037 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 113 no. points tested in the apartment blocks, 87% (98 no.) meet the BRE Guide 3rd Edition / BS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Of the 40 no. points tested in the houses and duplexes, 100% (40 no.) meet the BRE Guide 3rd /BS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Where windows do not meet this recommendation, this is predominantly as a result of their orientation, or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building in particular, 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 that is constrained by the site orientation, 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).

Overall, the sunlight provision results to the proposed development in accordance with BS EN 17037:23018 are considered very good due to the fact that not all living rooms can face south and the inclusion of balconies.

Finally, the sunlight exposure results are visually represented in Appendix C.

12.5 Daylight to Existing Buildings

This study considers the Proposed Scheme and tests if the VSC results are greater than 27% or not less than 0.8 times the value of the Existing Situation.

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (2nd and 3rd Editions), only the neighbouring buildings (From existing Phase 1 to the east) required to be assessed as the rest of the properties to the south of the proposed development did not meet the criterion as laid out within the BRE guide which is as follows.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

As outlined above, the daylight impact will be unnoticeable to the other neighbouring building occupants situated to the south of the proposed development.

With regards to those residential dwellings located to the North of the proposed development, as per Section 2.2.4 of the BRE Guide (3rd Edition), they do not need to be included in the assessment based on the height/distance rule, which states the following:

"Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing windows is three or more times its height above the centre of the existing window. In these cases the loss of light will be small. "

The proposed development facing these dwellings is 16.75m tall, and a typical existing ground floor window would be 1.5m above the ground. In this case, the effect on existing buildings more than 3 x (16.75 - 1.5) = 45.75 meters away need not to be analysed, and the nearest dwelling facing the development from the North is 65m away (from the project boundary, therefore more than that from the proposed development) as per the following screenshot, therefore these existing properties have been excluded from this assessment.

The Existing Phase 1 buildings have been included in the Internal Daylight Assessment in Section 10 of this report.

12.6 Existing Phase 1 – Internal Daylight

The purpose of the daylight calculations is to quantify the overall percentage of units which exceeds the BRE recommendations under the BS EN–17037 and the BS 8206-2:2008 standards. This illustrates the impact of the proposed development on the neighbouring Blocks A, B, C, and D of Knockrabo Phase 1. To note the previous BS 8206 standard assessment have been included to allow comparison

to the results that would have been conducted at the time of design. Although true a before and after analysis has also been included.

It can be concluded that the proposed development has a negligible adverse impact on the existing units in Block C & D as only 1 room out of 42 rooms tested under the BS 8206-22008 standard has a resultant ADF below the BRE recommended guidelines with the proposed development in place. Under the BS EN - 17037 standard, all rooms meet the daylight recommendations with the proposed development in place.

Individual room results under the IS EN – 17037 Standard can be viewed in Appendix C for information only.

12.7 Daylight to Proposed Development

For the daylight to proposed development assessment, one standard has been analysed: BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition). For completeness, IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition) non-annex results have been included in Appendix C for information only.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.3 or Table NA.1 of BS EN 17037-2018+A1-2021 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). 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 NA.1 (refer to Section 11.1 of this report). 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 of the standard, 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 NA.1 of BS EN 17037-2018+A1-2021.

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.

BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 National Annex

In the UK, EN 17037-2018+A1-2021 was adopted to form "BS EN 17037-2018+A1-2021". A National Annex 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."

BS EN 17037-2018+A1-2021 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 11.1 of this report). 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.

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 were assessed using a 200 lux target illuminance (E_T).

Across the proposed development, 98% of the tested spaces within the apartment blocks, 100% of the tested spaces in the houses and 100% of the tested spaces in the duplexes within the proposed development are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037-2018+A1-2021 using Method 2.

Compensatory Measures

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments 2023, 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.

The inclusion of the design solutions produced a high standard of daylight results under BS-EN 17037-2018+A1-2021 using Method 2, 95% for the tested spaces in the apartment blocks and 95% for the sampled houses and duplexes.

In addition to this, design features have been incorporated into the development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. These design features again help to balance off and compensate the lower levels of daylight measured in the applicable spaces and are summarised as follows:

- 80% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (2023). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 59.8% of the apartment units are dual aspect which is above the 50% minimum requirement as required by the Design Standards (2023). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- The proposed scheme provides 1,323sq.m of communal amenity space, thus exceeding the 982sq.m required pursuant to the Design Standards (2023)

In addition to this, specific compensatory measures for each space below the recommendations can be found in the table within Appendix A Section 13.2.

12.8 View Out

The View Out assessment is related to buildings such as offices or schools where seating layouts are typically fixed compared to domestic settings where an occupant can move around the space freely. In their own home occupants can choose to sit near to or even at a window which will inevitably provide the varying layers of a 'View Out' such as the ground, landscape or sky. This ability to choose their position within a domestic setting means they would always have access to a position in the apartment with the minimum requirements of 'View Out'. Therefore, all the properties would meet the minimum requirement as outlined in IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition).

12.9 Glare

As outlined in IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition), a Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

12.10 Observations

The Dun Laoghaire Rathdown County (DLRC) Development Plan 2022-2028 states the following in Section 12.3.4.2, Habitable Rooms:

"All habitable rooms within new residential units shall have access to appropriate levels of natural/daylight and ventilation. Development shall be guided by the principles of Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, in this regard. A daylight analysis will be required for all proposed developments of 50+ units, or as otherwise required by the Planning Authority. The impact of any development on existing habitable rooms should also be considered."

The same document states the following in Section 12.8.5.3, Communal Open Space – Quality:

"Communal amenity space within apartment and/or housing developments should be provided as a garden within the courtyard of a perimeter block or adjoining a linear apartment block. Designers must ensure that the heights and orientation of adjoining blocks permit adequate levels of sunlight to reach communal amenity space throughout the year in accordance with BRE 209 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice', (2011). The communal open space should be visible from, and accessible to, the maximum number of units within the proposed scheme. Inaccessible, hidden or otherwise back land communal open space, and narrow linear strips of communal open space will not be acceptable."

In the same document, Section 4.4.1.8 'Policy Objective PHP42: Building Design & Height, Appendix 5' outlines a detailed set of performance based-criteria that align with the objectives established in the Building Height Strategy (BHS):

"3. At site/building scale

- *d. Proposed design should maximise access to natural daylight, ventilation and views and minimise overshadowing.*
- *e. Proposal should demonstrate how it complies with quantitative performance standards on daylight and sunlight asset out in BRE guidance "Site Layout Planning for Daylight and Sunlight" (2nd Edition).*
- *f. Proposal should ensure no significant adverse impact on adjoining properties by way of overlooking and/or overshadowing."*

In all criteria regarding daylight and sunlight the DLRC Development Plan refers to guidelines set out in BRE Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building research Establishment report, 2011) and/or any updated, or subsequent guidance, which in this case refers to the BRE Guide 209, 2022 Edition (June 2022).

It is important to note that the recommendations within the BRE Guide (3rd Edition) 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 (3rd Edition), 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.

In addition, BRE Guide 3rd Edition also notes:

"This report is a comprehensive revision of the 2011 edition of Site layout planning for daylight and sunlight: a guide to good practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide 3rd Edition and BS EN 17037-2018+A1-2021 National Annex. With regards to the existing properties there is a negligible impact when considering sunlight and daylight as a result of the proposed development and the proposed development itself performs very well with the same regard.

13 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 standard are included in each table:

- BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021 National Annex

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

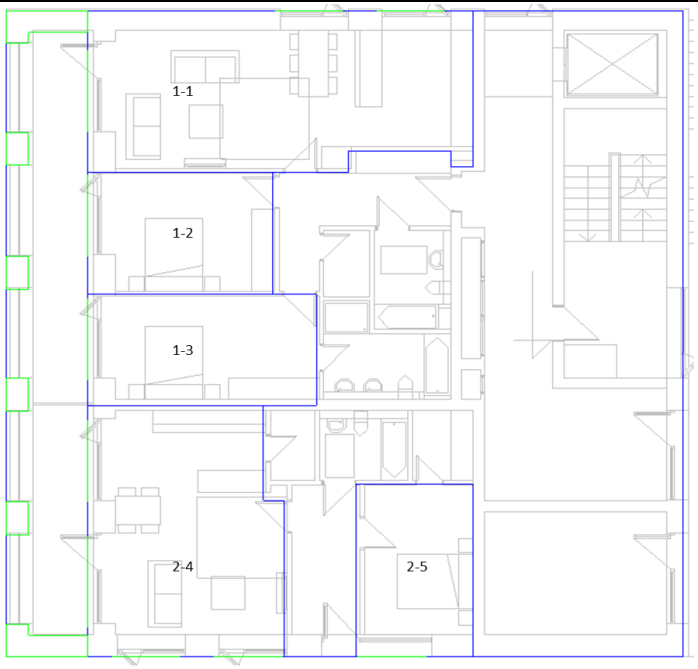
BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021 National Annex

✓ 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.

13.1 Daylight Provision Results

13.1.1 Block E - Level 00



BE_L00

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	LKD	100	✓
	2	Bedroom	100	✓
2	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓

13.1.2 Block E - Level 01

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
101	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
102	4	LKD	100	✓
	5	Bedroom	100	✓
	6	Bedroom	100	✓

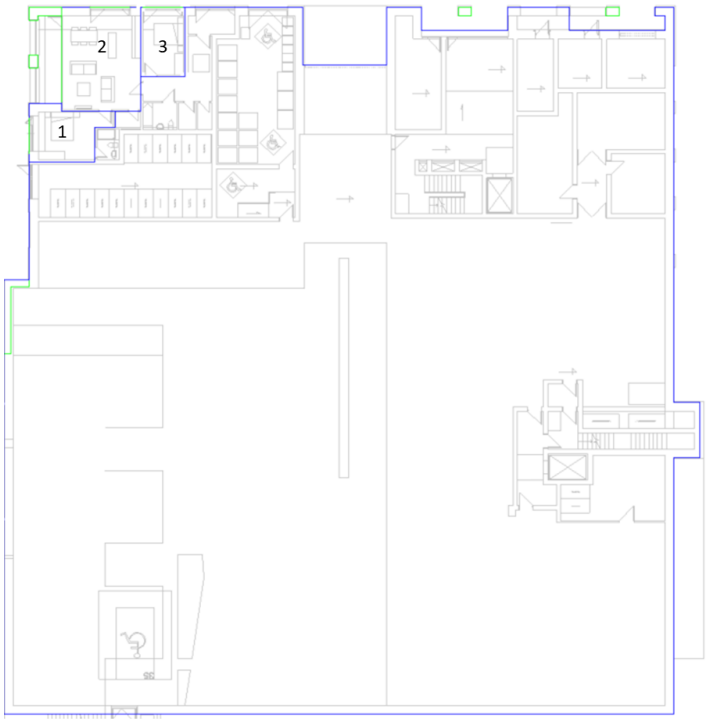
13.1.3 Block E - Level 02

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
201	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
202	4	LKD	100	✓
	5	Bedroom	100	✓
	6	Bedroom	100	✓

13.1.4 Block E - Level 03

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
301	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
302	4	LKD	100	✓
	5	Bedroom	100	✓
	6	Bedroom	100	✓

13.1.5 Block F - Level 00



BF_L00

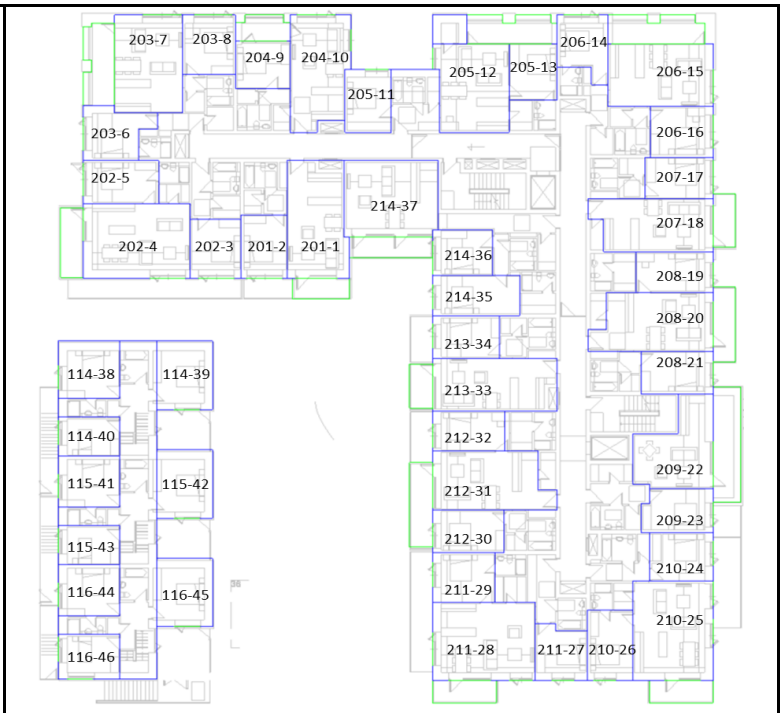
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	Bedroom	100	✓
	2	LKD	100	✓
	3	Bedroom	100	✓

13.1.6 Block F - Level 01

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
101	1	LKD	47	x
	2	Bedroom	100	✓
102	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
103	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
104	9	Bedroom	100	✓
	10	LKD	99	✓
	11	Bedroom	100	✓
105	12	LKD	70	✓
	13	Bedroom	100	✓
106	14	Bedroom	100	✓
	15	LKD	100	✓
	16	Bedroom	100	✓
107	17	Bedroom	100	✓
	18	LKD	42	x
108	19	Bedroom	100	✓
	20	LKD	32	x
	21	Bedroom	100	✓

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
109	22	LKD	55	✓
	23	Bedroom	100	✓
113	24	LKD	40	x
	25	Bedroom	100	✓
110	26	Bedroom	100	✓
	27	LKD	100	✓
	28	Bedroom	100	✓
111	29	Bedroom	100	✓
	30	LKD	51	✓
	31	Bedroom	100	✓
112	32	LKD	46	x
	33	Bedroom	100	✓
114	34	LKD	85	✓
115	35	LKD	100	✓
116	36	LKD	100	✓

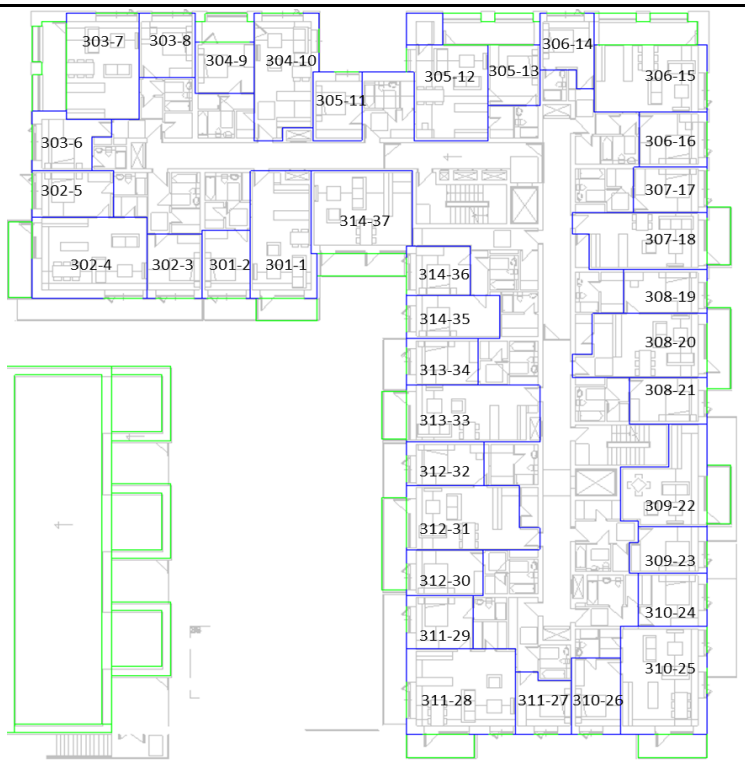
13.1.7 Block F - Level 02



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
201	1	LKD	50	✓
	2	Bedroom	100	✓
202	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
203	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
204	9	Bedroom	100	✓
	10	LKD	99	✓
	11	Bedroom	100	✓
205	12	LKD	68	✓
	13	Bedroom	100	✓
206	14	Bedroom	100	✓
	15	LKD	100	✓
	16	Bedroom	100	✓
207	17	Bedroom	100	✓
	18	LKD	50	✓
208	19	Bedroom	100	✓
	20	LKD	50	✓
	21	Bedroom	100	✓

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
209	22	LKD	57	✓
	23	Bedroom	100	✓
210	24	Bedroom	100	✓
	25	LKD	100	✓
	26	Bedroom	100	✓
211	27	Bedroom	100	✓
	28	LKD	100	✓
	29	Bedroom	100	✓
212	30	Bedroom	100	✓
	31	LKD	76	✓
	32	Bedroom	100	✓
213	33	LKD	59	✓
	34	Bedroom	100	✓
214	35	Bedroom	100	✓
	36	Bedroom	100	✓
	37	Bedroom	100	✓
114	38	Bedroom	70	✓
	39	Bedroom	100	✓
	40	Bedroom	100	✓
115	41	Bedroom	100	✓
	42	Bedroom	100	✓
	43	Bedroom	100	✓
116	44	Bedroom	100	✓
	45	Bedroom	100	✓
	46	LKD	50	✓

13.1.8 Block F - Level 03



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
301	1	LKD	56	✓
	2	Bedroom	100	✓
302	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
303	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
304	9	Bedroom	100	✓
	10	LKD	99	✓
	11	Bedroom	100	✓
305	12	LKD	67	✓
	13	Bedroom	100	✓
306	14	Bedroom	100	✓
	15	LKD	100	✓
	16	Bedroom	100	✓
307	17	Bedroom	100	✓
	18	LKD	53	✓

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
308	19	Bedroom	100	✓
	20	LKD	56	✓
	21	Bedroom	100	✓
309	22	LKD	86	✓
	23	Bedroom	100	✓
310	24	Bedroom	100	✓
	25	LKD	100	✓
	26	Bedroom	100	✓
311	27	Bedroom	100	✓
	28	LKD	100	✓
	29	Bedroom	100	✓
312	30	Bedroom	100	✓
	31	LKD	96	✓
	32	Bedroom	100	✓
313	33	LKD	78	✓
	34	Bedroom	100	✓
314	35	Bedroom	100	✓
	36	Bedroom	100	✓
	37	Bedroom	56	✓

13.1.9 Block F - Level 04

BF_L04

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
401	1	LKD	67	✓
	2	Bedroom	100	✓
402	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
403	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
404	9	Bedroom	100	✓
	10	LKD	99	✓
	11	Bedroom	100	✓
405	12	LKD	72	✓
	13	Bedroom	100	✓
406	14	Bedroom	100	✓
	15	LKD	100	✓
	16	Bedroom	100	✓
407	17	Bedroom	100	✓
	18	LKD	61	✓

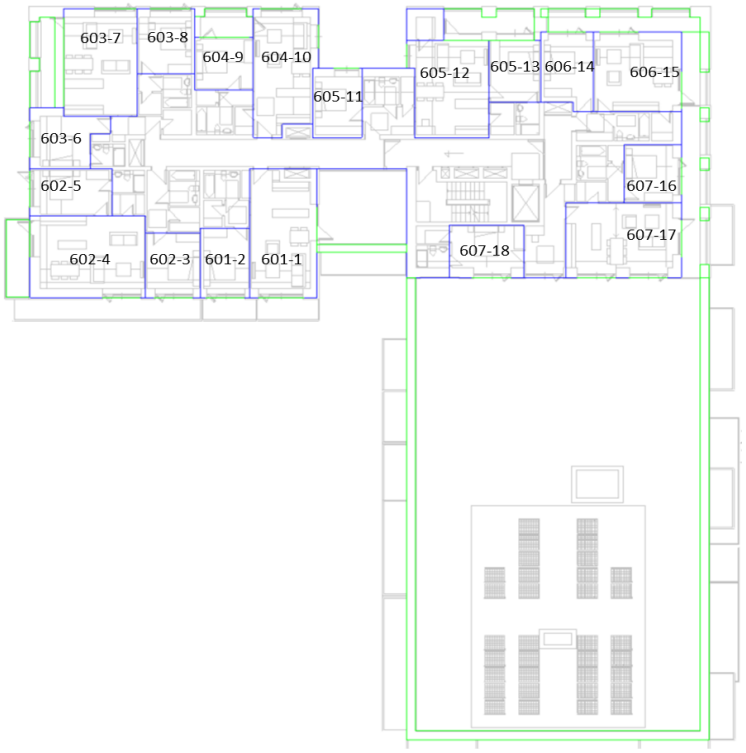
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
408	19	Bedroom	100	✓
	20	LKD	66	✓
	21	Bedroom	100	✓
409	22	LKD	89	✓
	23	Bedroom	100	✓
410	24	Bedroom	100	✓
	25	LKD	100	✓
	26	Bedroom	100	✓
411	27	Bedroom	100	✓
	28	LKD	100	✓
	29	Bedroom	100	✓
412	30	Bedroom	100	✓
	31	LKD	100	✓
	32	Bedroom	100	✓
413	33	LKD	97	✓
	34	Bedroom	100	✓
414	35	Bedroom	100	✓
	36	Bedroom	100	✓
	37	Bedroom	67	✓

13.1.10 Block F - Level 05

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
501	1	LKD	84	✓
	2	Bedroom	100	✓
502	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
503	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
504	9	Bedroom	100	✓
	10	LKD	100	✓
	11	Bedroom	100	✓
505	12	LKD	78	✓
	13	Bedroom	100	✓
506	14	Bedroom	100	✓
	15	LKD	100	✓
	16	Bedroom	100	✓
507	17	Bedroom	100	✓

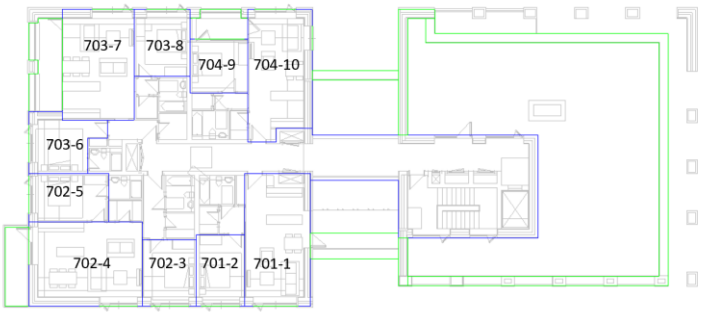
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
	18	LKD	77	✓
508	19	Bedroom	100	✓
	20	LKD	100	✓
	21	Bedroom	100	✓
509	22	LKD	92	✓
	23	Bedroom	100	✓
510	24	Bedroom	100	✓
	25	LKD	100	✓
	26	Bedroom	100	✓
511	27	Bedroom	100	✓
	28	LKD	100	✓
	29	Bedroom	100	✓
512	30	Bedroom	100	✓
	31	LKD	100	✓
	32	Bedroom	100	✓
513	33	LKD	100	✓
	34	Bedroom	100	✓
514	35	Bedroom	100	✓
	36	Bedroom	100	✓
	37	Bedroom	84	✓

13.1.11 Block F - Level 06



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
601	1	LKD	100	✓
	2	Bedroom	100	✓
602	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
603	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
604	9	Bedroom	100	✓
	10	LKD	99	✓
	11	Bedroom	100	✓
605	12	LKD	80	✓
	13	Bedroom	100	✓
606	14	Bedroom	100	✓
	15	LKD	100	✓
607	16	Bedroom	100	✓
	17	LKD	100	✓
	18	Bedroom	100	✓

13.1.12 Block F - Level 07



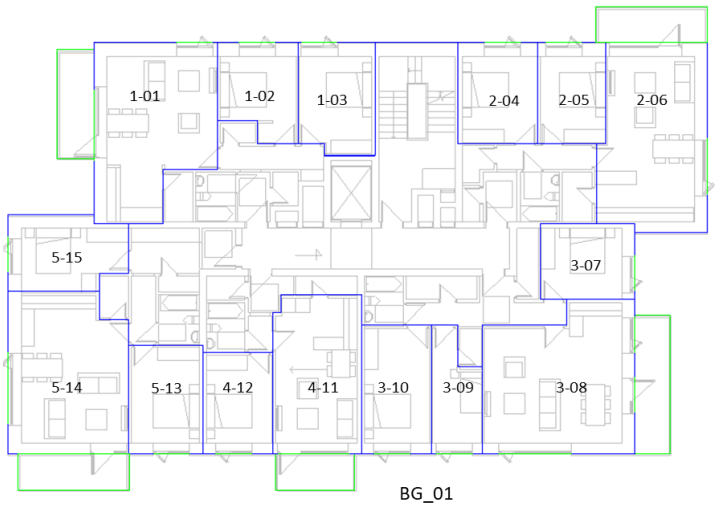
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
			Floor Area > E_T (%)	Comment
701	1	LKD	100	✓
	2	Bedroom	100	✓
702	3	Bedroom	100	✓
	4	LKD	100	✓
	5	Bedroom	100	✓
703	6	Bedroom	100	✓
	7	LKD	100	✓
	8	Bedroom	100	✓
704	9	Bedroom	100	✓
	10	LKD	100	✓

13.1.13 Block G - Level 00

BG_00

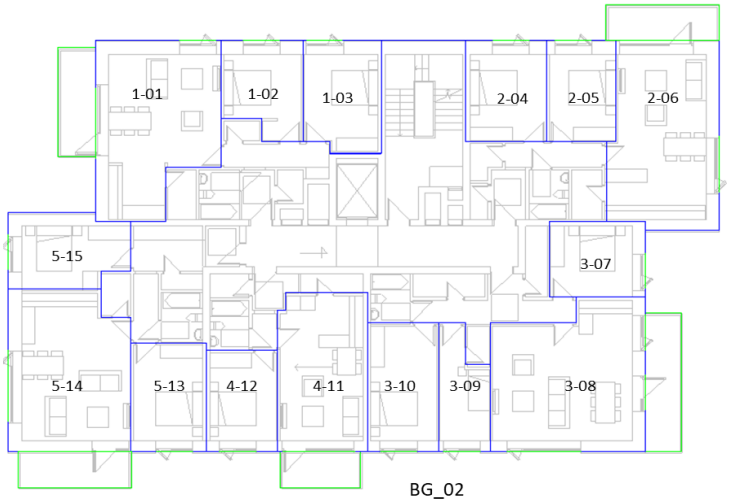
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
2	4	LKD	100	✓
	5	Bedroom	100	✓
	6	LKD	100	✓
3	7	Bedroom	93	✓
	8	Bedroom	100	✓
	9	LKD	100	✓

13.1.14 Block G - Level 01



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
2	4	Bedroom	100	✓
	5	Bedroom	100	✓
	6	LKD	100	✓
3	7	Bedroom	100	✓
	8	LKD	100	✓
	9	Bedroom	100	✓
	10	Bedroom	100	✓
4	11	LKD	59	✓
	12	Bedroom	100	✓
5	13	Bedroom	100	✓
	14	LKD	100	✓
	15	Bedroom	100	✓

13.1.15 Block G - Level 02



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
2	4	Bedroom	100	✓
	5	Bedroom	100	✓
	6	LKD	100	✓
3	7	Bedroom	100	✓
	8	LKD	100	✓
	9	Bedroom	100	✓
	10	Bedroom	100	✓
4	11	LKD	95	✓
	12	Bedroom	100	✓
5	13	Bedroom	100	✓
	14	LKD	100	✓
	15	Bedroom	100	✓

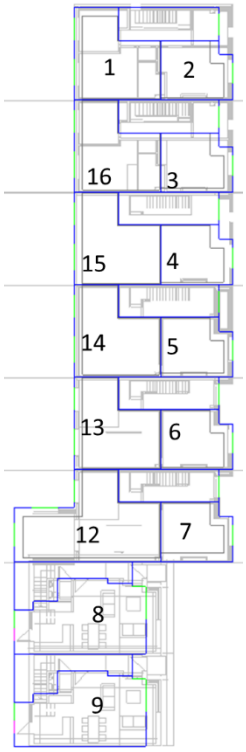
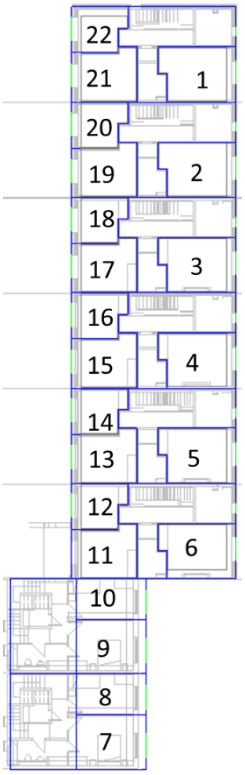
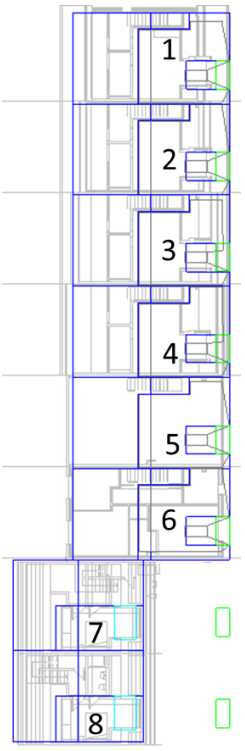
13.1.16 Block G - Level 03

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
2	4	Bedroom	100	✓
	5	Bedroom	100	✓
	6	LKD	100	✓
3	7	Bedroom	100	✓
	8	LKD	100	✓
	9	Bedroom	100	✓
	10	Bedroom	100	✓
4	11	LKD	100	✓
	12	Bedroom	100	✓
5	13	Bedroom	100	✓
	14	LKD	100	✓
	15	Bedroom	100	✓

13.1.17 Block G - Level 04

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2	
			Floor Area > E_T (%)	Comment
1	1	LKD	100	✓
	2	Bedroom	100	✓
	3	Bedroom	100	✓
2	4	Bedroom	100	✓
	5	Bedroom	100	✓
	6	LKD	100	✓

13.1.18 Houses Types H4A, H4A1, H4B & H4B1

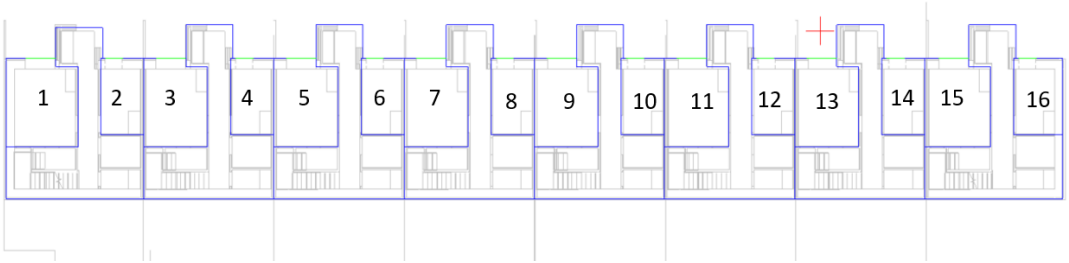
L00	L01	L02
		

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
					Floor Area > E_T (%)	Comment
L00	H4A1	1	1	KD	100	✓
			2	Living	63	✓
	H4A	2	3	Living	64	✓
		3	4	Living	57	✓
		4	5	Living	55	✓
		5	6	Living	63	✓
	H4B	6	7	Living	81	✓
	H3B	7	8	LKD	64	✓
	H3B	8	9	LKD	100	✓
	H4B	6	10	LKD	100	✓
	H4A	5	11	KD	100	✓
		4	12	KD	100	✓
		3	13	KD	100	✓
		2	14	KD	100	✓
L01	H4A1	1	1	Bedroom	100	✓
	H4A	2	2	Bedroom	100	✓
		3	3	Bedroom	100	✓
		4	4	Bedroom	100	✓
		5	5	Bedroom	100	✓
	H4B	6	6	Bedroom	100	✓
	H3B	8	7	Bedroom	100	✓
			8	Bedroom	100	✓
	H3B	7	9	Bedroom	100	✓
			10	Bedroom	100	✓
	H4B	6	11	Bedroom	100	✓
			12	Bedroom	100	✓
	H4A	5	13	Bedroom	100	✓
			14	Bedroom	100	✓
		4	15	Bedroom	100	✓
			16	Bedroom	100	✓
		3	17	Bedroom	100	✓
			18	Bedroom	100	✓
		2	19	Bedroom	100	✓
			20	Bedroom	100	✓
	H4A1	1	21	Bedroom	100	✓
			22	Bedroom	100	✓
L02	H4A1	1	1	Bedroom	100	✓
	H4A	2	2	Bedroom	100	✓
		3	3	Bedroom	100	✓
		4	4	Bedroom	100	✓

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
					Floor Area > E_T (%)	Comment
		5	5	Bedroom	100	✓
	H4B	6	6	Bedroom	100	✓
	H3B	7	7	Bedroom	100	✓
	H3B	8	8	Bedroom	100	✓

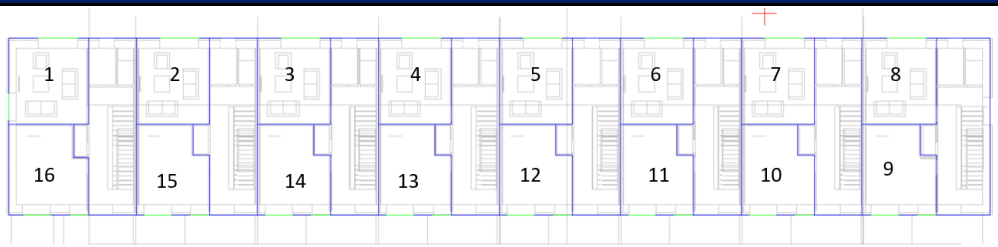
13.1.19 Duplexes Types D3A & D3AR

L00

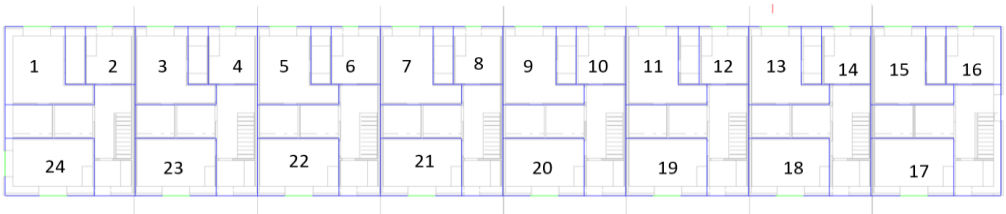


L01

L02



L03

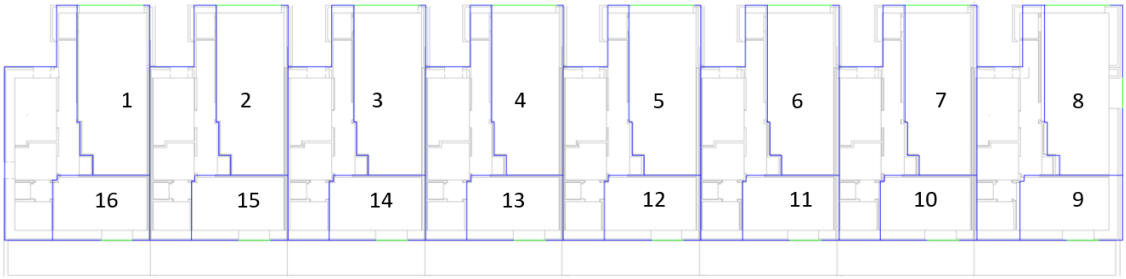


Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
					Floor Area > E_T (%)	Comment
L00	D3AR	1	1	Bedroom	100	✓
			2	Bedroom	95	✓
	D3A	1	3	Bedroom	100	✓
			4	Bedroom	100	✓
		2	5	Bedroom	100	✓
			6	Bedroom	100	✓
		3	7	Bedroom	100	✓
			8	Bedroom	100	✓
		4	9	Bedroom	100	✓
			10	Bedroom	100	✓
		5	11	Bedroom	100	✓
			12	Bedroom	100	✓
		6	13	Bedroom	100	✓
			14	Bedroom	50	✓
		7	15	Bedroom	100	✓
			16	Bedroom	100	✓
L01	D3AR	1	1	Bedroom	100	✓
			2	Living	100	✓
	D3A	1	3	Bedroom	100	✓
			4	Living	100	✓
		2	5	Bedroom	100	✓
			6	Living	100	✓
		3	7	Bedroom	100	✓
			8	Living	100	✓
		4	9	Bedroom	100	✓
			10	Living	100	✓
		5	11	Bedroom	100	✓
			12	Living	100	✓
		6	13	Bedroom	100	✓
			14	Living	100	✓
		7	15	Bedroom	100	✓
			16	Living	100	✓
			17	KD	100	✓
		6	18	KD	100	✓
		5	19	KD	100	✓
		4	20	KD	100	✓
		3	21	KD	100	✓
		2	22	KD	100	✓
		1	23	KD	100	✓
	D3AR	1	24	KD	100	✓

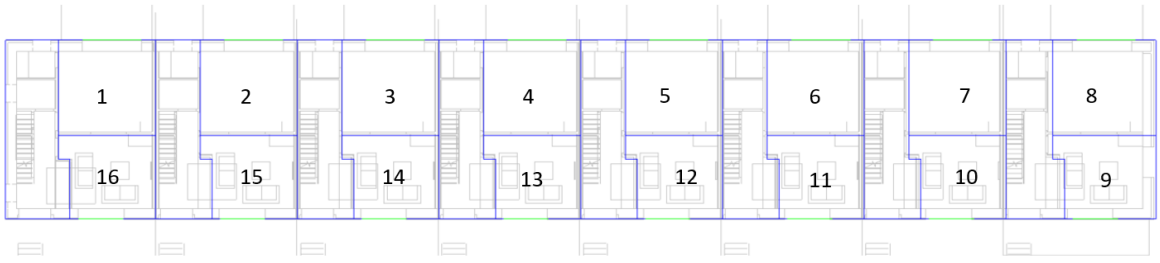
Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
					Floor Area > E_T (%)	Comment
L02	D3AR	2	1	Living	100	✓
	D3A	8	2	Living	100	✓
		9	3	Living	100	✓
		10	4	Living	100	✓
		11	5	Living	100	✓
		12	6	Living	100	✓
		13	7	Living	100	✓
		14	8	Living	100	✓
			9	KD	100	✓
		13	10	KD	100	✓
		12	11	KD	100	✓
		11	12	KD	100	✓
		10	13	KD	100	✓
		9	14	KD	99	✓
		8	15	KD	100	✓
	D3AR	2	16	KD	100	✓
L03	D3AR	2	1	Bedroom	100	✓
			2	Bedroom	100	✓
	D3A	8	3	Bedroom	100	✓
			4	Bedroom	100	✓
		9	5	Bedroom	100	✓
			6	Bedroom	100	✓
		10	7	Bedroom	100	✓
			8	Bedroom	100	✓
		11	9	Bedroom	100	✓
			10	Bedroom	100	✓
		12	11	Bedroom	100	✓
			12	Bedroom	100	✓
		13	13	Bedroom	100	✓
			14	Bedroom	100	✓
		14	15	Bedroom	100	✓
			16	Bedroom	100	✓
			17	Bedroom	100	✓
		13	18	Bedroom	100	✓
		12	19	Bedroom	100	✓
		11	20	Bedroom	100	✓
		10	21	Bedroom	100	✓
		9	22	Bedroom	100	✓
		8	23	Bedroom	100	✓
	D3AR	2	24	Bedroom	100	✓

13.1.20 Duplexes Types D3C, D3CR & D3CL

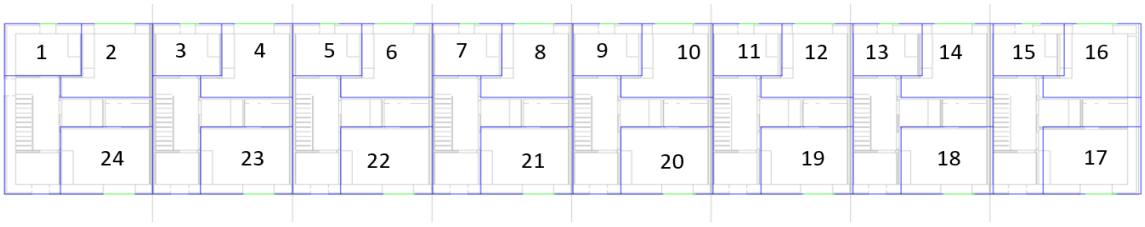
L00



L01



L02



Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
					Floor Area > E_T (%)	Comment
L00	D3CL	1	1	LKD	58	✓
	D3C	1	2	LKD	52	✓
		2	3	LKD	51	✓
		3	4	LKD	52	✓
		4	5	LKD	50	✓
		5	6	LKD	51	✓
		6	7	LKD	51	✓
	D3CR	1	8	LKD	85	✓
			9	Bedroom	93	✓
	D3C	6	10	Bedroom	90	✓
		5	11	Bedroom	90	✓
		4	12	Bedroom	88	✓
		3	13	Bedroom	90	✓
		2	14	Bedroom	92	✓
		1	15	Bedroom	89	✓
	D3CL	1	16	Bedroom	86	✓
L01	D3CL	2	1	KD	100	✓
	D3C	7	2	KD	100	✓
		8	3	KD	100	✓
		9	4	KD	100	✓
		10	5	KD	100	✓
		11	6	KD	98	✓
		12	7	KD	100	✓
	D3CR	2	8	KD	100	✓
			9	Living	100	✓
	D3C	12	10	Living	100	✓
		11	11	Living	100	✓
		10	12	Living	100	✓
		9	13	Living	100	✓
		8	14	Living	100	✓
		7	15	Living	100	✓
	D3CL	2	16	Living	100	✓
L02	D3CL	2	1	Bedroom	100	✓
			2	Bedroom	100	✓
	D3C	7	3	Bedroom	100	✓
			4	Bedroom	100	✓
		8	5	Bedroom	100	✓
			6	Bedroom	100	✓
		9	7	Bedroom	100	✓

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
					Floor Area > E_T (%)	Comment
			8	Bedroom	100	✓
		10	9	Bedroom	100	✓
			10	Bedroom	100	✓
		11	11	Bedroom	100	✓
			12	Bedroom	100	✓
		12	13	Bedroom	100	✓
			14	Bedroom	100	✓
	D3CR	2	15	Bedroom	100	✓
			16	Bedroom	100	✓
			17	Bedroom	100	✓
	D3C	12	18	Bedroom	100	✓
		11	19	Bedroom	100	✓
		10	20	Bedroom	100	✓
		9	21	Bedroom	100	✓
		8	22	Bedroom	100	✓
		7	23	Bedroom	100	✓
	D3CL	2	24	Bedroom	100	✓

13.2 Compensatory Measures Table for BS EN (Apartment Blocks)

Unit	IES Ref	Unit GIA (m^2)	Compensatory Measures					
			Unit floor area > minimum standard	Unit floor area ≥ 10% minimum standard	Private amenity area ≥ minimum standard	Unit has direct access to private amenity space	Unit overlooks public or communal open space	Floor to ceiling height in excess of 2.4m
Block F - Level 01								
L01: BF-101_Living/Kitchen	1	56	✓	✓	✓	✓	✓	✓
L01: BF-107_Living/Kitchen	18	56.6	✓	✓	✓	✓		✓
L01: BF-108_Living/Kitchen	20	72.6	✓	✓	✓	✓		✓
L01: BF-113_Living/Kitchen	24	54.8	✓	✓	✓	✓		✓
L01: BF-112_Living/Kitchen	32	53.6	✓	✓	✓	✓	✓	✓

14 Appendix B – Sunlight Exposure Results

14.1 Sunlight Exposure Results

The IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition) sunlight exposure results tabulated in Section 8.2 for 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.

14.1.1 View 01 – Block E

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

8 out of 8 windows passing

14.1.2 View 02 – Block F

Receives more than 1.5 hours of sunlight

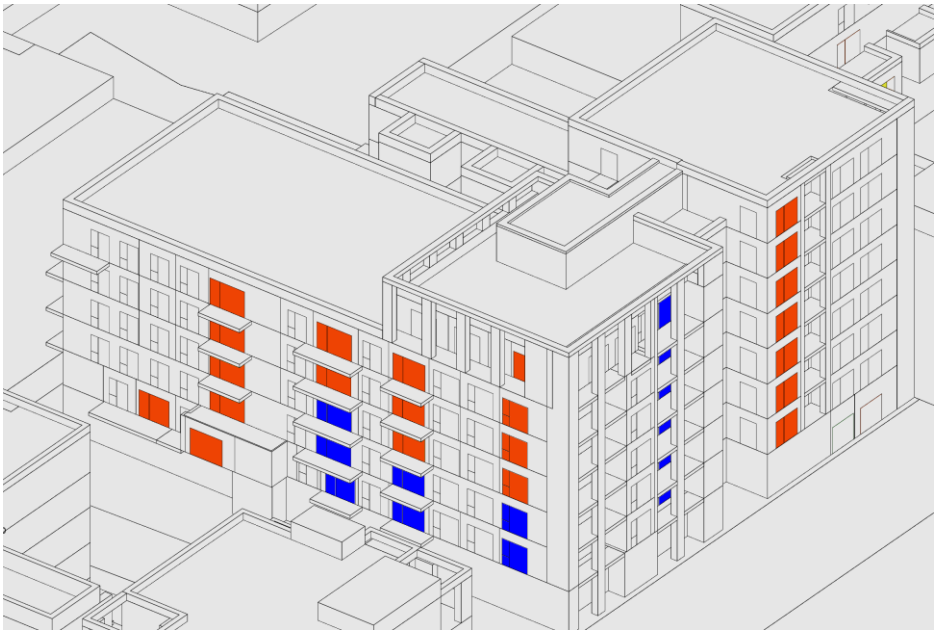
Receives less than 1.5 hours of sunlight

47 out of 47 windows passing

14.1.3 View 03 – Block F

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

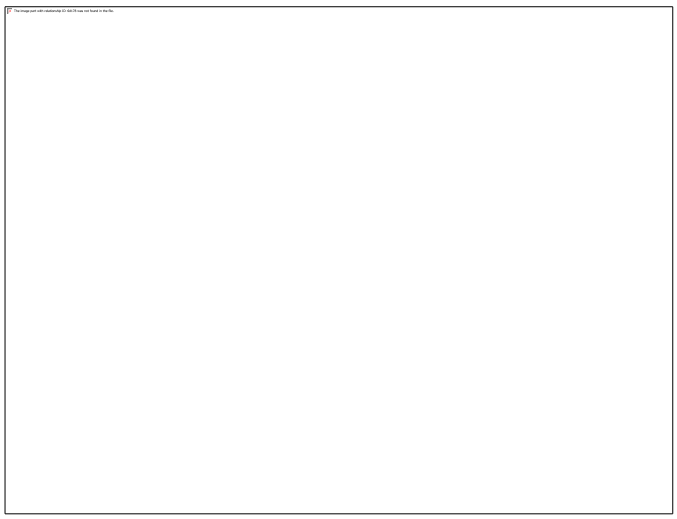


22 out of 35 windows passing

14.1.4 View 04 – Block F

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

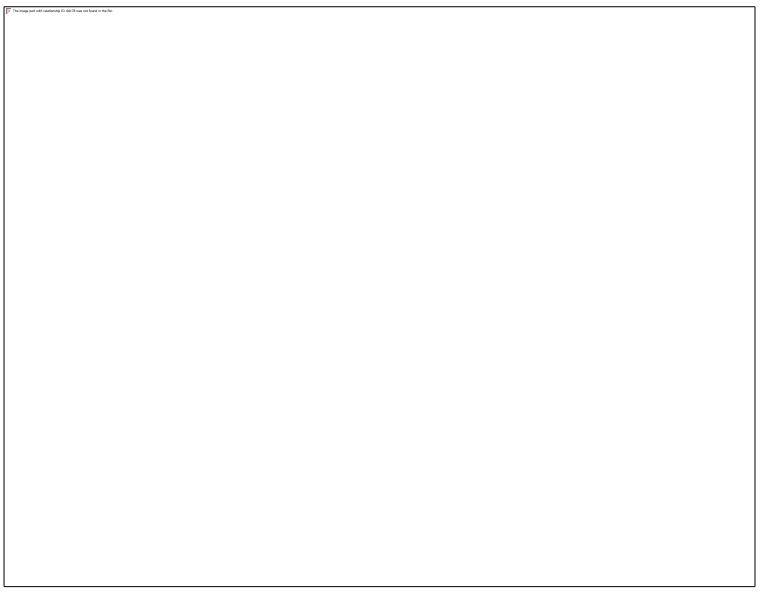


3 out of 3 windows passing

14.1.5 View 05 – Block G

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

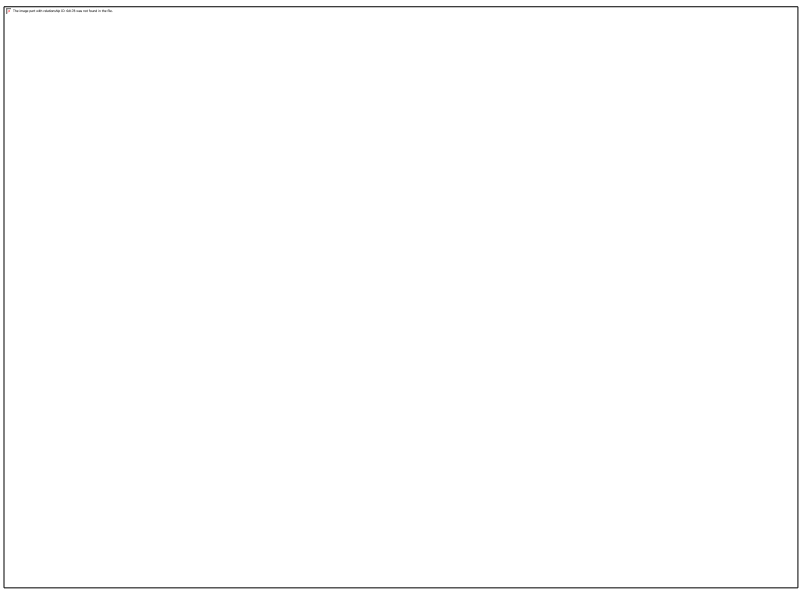


14 out of 14 windows passing

14.1.6 View 06 – Block G

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

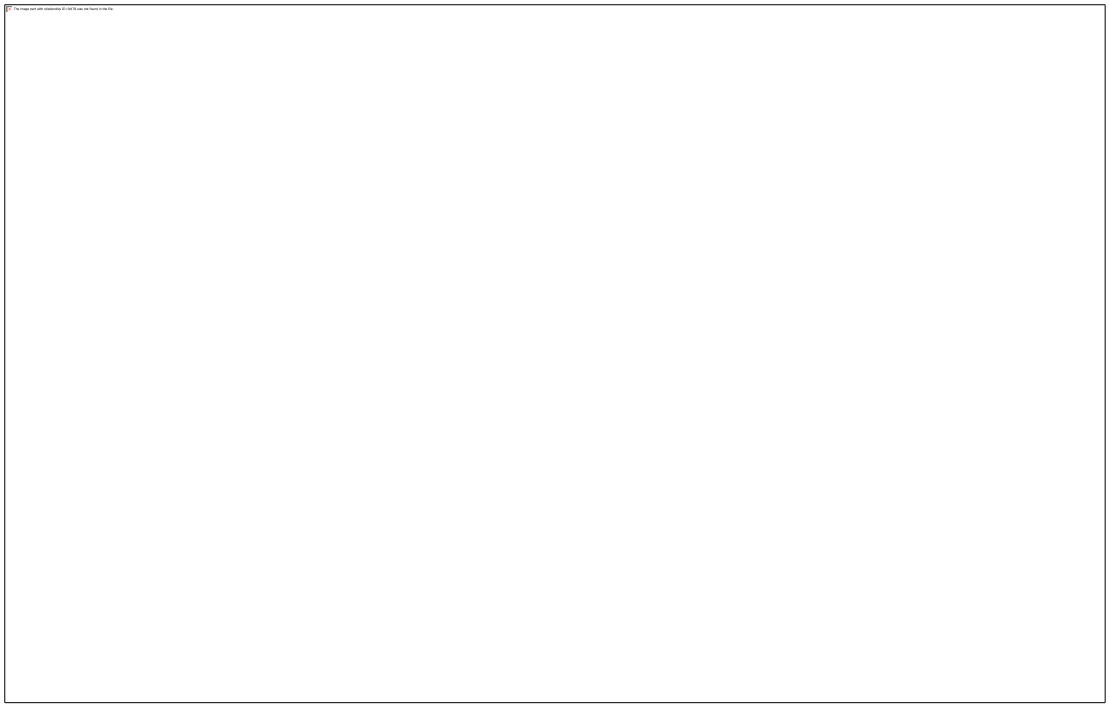


4 out of 6 windows passing

14.1.7 View 07 – Houses & Duplexes

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight



40 out of 40 windows passing

15 Appendix C – For Context & Information Only

15.1 BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021

As outlined in Section 5.1.2 of the IS EN 17037-2018+A1-2021 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+A1-2021 gives three levels of recommendation for the assessment of daylight provision in interior spaces which are summarised as follows:

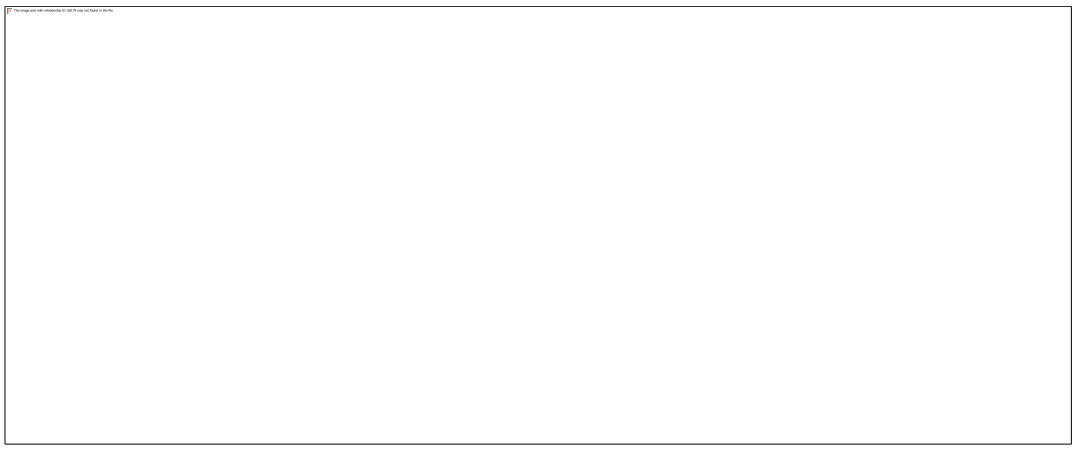
"The three levels are: minimum, medium and high, and the minimum recommendation should be provided."

It is important to note that IS EN 17037-2018+A1-2021 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+A1-2021 (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.

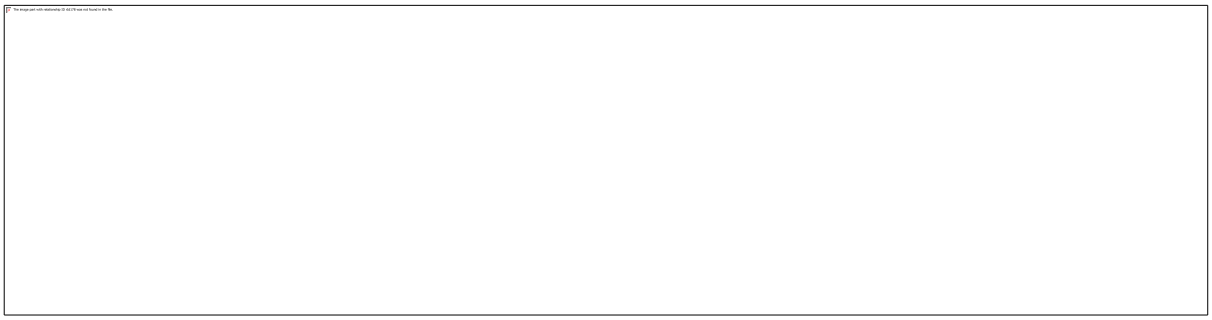
To achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.1, the following must be achieved:

- 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.



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%.



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+A1-2021.

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.

15.2 Daylight Provision Results – Proposed Development

Daylight Provision Results – Proposed Development

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 standard are included in each table:

- BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021

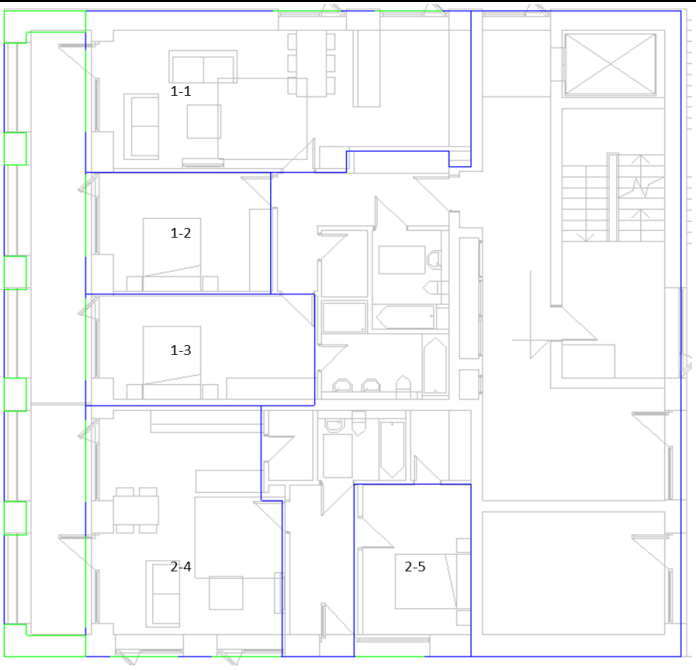
Please note, the "Comment" symbol in each of the tables represents the following:

BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021

✓ 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.

15.2.1 Block E - Level 00



BE_L00

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	LKD	99	100	✓
	2	Bedroom	74	100	✓
2	3	Bedroom	42	100	x
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓

15.2.2 Block E - Level 01

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
101	1	LKD	100	100	✓
	2	Bedroom	100	100	✓
	3	Bedroom	50	100	✓
102	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
	6	Bedroom	100	100	✓

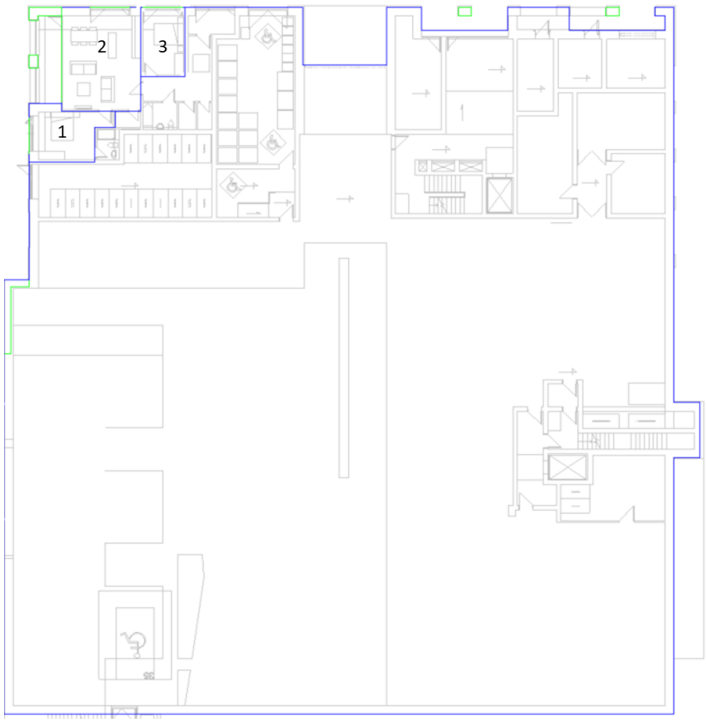
15.2.3 Block E - Level 02

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
201	1	LKD	99	100	✓
	2	Bedroom	81	100	✓
	3	Bedroom	43	100	x
202	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
	6	Bedroom	100	100	✓

15.2.4 Block E - Level 03

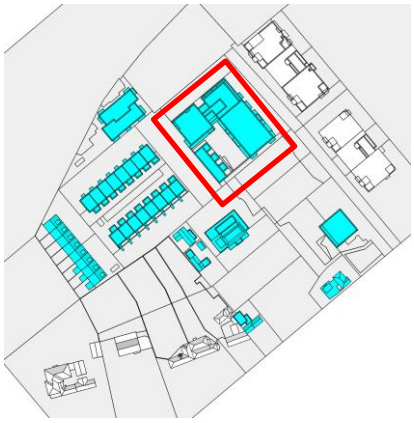
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
301	1	LKD	100	100	✓
	2	Bedroom	74	100	✓
	3	Bedroom	43	100	x
302	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
	6	Bedroom	100	100	✓

15.2.5 Block F - Level 00



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	Bedroom	98	100	✓
	2	LKD	100	100	✓
	3	Bedroom	100	100	✓

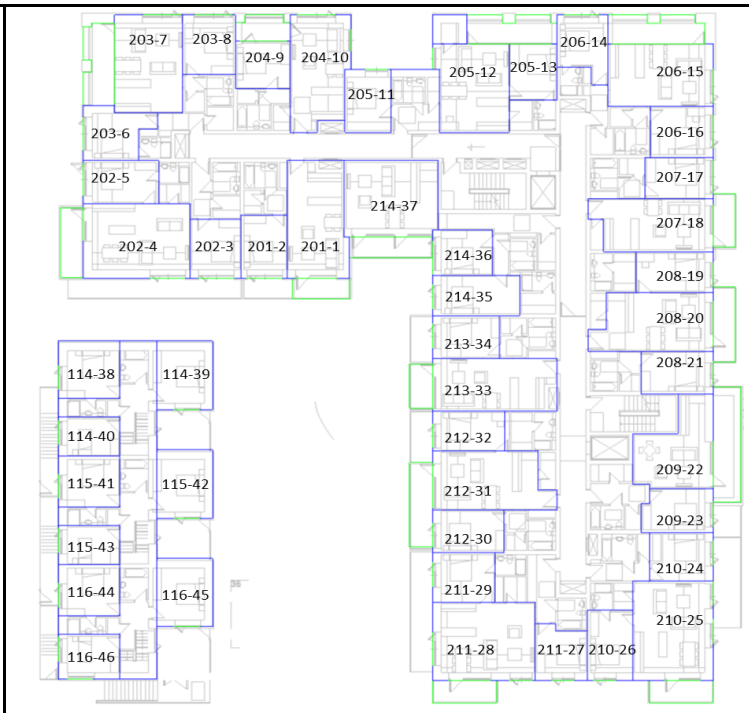
15.2.6 Block F - Level 01



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
101	1	LKD	30	82	x
	2	Bedroom	86	100	✓
102	3	Bedroom	83	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
103	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
104	9	Bedroom	100	100	✓
	10	LKD	71	100	✓
	11	Bedroom	96	100	✓
105	12	LKD	33	100	x
	13	Bedroom	100	100	✓
106	14	Bedroom	100	100	✓
	15	LKD	100	100	✓
	16	Bedroom	100	100	✓
107	17	Bedroom	92	100	✓
	18	LKD	25	74	x
108	19	Bedroom	31	100	x
	20	LKD	17	54	x

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
	21	Bedroom	50	100	✓
109	22	LKD	38	100	x
	23	Bedroom	31	100	x
113	24	LKD	28	70	x
	25	Bedroom	50	100	✓
110	26	Bedroom	100	100	✓
	27	LKD	100	100	✓
	28	Bedroom	100	100	✓
111	29	Bedroom	50	100	✓
	30	LKD	38	84	x
	31	Bedroom	56	100	✓
112	32	LKD	34	75	x
	33	Bedroom	53	100	✓
114	34	LKD	18	100	x
115	35	LKD	89	100	✓
116	36	LKD	100	100	✓

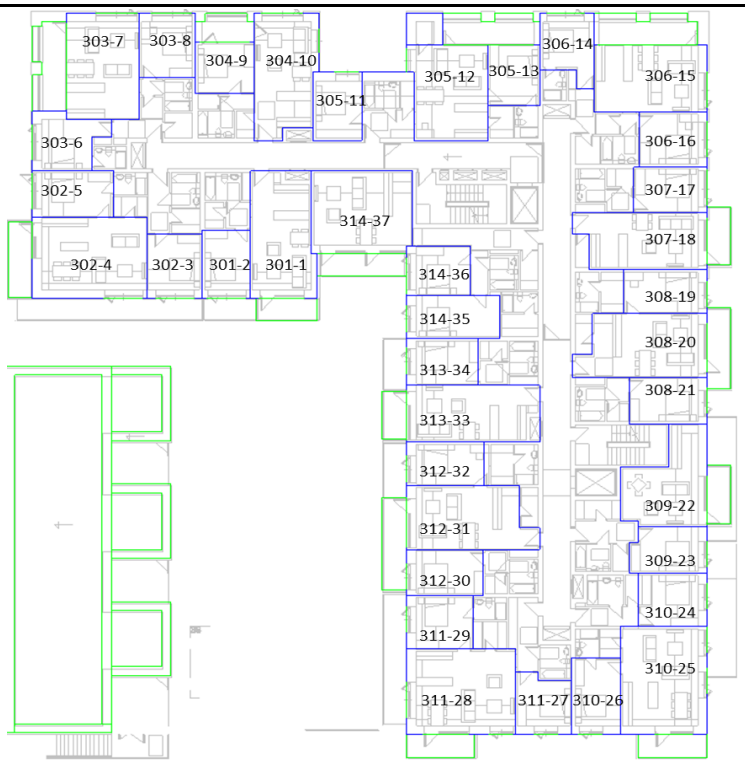
15.2.7 Block F - Level 02



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
201	1	LKD	32	90	x
	2	Bedroom	100	100	✓
202	3	Bedroom	97	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
203	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
204	9	Bedroom	100	100	✓
	10	LKD	69	100	✓
	11	Bedroom	96	100	✓
205	12	LKD	34	100	x
	13	Bedroom	100	100	✓
206	14	Bedroom	100	100	✓
	15	LKD	100	100	✓
	16	Bedroom	100	100	✓
207	17	Bedroom	98	100	✓
	18	LKD	30	76	x
208	19	Bedroom	40	100	x
	20	LKD	30	82	x

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
	21	Bedroom	42	100	x
209	22	LKD	34	92	x
	23	Bedroom	47	100	x
210	24	Bedroom	54	100	✓
	25	LKD	100	100	✓
	26	Bedroom	98	100	✓
211	27	Bedroom	100	100	✓
	28	LKD	100	100	✓
	29	Bedroom	100	100	✓
212	30	Bedroom	96	100	✓
	31	LKD	58	100	✓
	32	Bedroom	83	100	✓
213	33	LKD	45	95	x
	34	Bedroom	78	100	✓
214	35	Bedroom	33	100	x
	36	Bedroom	40	100	x
	37	Bedroom	100	100	✓
114	38	Bedroom	19	70	x
	39	Bedroom	100	100	✓
	40	Bedroom	100	100	✓
115	41	Bedroom	31	100	x
	42	Bedroom	100	100	✓
	43	Bedroom	100	100	✓
116	44	Bedroom	100	100	✓
	45	Bedroom	100	100	✓
	46	LKD	32	90	x

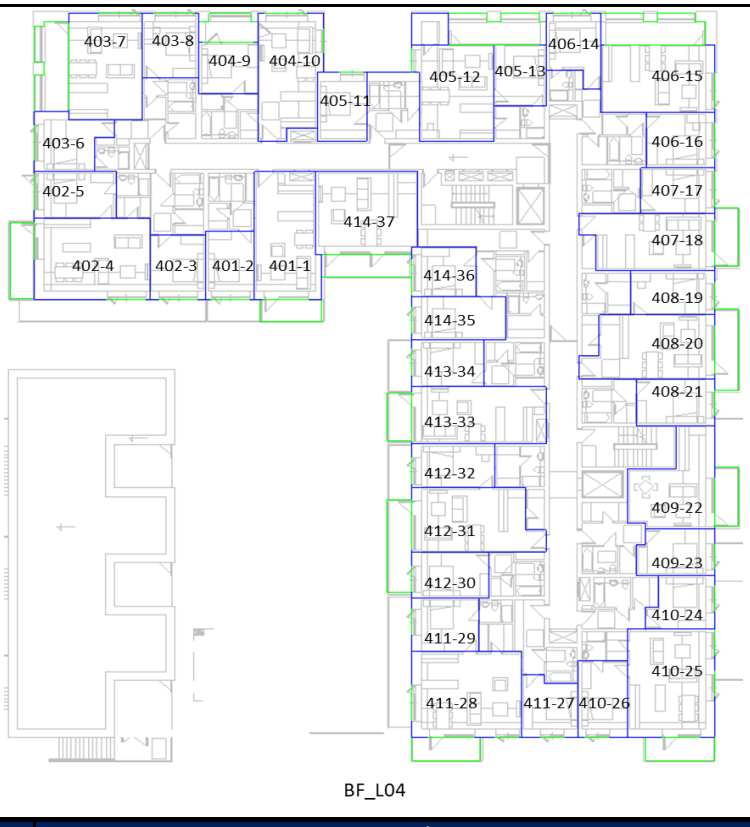
15.2.8 Block F - Level 03



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
301	1	LKD	40	100	x
	2	Bedroom	100	100	✓
302	3	Bedroom	100	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
303	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
304	9	Bedroom	100	100	✓
	10	LKD	72	100	✓
	11	Bedroom	97	100	✓
305	12	LKD	36	100	x
	13	Bedroom	100	100	✓
306	14	Bedroom	100	100	✓
	15	LKD	100	100	✓
	16	Bedroom	100	100	✓
307	17	Bedroom	100	100	✓

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
	18	LKD	36	92	x
308	19	Bedroom	50	100	✓
	20	LKD	41	96	x
	21	Bedroom	50	100	✓
309	22	LKD	56	95	✓
	23	Bedroom	62	100	✓
310	24	Bedroom	68	100	✓
	25	LKD	100	100	✓
	26	Bedroom	99	100	✓
311	27	Bedroom	100	100	✓
	28	LKD	100	100	✓
	29	Bedroom	100	100	✓
312	30	Bedroom	100	100	✓
	31	LKD	70	100	✓
	32	Bedroom	100	100	✓
313	33	LKD	54	100	✓
	34	Bedroom	100	100	✓
314	35	Bedroom	43	100	x
	36	Bedroom	54	100	✓
	37	Bedroom	40	100	x

15.2.9 Block F - Level 04



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
401	1	LKD	50	100	✓
	2	Bedroom	100	100	✓
402	3	Bedroom	100	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
403	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
404	9	Bedroom	100	100	✓
	10	LKD	71	100	✓
	11	Bedroom	99	100	✓
405	12	LKD	39	100	x
	13	Bedroom	100	100	✓
406	14	Bedroom	100	100	✓
	15	LKD	100	100	✓
	16	Bedroom	100	100	✓
407	17	Bedroom	100	100	✓
	18	LKD	43	98	x

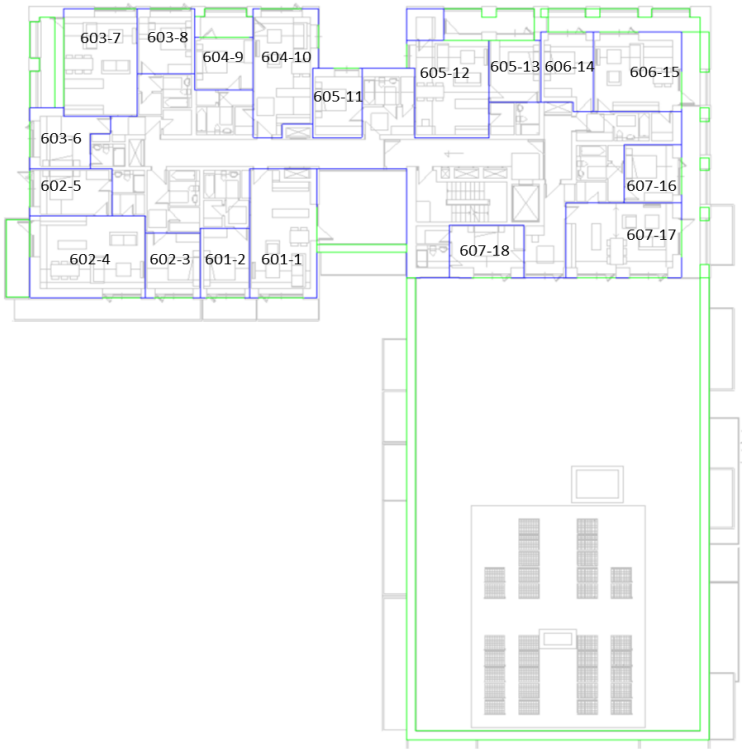
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
408	19	Bedroom	56	100	✓
	20	LKD	47	98	x
	21	Bedroom	58	100	✓
409	22	LKD	70	97	✓
	23	Bedroom	74	100	✓
410	24	Bedroom	97	100	✓
	25	LKD	100	100	✓
	26	Bedroom	100	100	✓
411	27	Bedroom	100	100	✓
	28	LKD	100	100	✓
	29	Bedroom	100	100	✓
412	30	Bedroom	100	100	✓
	31	LKD	79	100	✓
	32	Bedroom	100	100	✓
413	33	LKD	60	100	✓
	34	Bedroom	100	100	✓
414	35	Bedroom	81	100	✓
	36	Bedroom	74	100	✓
	37	Bedroom	50	100	✓

15.2.10 Block F - Level 05

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
501	1	LKD	61	100	✓
	2	Bedroom	100	100	✓
502	3	Bedroom	100	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
503	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
504	9	Bedroom	100	100	✓
	10	LKD	73	100	✓
	11	Bedroom	99	100	✓
505	12	LKD	40	100	x
	13	Bedroom	100	100	✓
506	14	Bedroom	100	100	✓
	15	LKD	100	100	✓
	16	Bedroom	100	100	✓
507	17	Bedroom	100	100	✓

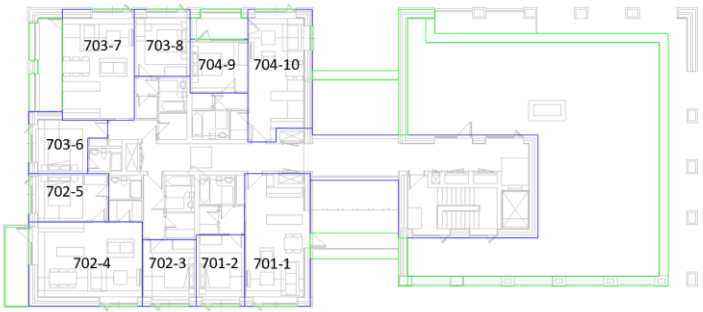
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
	18	LKD	56	100	✓
508	19	Bedroom	67	100	✓
	20	LKD	73	100	✓
	21	Bedroom	75	100	✓
509	22	LKD	89	100	✓
	23	Bedroom	88	100	✓
510	24	Bedroom	97	100	✓
	25	LKD	100	100	✓
	26	Bedroom	100	100	✓
511	27	Bedroom	100	100	✓
	28	LKD	100	100	✓
	29	Bedroom	100	100	✓
512	30	Bedroom	100	100	✓
	31	LKD	95	100	✓
	32	Bedroom	100	100	✓
513	33	LKD	100	100	✓
	34	Bedroom	100	100	✓
514	35	Bedroom	100	100	✓
	36	Bedroom	94	100	✓
	37	Bedroom	61	100	✓

15.2.11 Block F - Level 06



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
601	1	LKD	95	100	✓
	2	Bedroom	100	100	✓
602	3	Bedroom	100	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
603	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
604	9	Bedroom	100	100	✓
	10	LKD	72	100	✓
	11	Bedroom	100	100	✓
605	12	LKD	41	100	x
	13	Bedroom	100	100	✓
606	14	Bedroom	100	100	✓
	15	LKD	100	100	✓
607	16	Bedroom	100	100	✓
	17	LKD	100	100	✓
	18	Bedroom	100	100	✓

15.2.12 Block F - Level 07



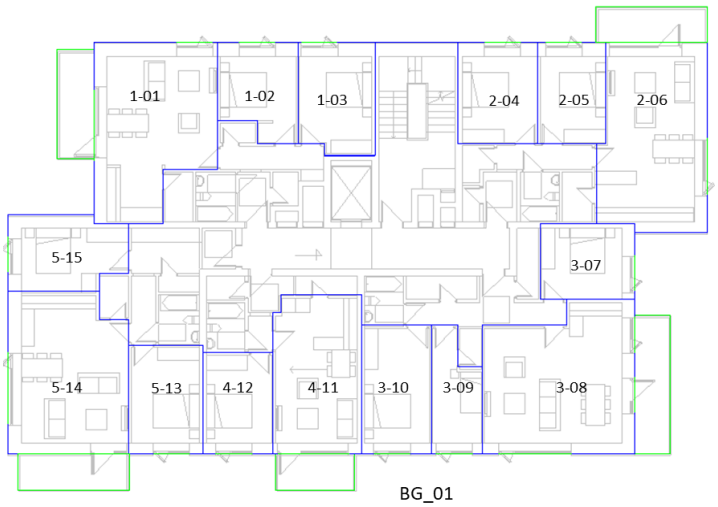
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
701	1	LKD	88	100	✓
	2	Bedroom	100	100	✓
702	3	Bedroom	100	100	✓
	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
703	6	Bedroom	100	100	✓
	7	LKD	100	100	✓
	8	Bedroom	100	100	✓
704	9	Bedroom	100	100	✓
	10	LKD	78	100	✓

15.2.13 Block G - Level 00

BG_00

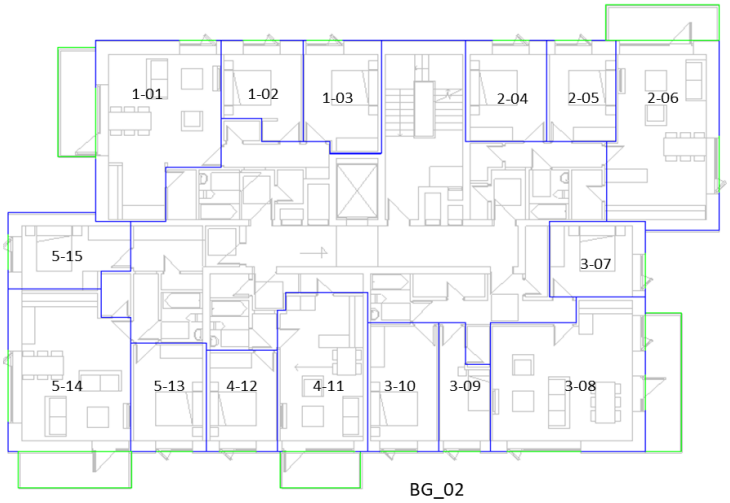
Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	LKD	100	100	✓
	2	Bedroom	100	100	✓
	3	Bedroom	96	100	✓
2	4	LKD	100	100	✓
	5	Bedroom	100	100	✓
	6	LKD	100	100	✓
3	7	Bedroom	25	93	x
	8	Bedroom	100	100	✓
	9	LKD	100	100	✓

15.2.14 Block G - Level 01



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	LKD	100	100	✓
	2	Bedroom	100	100	✓
	3	Bedroom	99	100	✓
2	4	Bedroom	100	100	✓
	5	Bedroom	100	100	✓
	6	LKD	100	100	✓
3	7	Bedroom	70	100	✓
	8	LKD	100	100	✓
	9	Bedroom	100	100	✓
	10	Bedroom	40	100	x
4	11	LKD	36	100	x
	12	Bedroom	50	100	✓
5	13	Bedroom	62	100	✓
	14	LKD	100	100	✓
	15	Bedroom	100	100	✓

15.2.15 Block G - Level 02



Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	LKD	100	100	✓
	2	Bedroom	100	100	✓
	3	Bedroom	98	100	✓
2	4	Bedroom	100	100	✓
	5	Bedroom	100	100	✓
	6	LKD	100	100	✓
3	7	Bedroom	80	100	✓
	8	LKD	100	100	✓
	9	Bedroom	100	100	✓
	10	Bedroom	55	100	✓
4	11	LKD	59	100	✓
	12	Bedroom	73	100	✓
5	13	Bedroom	76	100	✓
	14	LKD	100	100	✓
	15	Bedroom	100	100	✓

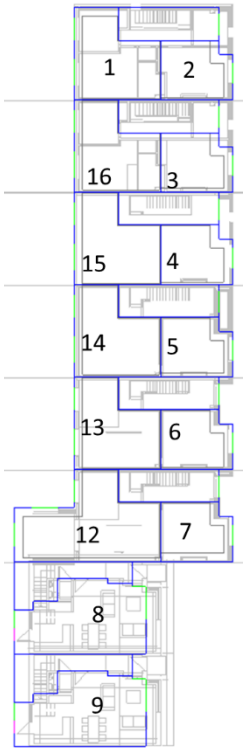
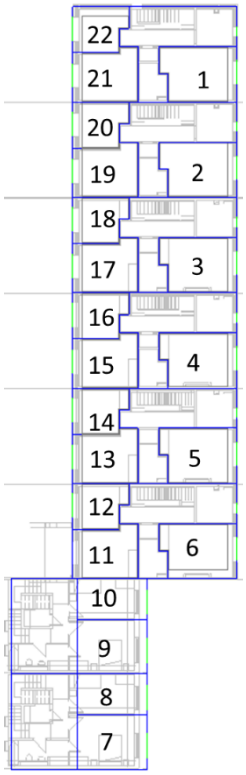
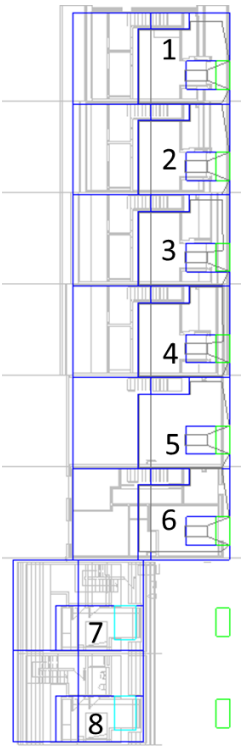
15.2.16 Block G - Level 03

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	LKD	100	100	✓
	2	Bedroom	100	100	✓
	3	Bedroom	96	100	✓
2	4	Bedroom	100	100	✓
	5	Bedroom	100	100	✓
	6	LKD	85	100	✓
3	7	Bedroom	84	100	✓
	8	LKD	100	100	✓
	9	Bedroom	100	100	✓
	10	Bedroom	74	100	✓
4	11	LKD	100	100	✓
	12	Bedroom	100	100	✓
5	13	Bedroom	100	100	✓
	14	LKD	100	100	✓
	15	Bedroom	100	100	✓

15.2.17 Block G - Level 04

Unit No.	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
			Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	1	LKD	100	100	✓
	2	Bedroom	100	100	✓
	3	Bedroom	99	100	✓
2	4	Bedroom	100	100	✓
	5	Bedroom	100	100	✓
	6	LKD	96	100	✓

15.2.18 Houses Types H4A, H4A1, H4B & H4B1

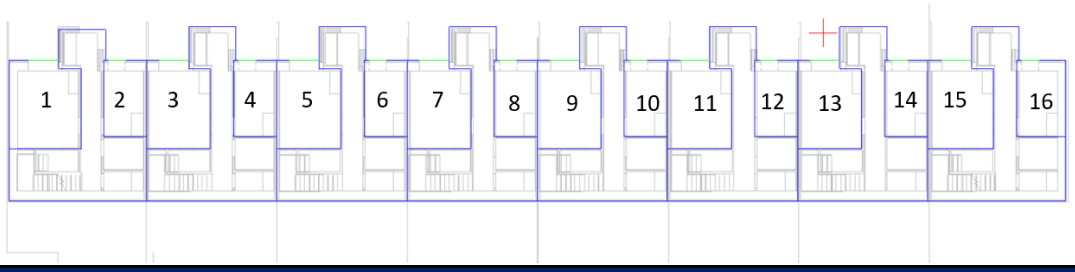
L00	L01	L02
		

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
L00	H4A1	1	1	KD	100	100	✓
			2	Living	24	93	x
	H4A	2	3	Living	21	99	x
		3	4	Living	19	91	x
		4	5	Living	21	89	x
		5	6	Living	25	97	x
	H4B	6	7	Living	26	96	x
	H3B	7	8	LKD	50	97	✓
	H3B	8	9	LKD	100	100	✓
	H4B	6	10	LKD	100	100	✓
	H4A	5	11	KD	100	100	✓
		4	12	KD	100	100	✓
		3	13	KD	100	100	✓
		2	14	KD	100	100	✓
L01	H4A1	1	1	Bedroom	60	100	✓
	H4A	2	2	Bedroom	57	100	✓
		3	3	Bedroom	58	100	✓
		4	4	Bedroom	58	100	✓
		5	5	Bedroom	67	100	✓
	H4B	6	6	Bedroom	86	100	✓
	H3B	8	7	Bedroom	98	100	✓
			8	Bedroom	100	100	✓
	H3B	7	9	Bedroom	100	100	✓
			10	Bedroom	100	100	✓
	H4B	6	11	Bedroom	100	100	✓
			12	Bedroom	100	100	✓
	H4A	5	13	Bedroom	100	100	✓
			14	Bedroom	100	100	✓
		4	15	Bedroom	100	100	✓
			16	Bedroom	100	100	✓
		3	17	Bedroom	100	100	✓
			18	Bedroom	100	100	✓
		2	19	Bedroom	100	100	✓
			20	Bedroom	100	100	✓
	H4A1	1	21	Bedroom	100	100	✓
			22	Bedroom	100	100	✓
L02	H4A1	1	1	Bedroom	100	100	✓
	H4A	2	2	Bedroom	100	100	✓
		3	3	Bedroom	100	100	✓

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
		4	4	Bedroom	100	100	✓
		5	5	Bedroom	100	100	✓
	H4B	6	6	Bedroom	100	100	✓
	H3B	7	7	Bedroom	100	100	✓
	H3B	8	8	Bedroom	100	100	✓

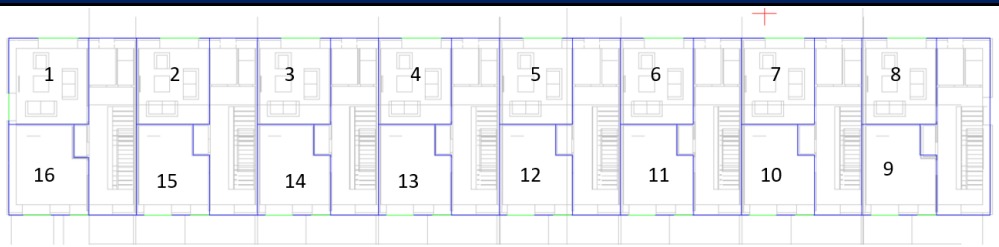
15.2.19 Duplexes Types D3A & D3AR

L00

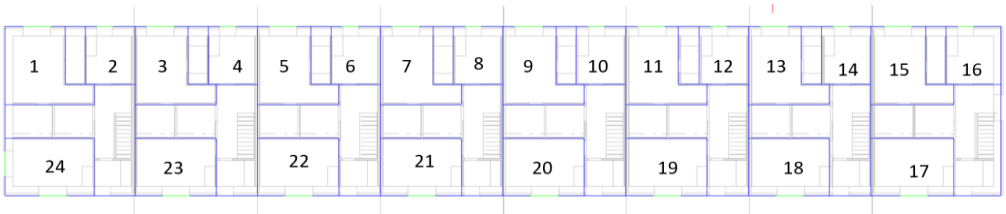


L01

L02



L03



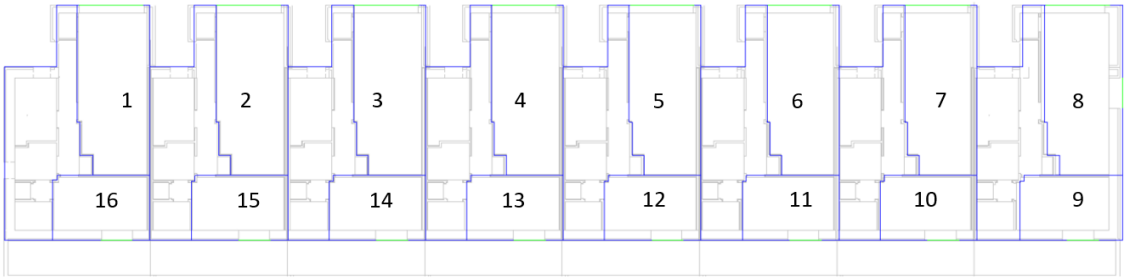
Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
L00	D3AR	1	1	Bedroom	53	100	✓
			2	Bedroom	25	95	x
	D3A	1	3	Bedroom	40	100	x
			4	Bedroom	31	100	x
		2	5	Bedroom	42	100	x
			6	Bedroom	31	100	x
		3	7	Bedroom	41	100	x
			8	Bedroom	28	100	x
		4	9	Bedroom	40	100	x
			10	Bedroom	31	100	x
		5	11	Bedroom	59	100	✓
			12	Bedroom	9	100	x
		6	13	Bedroom	20	100	x
			14	Bedroom	3	50	x
		7	15	Bedroom	7	100	x
			16	Bedroom	9	100	x
L01	D3AR	1	1	Bedroom	100	100	✓
			2	Living	100	100	✓
	D3A	1	3	Bedroom	97	100	✓
			4	Living	100	100	✓
		2	5	Bedroom	94	100	✓
			6	Living	100	100	✓
		3	7	Bedroom	88	100	✓
			8	Living	100	100	✓
		4	9	Bedroom	86	100	✓
			10	Living	100	100	✓
		5	11	Bedroom	73	100	✓
			12	Living	94	100	✓
		6	13	Bedroom	44	100	x
			14	Living	65	100	✓
		7	15	Bedroom	35	100	x
			16	Living	50	100	✓
			17	KD	100	100	✓
		6	18	KD	100	100	✓
		5	19	KD	100	100	✓
		4	20	KD	100	100	✓
		3	21	KD	100	100	✓
		2	22	KD	100	100	✓
		1	23	KD	100	100	✓

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
	D3AR	1	24	KD	100	100	✓
L02	D3AR	2	1	Living	100	100	✓
	D3A	8	2	Living	100	100	✓
		9	3	Living	100	100	✓
		10	4	Living	100	100	✓
		11	5	Living	100	100	✓
		12	6	Living	97	100	✓
		13	7	Living	78	100	✓
		14	8	Living	62	100	✓
			9	KD	95	100	✓
		13	10	KD	77	100	✓
		12	11	KD	71	100	✓
		11	12	KD	82	100	✓
		10	13	KD	82	100	✓
		9	14	KD	70	100	✓
		8	15	KD	74	100	✓
	D3AR	2	16	KD	100	100	✓
L03	D3AR	2	1	Bedroom	100	100	✓
			2	Bedroom	39	100	x
	D3A	8	3	Bedroom	96	100	✓
			4	Bedroom	36	100	x
		9	5	Bedroom	96	100	✓
			6	Bedroom	39	100	x
		10	7	Bedroom	96	100	✓
			8	Bedroom	31	100	x
		11	9	Bedroom	93	100	✓
			10	Bedroom	33	100	x
		12	11	Bedroom	93	100	✓
			12	Bedroom	31	100	x
		13	13	Bedroom	86	100	✓
			14	Bedroom	100	100	✓
		14	15	Bedroom	50	100	✓
			16	Bedroom	46	100	x
			17	Bedroom	99	100	✓
		13	18	Bedroom	97	100	✓
		12	19	Bedroom	99	100	✓
		11	20	Bedroom	99	100	✓
		10	21	Bedroom	99	100	✓
		9	22	Bedroom	99	100	✓

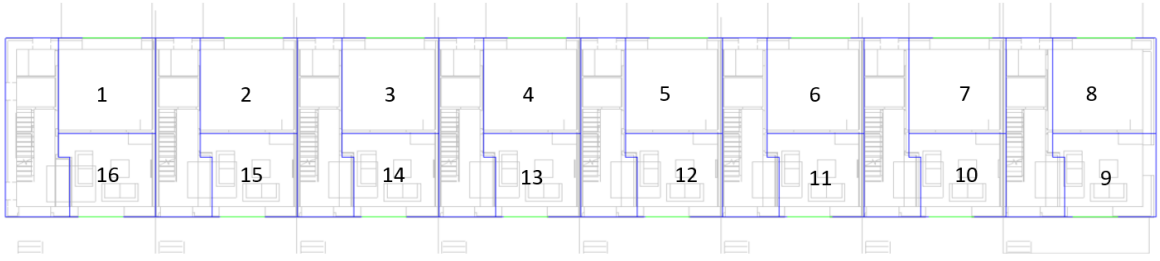
Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
		8	23	Bedroom	99	100	✓
	D3AR	2	24	Bedroom	100	100	✓

15.2.20 Duplexes Types D3C, D3CR & D3CL

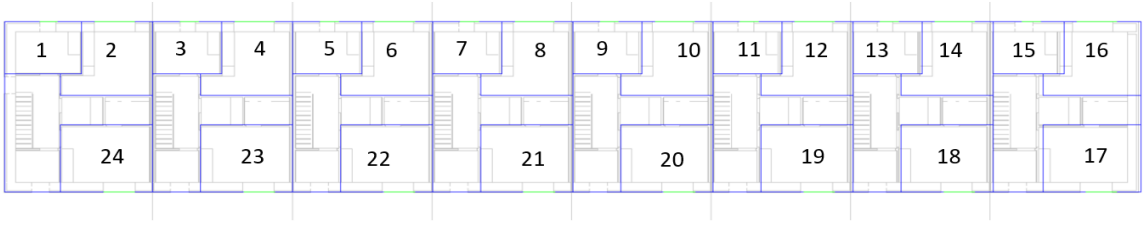
L00



L01



L02



Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
L00	D3CL	1	1	LKD	41	95	x
	D3C	1	2	LKD	38	80	x
		2	3	LKD	35	79	x
		3	4	LKD	30	69	x
		4	5	LKD	34	77	x
		5	6	LKD	28	69	x
		6	7	LKD	37	80	x
	D3CR	1	8	LKD	71	100	✓
			9	Bedroom	34	93	x
	D3C	6	10	Bedroom	33	90	x
		5	11	Bedroom	32	90	x
		4	12	Bedroom	32	88	x
		3	13	Bedroom	35	90	x
		2	14	Bedroom	33	92	x
		1	15	Bedroom	33	89	x
	D3CL	1	16	Bedroom	28	86	x
L01	D3CL	2	1	KD	90	100	✓
	D3C	7	2	KD	82	100	✓
		8	3	KD	67	100	✓
		9	4	KD	63	100	✓
		10	5	KD	67	100	✓
		11	6	KD	58	100	✓
		12	7	KD	68	100	✓
	D3CR	2	8	KD	89	100	✓
			9	Living	100	100	✓
	D3C	12	10	Living	100	100	✓
		11	11	Living	100	100	✓
		10	12	Living	100	100	✓
		9	13	Living	100	100	✓
		8	14	Living	100	100	✓
		7	15	Living	100	100	✓
	D3CL	2	16	Living	100	100	✓
L02	D3CL	2	1	Bedroom	53	100	✓
			2	Bedroom	100	100	✓
	D3C	7	3	Bedroom	59	100	✓
			4	Bedroom	100	100	✓
		8	5	Bedroom	59	100	✓
			6	Bedroom	100	100	✓
		9	7	Bedroom	44	100	x

Floor	Type	Unit	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2 National Annex		
					Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
			8	Bedroom	100	100	✓
		10	9	Bedroom	56	100	✓
			10	Bedroom	100	100	✓
		11	11	Bedroom	41	100	x
			12	Bedroom	100	100	✓
		12	13	Bedroom	41	100	x
			14	Bedroom	100	100	✓
	D3CR	2	15	Bedroom	56	100	✓
			16	Bedroom	100	100	✓
			17	Bedroom	88	100	✓
	D3C	12	18	Bedroom	82	100	✓
		11	19	Bedroom	86	100	✓
		10	20	Bedroom	82	100	✓
		9	21	Bedroom	85	100	✓
		8	22	Bedroom	89	100	✓
		7	23	Bedroom	97	100	✓
	D3CL	2	24	Bedroom	100	100	✓

15.2.21 Compensatory Measures Table for IS EN

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 to private amenity space	Unit overlooks public or communal open space	Floor to ceiling height in excess of 2.4m
Block E – Level 00								
L00: BE-01_Bedroom 02	3	95.9	✓	✓	✓	✓	✓	✓
Block E – Level 02								
L02: BE-201_Bedroom 02	3	95.9	✓	✓	✓	✓	✓	✓
Block E – Level 03								
L02: BE-301_Bedroom 02	3	95.9	✓	✓	✓	✓	✓	✓
Block F - Level 01								
L01: BF-101_Living/Kitchen	1	54.4	✓	✓	✓	✓	✓	✓
L01: BF-105_Living/Kitchen	12	80.2	✓	✓	✓	✓	✓	✓
L01: BF-107_Living/Kitchen	18	56.6	✓	✓	✓	✓		✓
L01: BF-108_Bedroom 01	19	72.6	✓	✓	✓	✓		✓
L01: BF-108_Living/Kitchen	20	72.6	✓	✓	✓	✓		✓
L01: BF-109_Living/Kitchen	22	60.5	✓	✓	✓	✓		✓
L01: BF-109_Bedroom	23	60.5	✓	✓	✓	✓		✓
L01: BF-113_Living/Kitchen	24	54.8	✓	✓	✓	✓		✓
L01: BF-111_Living/Kitchen	30	84.8	✓	✓	✓	✓	✓	✓
L01: BF-112_Living/Kitchen	32	53.6	✓	✓	✓	✓	✓	✓
L01: BF-114_Living/Kitchen	34	116.3	✓	✓	✓	✓	✓	✓
Block F - Level 02								
L02: BF-201_Living	1	55.4	✓	✓	✓	✓	✓	✓
L02: BF-205_Living	12	80.2	✓	✓	✓	✓	✓	✓
L02: BF-207_Living	18	56.6	✓	✓	✓	✓		✓
L02: BF-208_Bedroom 01	19	84.8	✓	✓	✓	✓		✓
L02: BF-208_Living	20	84.8	✓	✓	✓	✓		✓
L02: BF-208_Bedroom 02	21	84.8	✓	✓	✓	✓		✓
L02: BF-209_Living	22	56.8	✓	✓	✓	✓		✓
L02: BF-209_Bedroom	23	56.8	✓	✓	✓	✓		✓
L02: BF-213_Living	33	56.3	✓	✓	✓	✓	✓	✓
L02: BF-214_Bedroom 02	35	95.4	✓	✓	✓	✓	✓	✓
L02: BF-214_Bedroom 01	36	95.4	✓	✓	✓	✓	✓	✓
L02: BF-114_Bedroom 03	39	116.3	✓	✓	✓	✓	✓	✓
L02: BF-115_Bedroom 03	42	116.3	✓	✓	✓	✓	✓	✓
Block F - Level 03								
L03: BF-301_Living	1	55.4	✓	✓	✓	✓	✓	✓
L03: BF-305_Living	12	80.2	✓	✓	✓	✓	✓	✓
L03: BF-307_Living	18	56.6	✓	✓	✓	✓		✓
L03: BF-308_Living	20	84.8	✓	✓	✓	✓		✓
L03: BF-314_Bedroom 02	35	95.4	✓	✓	✓	✓	✓	✓
Block F - Level 04								
L04: BF-405_Living	12	80.2	✓	✓	✓	✓	✓	✓
L04: BF-407_Living	18	56.6	✓	✓	✓	✓		✓
L04: BF-408_Living	20	84.8	✓	✓	✓	✓		✓
Block F - Level 05								
L05: BF-505_Living	12	80.2	✓	✓	✓	✓	✓	✓
Block G - Level 00								
L00: G-03_Bedroom 02	7	82.9	✓	✓	✓	✓	✓	✓
Block G - Level 01								
L01: G-03_Bedroom 02	10	96.1	✓	✓	✓	✓		✓
L01: G-04_LKD	11	50.2	✓	✓	✓	✓		✓
Block H - Level 00								
L00-H4A1-01-Bedroom 01	2	142	✓	✓	✓	✓		✓

Unit	IES Ref	Unit GIA (m^2)	Compensatory Measures					
			Unit floor area > minimum standard	Unit floor area ≥ 10% minimum standard	Private amenity area ≥ minimum standard	Unit has direct access to private amenity space	Unit overlooks public or communal open space	Floor to ceiling height in excess of 2.4m
L00-H4A-02-Bedroom 01	3	142	✓	✓	✓	✓		✓
L00-H4A-03-Bedroom 01	4	142	✓	✓	✓	✓		✓
L00-H4A-04-Bedroom 01	5	142	✓	✓	✓	✓		✓
L00-H4A-05-Bedroom 01	6	142	✓	✓	✓	✓		✓
L00-H4B-06-Bedroom 01	7	153	✓	✓	✓	✓		✓
Block D3A - Level 00								
L00: D3AR_Bedroom 02	2	95.6	✓		✓	✓	✓	✓
L00: D3A_01_Bedroom 01	3	95.6	✓		✓	✓	✓	✓
L00: D3A_01_Bedroom 02	4	95.6	✓		✓	✓	✓	✓
L00: D3A_02_Bedroom 01	5	95.6	✓		✓	✓	✓	✓
L00: D3A_02_Bedroom 02	6	95.6	✓		✓	✓	✓	✓
L00: D3A_03_Bedroom 01	7	95.6	✓		✓	✓	✓	✓
L00: D3A_03_Bedroom 02	8	95.6	✓		✓	✓	✓	✓
L00: D3A_04_Bedroom 01	9	95.6	✓		✓	✓	✓	✓
L00: D3A_04_Bedroom 02	10	95.6	✓		✓	✓	✓	✓
Block D3A - Level 01								
L01: D3A_06_Bedroom 03	13	95.6	✓		✓	✓	✓	✓
L01: D3A_07_Bedroom 03	15	95.6	✓		✓	✓	✓	✓
Block D3A - Level 03								
L03: D3AR_02_Bedroom 03	2	108	✓	✓	✓	✓	✓	✓
L03: D3A_08_Bedroom 03	4	108	✓	✓	✓	✓	✓	✓
L03: D3A_09_Bedroom 03	6	108	✓	✓	✓	✓	✓	✓
L03: D3A_10_Bedroom 03	8	108	✓	✓	✓	✓	✓	✓
L03: D3A_11_Bedroom 03	10	108	✓	✓	✓	✓	✓	✓
L03: D3A_12_Bedroom 03	12	108	✓	✓	✓	✓	✓	✓
L03: D3A_14_Bedroom 03	16	108	✓	✓	✓	✓	✓	✓
Block D3C - Level 00								
L00: D3CL_01_LKD	1	69.14	✓		✓	✓	✓	✓
L00: D3C_01_LKD	2	69.14	✓		✓	✓	✓	✓
L00: D3C_02_LKD	3	69.14	✓		✓	✓	✓	✓
L00: D3C_03_LKD	4	69.14	✓		✓	✓	✓	✓
L00: D3C_04_LKD	5	69.14	✓		✓	✓	✓	✓
L00: D3C_05_LKD	6	69.14	✓		✓	✓	✓	✓
L00: D3C_06_LKD	7	69.14	✓		✓	✓	✓	✓
L00: D3CR_01_Bedroom 01	9	69.14	✓		✓	✓	✓	✓
L00: D3C_06_Bedroom 01	10	69.14	✓		✓	✓	✓	✓
L00: D3C_05_Bedroom 01	11	69.14	✓		✓	✓	✓	✓
L00: D3C_04_Bedroom 01	12	69.14	✓		✓	✓	✓	✓
L00: D3C_03_Bedroom 01	13	69.14	✓		✓	✓	✓	✓
L00: D3C_02_Bedroom 01	14	69.14	✓		✓	✓	✓	✓
L00: D3C_01_Bedroom 01	15	69.14	✓		✓	✓	✓	✓
L00: D3CL_01_Bedroom 01	16	69.14	✓		✓	✓	✓	✓
Block D3C - Level 02								
L02: D3C_09_Bedroom 03	7	105.22	✓	✓	✓	✓	✓	✓
L02: D3C_11_Bedroom 03	11	105.22	✓	✓	✓	✓	✓	✓
L02: D3C_12_Bedroom 03	13	105.22	✓	✓	✓	✓	✓	✓

15.3 Daylight Results – Proposed Development

The following tables summarise the daylight provision results for the tested spaces within the apartment blocks, the houses and duplexes assessed within the development under the BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2.

The results are summarised in the following tables:

Apartment Blocks

A compliance rate of 87% is achieved under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2 for tested spaces in the apartment blocks within the proposed development. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	194
Total No. LKDs Tested	109
Total No. Spaces Tested	**303**

BRE Guide 3rd Edition / IS EN 17037:2018+A1-2021 Method 2 Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	179	92%	15	8%
No. LKDs	84	77%	25	23%
Total No.	**263**	**87%**	**40**	**13%**

Houses

A compliance rate of 86% is achieved under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2 for the houses within the proposed development. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	30
Total No. LKDs Tested	3
Total No. KDs Tested	5
Total No. Living Rooms Tested	6
Total No. Spaces Tested	**44**

BRE Guide 3rd Edition / IS EN 17037:2018+A1-2021 Method 2 Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	30	100%	0	0%
No. LKDs	3	100%	0	0%
No. KDs	5	100%	0	0%
No. Living Rooms	0	0%	6	100%
Total No.	**44**	**86%**	**6**	**14%**

Duplexes

A compliance rate of 70% is achieved under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2 for the duplexes within the proposed development. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	80
Total No. LKDs Tested	8
Total No. KDs Tested	24
Total No. Living Rooms Tested	24
Total No. Spaces Tested	**136**

BRE Guide 3rd Edition / IS EN 17037:2018+A1-2021 Method 2 Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	46	58%	34	42%
No. LKDs	1	13%	7	87%
No. KDs	24	100%	0	0%
No. Living Rooms	24	100%	0	0%
Total No.	**95**	**70%**	**41**	**30%**

15.4 Daylight Provision Results – Existing Phase 1

The tables in the following sections summarise the daylight provision results for the rooms that were assessed in the existing phase 1 development under the IS EN 17037-2018+A1-2021 Method 2. Note, within the tables the code "LKD" equates to combined Living, Kitchen, Dining area.

The results for the following daylight standard are included in each table:

- BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021

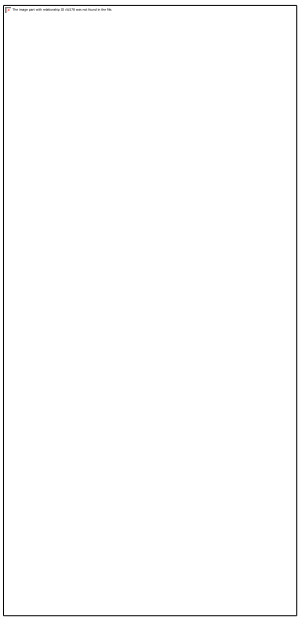
Please note, the "Comment" symbol in each of the tables represents the following:

BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021

✓ 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}).

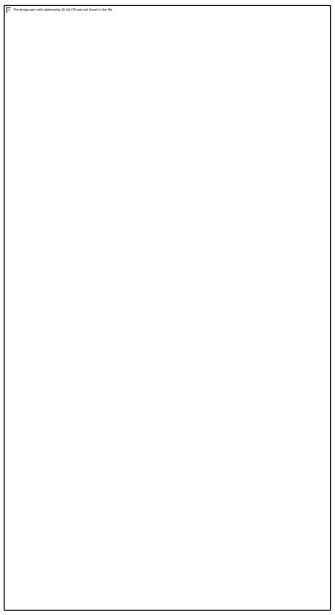
x These rooms do not achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements.

15.4.2 Blocks A & B - Level 01



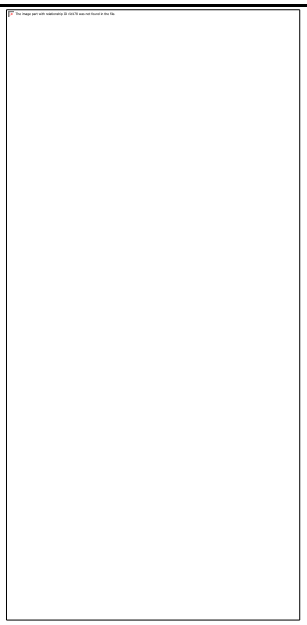
Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	Bedroom	75	100	✓
2	Bedroom	100	100	✓
3	LKD	100	100	✓
4	LKD	82	100	✓
5	Bedroom	40	100	x
6	Bedroom	27	73	x
7	LKD	98	100	✓
8	Bedroom	44	100	x
9	Bedroom	40	100	x
10	Bedroom	29	96	x
11	Bedroom	41	100	x
12	LKD	82	100	✓
13	LKD	91	100	✓

15.4.1 Blocks A & B - Level 00



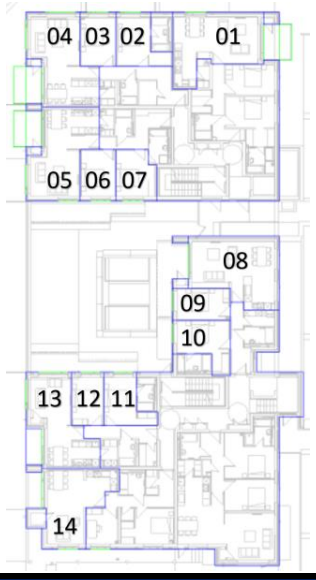
Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	Bedroom	76	100	✓
2	Bedroom	100	100	✓
3	LKD	100	100	✓
4	LKD	82	100	✓
5	Bedroom	36	100	x
6	Bedroom	21	77	x
7	LKD	89	100	✓
8	Bedroom	33	78	x
9	Bedroom	32	72	x
10	Bedroom	22	76	x
11	Bedroom	29	100	x
12	LKD	84	100	✓

15.4.3 Blocks A & B - Level 02



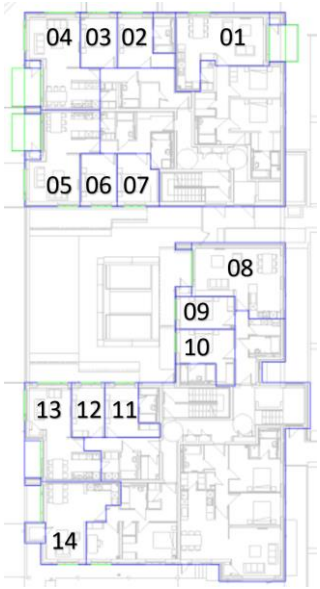
Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	Bedroom	75	100	✓
2	Bedroom	100	100	✓
3	LKD	100	100	✓
4	LKD	87	100	✓
5	Bedroom	51	100	✓
6	Bedroom	40	100	x
7	LKD	100	100	✓
8	Bedroom	55	100	✓
9	Bedroom	54	100	✓
10	Bedroom	42	100	x
11	Bedroom	53	100	✓
12	LKD	87	100	✓
13	LKD	91	100	✓

15.4.4 Blocks C & D - Level 00



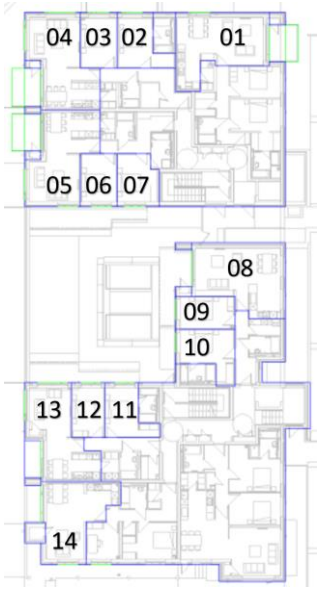
Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	LKD	85	97	✓
2	Bedroom	57	100	✓
3	Bedroom	64	100	✓
4	LKD	100	100	✓
5	LKD	100	100	✓
6	Bedroom	95	100	✓
7	Bedroom	62	100	✓
8	LKD	58	100	✓
9	Bedroom	100	100	✓
10	Bedroom	91	100	✓
11	Bedroom	43	100	x
12	Bedroom	97	100	✓
13	LKD	60	100	✓
14	LKD	95	100	✓

15.4.5 Blocks C & D - Level 01



Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	LKD	87	100	✓
2	Bedroom	73	100	✓
3	Bedroom	78	100	✓
4	LKD	100	100	✓
5	LKD	100	100	✓
6	Bedroom	100	100	✓
7	Bedroom	76	100	✓
8	LKD	100	100	✓
9	Bedroom	100	100	✓
10	Bedroom	93	100	✓
11	Bedroom	74	100	✓
12	Bedroom	68	100	✓
13	LKD	100	100	✓
14	LKD	100	100	✓

15.4.6 Blocks C & D - Level 02



Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2		
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment
1	LKD	88	100	✓
2	Bedroom	88	100	✓
3	Bedroom	99	100	✓
4	LKD	100	100	✓
5	LKD	100	100	✓
6	Bedroom	100	100	✓
7	Bedroom	100	100	✓
8	LKD	100	100	✓
9	Bedroom	100	100	✓
10	Bedroom	93	100	✓
11	Bedroom	74	100	✓
12	Bedroom	89	100	✓
13	LKD	100	100	✓
14	LKD	100	100	✓

15.5 Daylight Results – Existing Phase 1

The following tables summarise the daylight provision results for the tested spaces within apartment blocks A, B, C and D, as part of the existing development Phase 1, assessed under the IS EN 17037-2018+A1-2021 Method 2.

Blocks A & B

A compliance rate of 63% is achieved under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2 for tested spaces in blocks A&B within the existing development Phase 1. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	24
Total No. LKDs Tested	14
Total No. Spaces Tested	**38**

BRE Guide 3rd Edition / IS EN 17037:2018+A1-2021 Method 2				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	10	42%	14	58%
No. LKDs	14	100%	0	0%
Total No.	**24**	**63%**	**14**	**37%**

Blocks C & D

A compliance rate of 98% is achieved under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2 for tested spaces in blocks C&D within the existing development Phase 1. The daylight provision results are summarised below.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	24
Total No. LKDs Tested	18
Total No. Spaces Tested	**42**

BRE Guide 3rd Edition / IS EN 17037:2018+A1-2021 Method 2				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	23	96%	1	4%
No. LKDs	18	100%	0	0%
Total No.	**41**	**98%**	**1**	**2%**