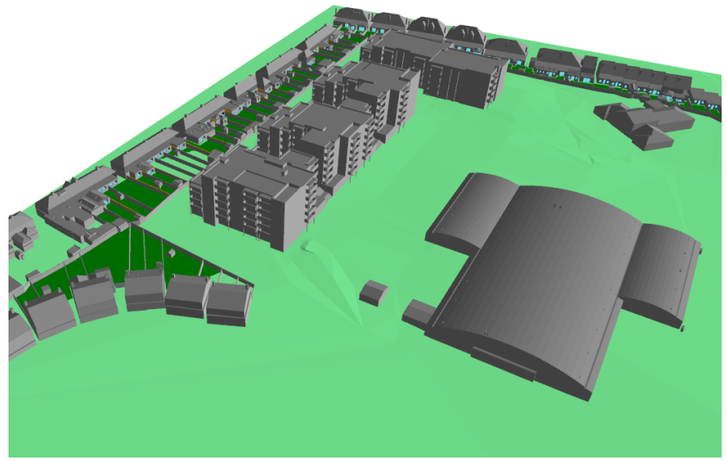
Carlisle Residential LRD

1 Terenure Land Limited



Daylight & Sunlight Analysis

IN2 Project No. D2124

02/11/2022

Revision History

Date	Revision	Description
28/09/2022	00	Issue to design team
10/10/2022	01	Updated analysis with inclusion of Sunlight results
02/11/2022	02	Updated for Planning

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1.0 Executive Summary

The report has been prepared as a desktop exercise with 3D massing and survey information provided by others. No site visits took place as information provided included all relevant required information and our understanding is that any survey information or 3D models provided were carried out by relevant suitably qualified professionals.

Various software programs were utilised in the analysis of the proposed development. These included:

- Radiance Lighting Software
- TAS by EDSL

Section 2.0 introduces the various Guidelines and Standards utilised throughout the Daylight / Sunlight analysis undertaken. The specific methodology for each topic (as relevant) is detailed in the relevant section in the body of this report as identified.

Analysis Type	**Relevance**	**Assessment Methodology**	**Compliance Guidelines Targets**	**Reference section of this report**
Daylight	Proposed Development	Spatial Daylight Autonomy	BRE 209 (2022 Edition)	Section 7.0 – Internal Daylight Analysis
Daylight	Existing Neighbouring Buildings	Vertical Sky Component	BRE 209 (2022 Edition)	Section 5.0 – Impact on Neighbouring Buildings
Sunlight	Proposed Development	Sunlight Exposure	BRE 209 (2022 Edition)	Section 8.0 – Exposure to Sunlight
Sunlight	Proposed Development Amenity Spaces	Sunlight Hours	BRE 209 (2022 Edition)	Section 4.0 – Site Sunlighting and Shading
Sunlight	Existing Neighbouring Buildings	Annual Probable Sunlight Hours	BRE 209 (2022 Edition)	Section 5.0 – Impact on Neighbouring Buildings
Sunlight	Existing Neighbouring Buildings Amenity Spaces (Gardens)	Sunlight Hours	BRE 209 (2022 Edition)	Section 6.0 – Site Shading Diagrams

1.0 Executive Summary (Cont'd)

This report compiles the daylight and sunlight analysis as undertaken by IN2 Engineering Design Partnership for the proposed development at Carlisle, Dublin 12.

Permission was granted, under ABP 313043 on the 22/09/2022, for an SHD on the subject site comprising 208 no. apartment units in 5 no. blocks. The current proposed LRD application provides the same layout and quantum of units as this permitted development. Results and conclusions drawn for site sunlight and shading, impact on neighbouring, and site shading assessments are the same as permitted in the SHD application. Internal daylight analysis has been re-assessed using the current Spatial Daylight Autonomy (SDA) metric (as described in Sections 2.0 and 7.0). Analysis of Exposure to Sunlight for the proposed development has been undertaken for the LRD scheme. This assessment was not required at the time of submission of the SHD scheme.

The report summarises the analysis undertaken, and conclusions determined for the proposed arrangements.

Section 4.0 details the results of sunlighting and shading to external amenity spaces within proposed developments. Both the communal open space and the public open space are predicted to receive at least 2 hours of direct sunlight to over 50% of their areas on the 21st March. The public open spaces receive this level of sunlight to 100% of their area and the communal open spaces receive sunlight to 81% of their areas. Therefore, all amenity spaces were found to be compliant with the guidelines.

The impact of the proposed development on neighbouring buildings is assessed in Section 5.0. Neighbouring buildings on Park Crescent, Captain's Road, Brookfield Green and Brookfield have been assessed. Windows on extensions and conservatories in all existing buildings have been accounted for in the analysis. The neighbouring buildings were assessed for both VSC, a measure of potential daylight, and Annual Probable Daylight Hours, a measure of direct sunlight. As presented in Section 5.0, the report confirms the proposed development does not negatively impact on any of the neighbouring developments in terms of daylight (VSC) and sunlight (APSH) availability.

Section 6.0 illustrates Shadow Diagrams for Equinox and Summer/ Winter Solstices for the proposed development site and its surroundings. These demonstrate that the proposed development does not negatively impact on sunlight to existing neighbouring garden amenity spaces.

The internal daylight analysis, as detailed in section 7.0, has been undertaken for all units across the development. Kitchen/ Living/ Dining and bedroom spaces on every floor across the proposed development were undertaken using the Spatial Daylight Autonomy (SDA) metric. The analysis determined that 97% of rooms were in excess of the prescribed BRE guidelines as set out within this report. This extent of compliance was achieved through design development, with increased glazing/ reduced balcony depths / adjustment of balcony locations applied to ensure the residences can benefit from maximised daylight availability.

The 2020 Apartment Guidelines advise that "*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",* therefore section 6.0 identifies these alternative, compensatory measures which will be considered for any non-compliant apartments.

Section 8.0 includes the results for exposure to sunlight. Exposure to sunlight is the new metric, as defined in BR 202 2022 edition, for assessing sunlight availability to a dwelling. The guide notes that *"Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the … recommendations."* 87% of units within the proposed development are determined to be compliant with BR 209 recommendations for exposure to sunlight.

In summary, this report confirms that best practice daylight and sunlight availability have been ensured for the proposed development.

2.0 Standards and Guidelines

The following standards and guidance documents have been consulted when compiling this report to ensure compliance with the various Daylight and Sunlight requirements as applicable and relevant:

a) Sustainable Urban Housing: Design Standards for New Apartments (December 2020) (the **"2020 Apartment Guidelines").** These are guidelines issued under section 28 of the 2000 Planning and Development Act (as amended).

b) Dublin City Development Plan 2016-2022, (the "**Development Plan**").

c) Draft Dublin City Development Plan 2022-2028, (the "**Draft Development Plan**").

d) The Building Research Establishment's (BRE) Site Layout Planning for Daylight and Sunlight: A guide to good practice (BRE 209) (2nd edition) (the "**BRE Guide 2nd Edition**").

e) British Standard BS 8206-2:2008 – "Lighting for Buildings – Part 2: Code of Practice for Daylighting" (the "**2008 British Standard**").

f) The Building Research Establishment's (BRE) Site Layout Planning for Daylight and Sunlight: A guide to good practice (BRE 209) 3rd edition/ 2022 edition, (the **"BRE Guide").**

g) British Standard BS EN 17037:2018 – Daylight in Buildings (the "**2018 British EN Standard**").

h) Irish Standard IS EN 17037:2018 (the "**2018 Irish EN Standard**").

It should be noted at the outset that the 2008 British Standard has been superseded by the 2018 British Standard, and BRE Guide 2nd Edition has been superseded by BRE Guide 2022 edition. Both previous revisions have now been withdrawn.

EN 17037:2018, which was approved by the Comité Européen de Normalisation (CEN) on 29 July 2018 has been adopted in the UK as BS EN 17037:2018, and in Ireland as IS EN 17037:2018. The texts of the 2018 British Standard and the 2018 Irish Standard are the same, with one exception. The exception is that the 2018 British Standard contains an additional "National Annex" which specifically sets out requirements within dwellings, to ensure some similarity to the now superseded 2008 British Standard.

The 2020 Apartment Guidelines state:

> *"[6.5] The provision of acceptable levels of natural light in new apartment developments is an important planning consideration as it contributes to the liveability and amenity enjoyed by apartment residents. In assessing development proposals, planning authorities must however weigh up the overall quality of the design and layout of the scheme and the measures proposed to maximise daylight provision with the location of the site and the need to ensure an appropriate scale of urban residential development.*
>
> *[6.6] Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2:2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision.*
>
> *[6.7] Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific (sic). This may arise due to a 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."*

The 2020 Apartment Guidelines state that "*Planning Authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition)."* However, subsequent to release of 2020 Apartment Guidelines, this BRE Guide has been comprehensively updated (BR.209 3rd Edition, 2022) with regards to daylight assessments for new buildings, in particular to incorporate the European Standard EN.17037: 2018 (which stipulated that all "conflicting national standards should be withdrawn at the latest by June 2019". The 2022 BRE Guide (and associated EN Standard) enables a more accurate and sophisticated calculation methodology (Spatial Daylight Autonomy or SDA) as this accounts for the following factors that had not been accounted for within the (now superseded) metric of Average Daylight Factor (ADF):

- Site Location
- Climate
- Window Orientation
- Uniformity of light within room

The rationale for utilisation of the BRE Guide 2022 edition over the BRE Guide 2nd edition as specifically referred to in the National Guidelines follows:

a. Rationale for Utilisation of BRE Guide 3rd Edition Methodology

Whilst National Guidelines for Apartments specifically state that internal daylight analysis should be undertaken utilising Standards Guides "like… BRE Guide 2nd Edition", this report has been prepared in accordance with that document's superseding 3rd Edition, released in May 2022.

The rationale for utilising the 3rd Edition was to allow for the more sophisticated and accurate Spatial Daylight Autonomy (SDA) methodology included within the 3rd Edition, which replaces the now obsolete Average Daylight Factor (ADF) calculations included in previous, now withdrawn, 2nd Edition.

It may be noted that whilst this 3rd / 2022 Edition is the first time SDA methodology has been included within the BRE Guide, it has been done so to incorporate the requirements of European Standard which has been in place since 2018: Section 1.1 below details the differentiation between 2nd and 3rd Editions of the BRE Guide and their inferred Standards.

The SDA methodology differs significantly in being *climate-based*; accounting for a city or location's site latitude and extent of cloudiness experienced, and Section 1.2 outlines how use of measured sky brightness enables more accurate representation of daylight conditions in contrast to the theoretical sky model previously utilised in the now obsolete ADF calculations.

The accuracy and sophistication of the SDA methodology means that many aspects of daylighting analysis that the ADF methodology was not equipped to take account of are now addressed, including Room Orientation, Sky View/ Balconies and Room Layout/ Daylight Uniformity, which are detailed in Sections c-e respectively below, utilising examples of room layouts (Note that no rooms analysed, nor results indicated in these sections relate to the proposed development and are included for illustrative purposes only).

The building *design* itself has been progressed on the basis of being informed by the SDA methodology for daylight, The SDA methodology set out in the 3rd edition of the BRE Guide represents best industry practice, enabling a more sophisticated and accurate daylight analysis compared to older guidlines. For this reason, it has been adopted in preference to the ADF methodology for the purpose of the daylight and sunlight analysis for this project and the building design has been developed on the basis of being informed by the SDA methodology which has ensured that aspects that could not be accounted for within the ADF calculation technique have been correctly addressed- particularly with regard to room orientation and layout configuration.

The design has been developed in an iterative process whereby orientation to the sun-path was considered a determining factor in the design of the project from a daylight perspective. As the design developed, several options were tested utilising the SDA methodology in order that the design could obtain an optimal balance of SDA results across the entire project. These options included changes to window size, layout changes within units, and the location of typologies within the overall block, all done as a consequence of employing the SDA methodology as a design tool to improve the performance of the design for actual daylight on this site. The qualitative impact of the SDA methodology resulted in several block design developments such as the increase in window sizes on the north elevation of dual aspect units, and modification to the placement and orientation of bedrooms and living spaces according to the SDA analysis. With regard to the East and West facing balconies and living spaces, the overall environmental performance was considered carefully and in parallel with the SDA methodology to ensure that competing demands for daylight and large windows with slightly higher U-values did not cause either overheating or underheating of units. Across the site, the use of the SDA methodology was integral to the development of an environmentally responsive design offering qualitative benefits inclusive of energy efficiency, for the mixed tenure residential units.

Had the ADF methodology been employed, the current design would differ significantly in terms of unit position, facade design, window size, massing, and balcony position. The employment of the ADF methodology would have resulted in a materially different design. The more sophisticated SDA method results in a more optimal design from a daylight provision perspective.

For the purpose of this report the analysis is solely based on the SDA methodology set out in the 3rd edition of the BRE Guide, and where the proposed design cannot fully meet the requirements of the 3rd edition this has been clearly identified and alternative compensatory design solutions to overcome or mitigate any such non-compliance has been presented. This approach represents best practice as being more accurate and therefore better satisfies the objectives of the 2020 Apartment Guidelines with respect to the assessment of daylight provision.

b. Overview of BR.209 Editions

National Guidelines for Design Standards for New Apartments (2020) states that *Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision.*

The BRE Guide 2nd Edition was released in 2011 and in terms of internal daylight provision referenced the BS.8206-2 Standard referred to also in the National Guidelines. This Standard utilised Average Daylight Factor (ADF) Methodology as described below.

However, subsequent to release of the 2020 National Guidelines, the BRE Guide 3rd Edition was released in May 2022, primarily to incorporate the prevailing best practice as reflected in European Standard EN.17037:2018 in terms of internal daylight and sunlight analysis for new developments.

The European Standard provides updated metrics in terms of *climate-based* daylight assessment, including Spatial Daylight Autonomy (SDA) which was utilised for this analysis.

The BRE 3rd Edition has completely superseded its previous 2nd Edition, which is now withdrawn along with its accompanying BS.8206-2, in accordance with EN.17037's requirement that all "conflicting National Standards be withdrawn". Therefore, the underlining methodology for daylight assessment utilised within BRE 2nd Edition and BS.8206-2- Average Daylight Factor (ADF) is now effectively obsolete as it is no longer best practice and has been replaced by the mores sophisticated and accurate SDA methodology.

Fig b.1– BR.209 2nd (2011) and 3rd (2022) Editions

c. Climate/ Site Location

A critical aspect of the new European Standard for daylighting EN.17037 that has been incorporated into BRE 3rd Edition is the utilisation of *climate-based* analysis, in contrast to the now obsolete Average Daylight Factor (ADF) methodology which was independent of both climate and site location.

The ADF methodology utilised a mathematical model of sky brightness, defined by the *Commission Internationale de l'Eclairage* (CIE) as an Overcast Sky. Figure c.1 illustrates example of CIE overcast sky, as viewed as a hemispherical dome from ground level. It can be seen how this theoretical sky model's brightness is highest at the zenith (i.e. straight upwards in sky), reducing to the horizon, but is also unidirectional (with no distinction between North, South, East or West).

As the ADF methodology utilised this identical sky model for analysis, a room would be determined to have the same daylight availability irrespective of site location throughout the world or its actual climate, in terms of extent of cloudiness and associated availability of natural light. Furthermore, as the sky is assumed to be brightest at the zenith, it is not representative of real skies, excepting equatorial locations at midday (when sun would be directly above on an overcast day), as a result daylight availability calculated using the ADF methodology is distorted and does not accurately reflect the actual conditions for Ireland.

In contrast to ADF, the Spatial Daylight Autonomy (SDA) metric is based on real climate data (i.e., IWEC 039690 for Dublin etc.), from which sky brightness is utilised on an hour-by-hour basis throughout a year for calculation. Consequently daylight analysis in accordance with the SDA methodology is representative of the actual sunlight conditions at a given location unlike an analysis based on the ADF methodology which is much more crude and unrepresentative of actual sunlight conditions.

Figure c.2 illustrates sky brightness distribution as utilised within SDA calculation, for Dublin location on 21st March (Equinox) Noon. In contrast to the mathematical CIE sky model utilised for ADF calculations, the SDA sky correctly accounts for that sky brightness is highest (at this point of time) towards South. Conversely, the sky towards North has less brightness than that assumed in the ADF/ CIE theoretical model.

SDA calculations create a similar sky to that illustrated in Fig c.2 for each daylit hour of the year (4,380 hours), based on sun position for the time of year/ day, as well as extent of cloudiness from the recorded climate data. Hence SDA calculated Daylight *Autonomy*- that is the extent of the year for which sufficient natural light can be received in a room.

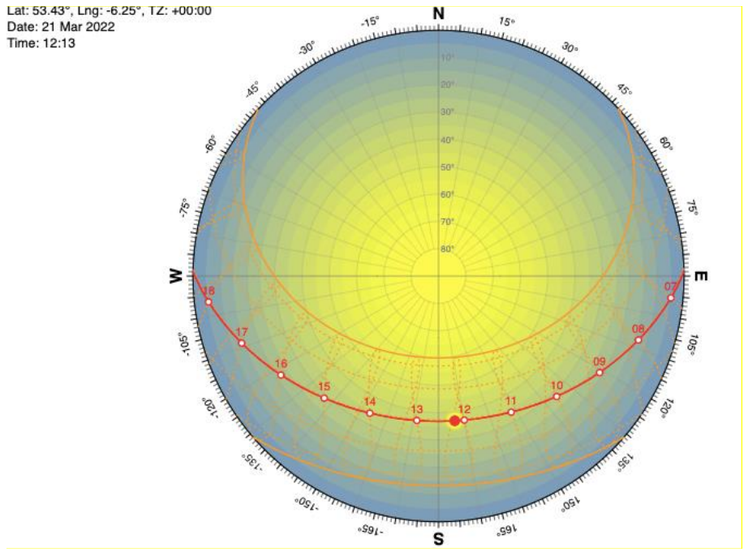


Fig c.1– ADF Sky (CIE Overcast Model)

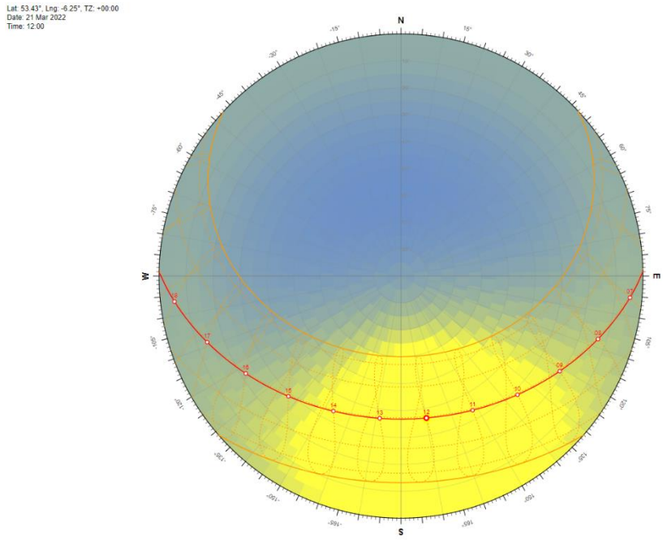


Fig c.2– SDA Sky (Dublin IWEC Climate)

d. Orientation

As noted above in Section b, the ADF calculation methodology was based on a theoretical sky model that was unidirectional. This resulted in a room's orientation not being accounted for, so that identical rooms facing North and South would be incorrectly deemed to receive the same extent of daylight.

Fig. d.1 illustrates results of an ADF calculation, highlighting two identical rooms facing Northeast (encircled in cyan) and Southwest (encircled in yellow) respectively. As can be seen from the contour results, the predicted daylight from the calculation utilising the ADF sky model (CIE Overcast Sky) determined identical daylighting (and hence ADF value) for the rooms irrespective of their orientation. This therefore repersents a theoretical scenario and does not relfect realistic daylight avaialbility.

This can be assessed in contrast to SDA calculation results for the same spaces presented in Fig. d.2, where the difference in predicted natural light is apparent in the contours displayed for the NE (blue to rear of room) and SW rooms.

The green/ black contour diagram then illustrates the regions of the rooms for which requisite SDA was achieved, with a clear differentiation between the NE room (70% approx.) and SW (100% approx.) being apparent.

Therefore, this is an illustration of how the now obsolete ADF methodology underestimated natural light availability for rooms with Southern aspects, due to the unrepresentative theoretical sky model utilised. Conversely, daylighting performance to North facing rooms could be *overestimated* within ADF calculations due to the same misrepresentation of real sky brightness conditions.

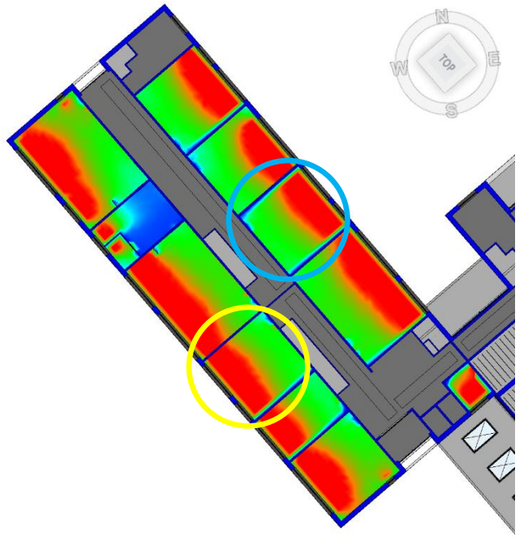


Fig d.1–Orientation – ADF Contours

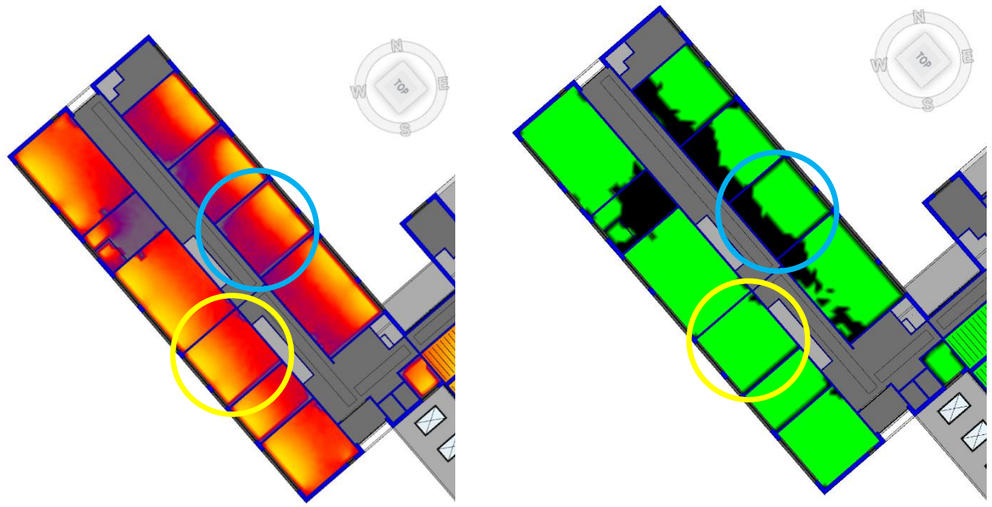


Fig d.2– Orientation - SDA Contours and Compliance

e. Sky View/ Balconies

A perhaps unintended consequence in the utilisation of ADF calculations was how balconies impact on daylight performance within its methodology.

As illustrated in Section b above, the theoretical sky model used within ADF calculations assumed that the zenith was the brightest proportion of the sky, as opposed to SDA correctly determining brightness from climate data, with the maximum generally orientated towards the South.

This overestimation of natural light directly upwards in the sky resulted in the effect of balconies or other overhead structures being in turn incorrectly overestimated in terms of how much daylight reduction they would incur on a room below.

Fig. e.1 illustrates an ADF calculation for south facing bedroom with inset balcony structure above. The room was found to be deficient in terms of daylight performance (ADF = 0.7%, below requisite 1.0%) utilising this methodology.

However, in reality the south facing bedroom will receive plentiful natural light from the brightest part of the sky and this is correctly incorporated within the SDA calculations allowing that accurate climate data (for sun position, cloudiness etc.) is utilised. Fig. e.2 illustrates how the bedroom was deemed to be compliant under the SDA methodology, with more than half (59%) the requisite amount of natural light having been determined to be received throughout the year.

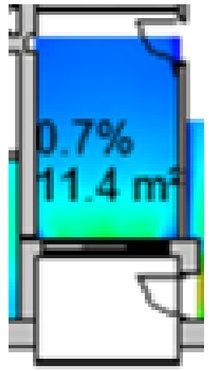


Fig e.1–Balcony – ADF Contours

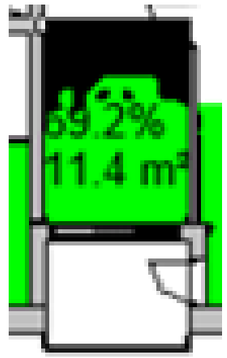


Fig e.2– Balcony - SDA Compliance

f. Room Layout/ Daylight Uniformity

A further shortcoming within the ADF methodology was that the *uniformity* of daylight within a room was not accounted for, because the calculation was based on determining the *average* daylight within a room.

Fig. f.1 illustrates an ADF calculation for an l-shaped bedroom, with a large window located at the façade. This window would ensure that a high degree of daylight would be received immediately adjacent to the façade (red contours), but with little being received to the rear which would remain dark with no natural light.

However, despite this room having poor daylight at its rear, should sufficient light be received to the front of the room so as the overall requisite *Average* could be achieved, this would have been deemed compliant in terms of ADF (in this case, comfortably so: with ADF=1.7% in comparison to minimum 1.0% required).

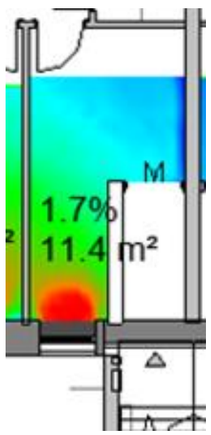


Fig f.1–Room Layout – ADF Contours

In contrast, this room layout configuration is penalised under the SDA methodology, as the *Spatial* basis of the calculation requires that at least 50% of the room can receive sufficient daylight. As can be seen in Fig. f.2, in the case of this bedroom, it would be deemed non-compliant for SDA as only 43% of the space was found to receive the required natural light.

The above is an example of how the SDA methodology correctly penalises room layout configurations where *uniformity* of daylight would be inadequate, whereas in contrast, ADF compliance would have been determined where in reality, natural light availability would have been substandard.

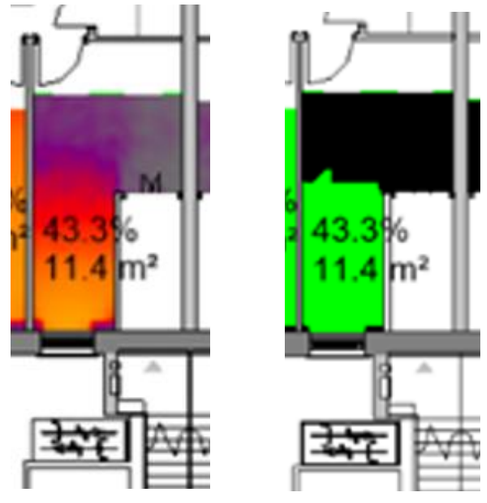


Fig f.2– Room Layout - SDA Contours and Compliance

The Development Plan

The Dublin City Development Plan refers to Policy CC4 (section 3.5.2) which notes:

> *"To encourage building layout and design which maximises daylight, natural ventilation, active transport and public transport use."*

Section 16.10.1 Residential Quality Standards – Apartments, sets out guidelines to achieve this with reference to BRE209 2nd Edition:

> *"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)."*

However, the BRE 209 3rd Edition has completely superseded its previous 2nd Edition, which is now withdrawn along with its accompanying BS.8206-2, in accordance with EN.17037's requirement that all "conflicting National Standards be withdrawn". Therefore, the underlying methodology for daylight assessment utilised within BRE 2nd Edition and BS.8206-2- Average Daylight Factor (ADF) is now effectively obsolete as it is no longer best practice and has been replaced by the more sophisticated and accurate MDF or SDA methodologies. It is therefore an appropriate approach to utilise the current BRE 209 3rd Edition.

Additionally, guidance is given to sunlight availability with regards to dual aspect apartments:

> *"Dual aspect apartments maximise the availability of sunlight and should be provided where possible. It is a specific planning policy requirement in the 2015 Department Guidelines that the minimum number of dual aspect apartments that may be provided in any single apartment scheme shall be 50%. In certain circumstances, usually on inner urban sites, this may be further reduced to an absolute minimum of 33% where it is necessary to ensure good street frontage and subject to high quality design."*

The Draft Development Plan

The Draft Dublin City Development Plan 2022-2028 refers to BR209 2nd Edition. However, as this document has now been withdrawn and replaced with BR209 2022 Edition, the newest version of this document has been implemented as best practice for this report. It is understood that the Draft Dublin City Development Plan 2022-2028 should be updated to reflect this as it is noted that:

> *"The planning authority understand that, at present, there is some ambiguity in what may be considered the appropriate standard to apply for daylight and sunlight assessments. There is a period of transition at present, during which BS 8206-2 has been superseded, but the relevant guidance within BR 209 has not yet been updated. Thus, both BS 8206-2 and BS EN 17037 have relevance. As such, both for clarity and as an interim measure during this transition period, the planning authority will look to receive relevant metrics from BR 209, BS 8206-2 and BS EN 17037. If, over the coming years, a revised version of BR 209 is to be issued, the guidance within this new version will take precedence."*

The BRE Guide (2022 Edition)

The BRE Guide describes its purpose in the following terms in the "Summary" section (v):

> *"This guide gives advice on site layout planning to achieve good sunlighting and daylighting, both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations for new buildings in the British Standard Daylight in buildings, BS EN 17037. It contains guidance on site layout to provide good natural lighting within a new development; safeguarding of daylight and sunlight within existing buildings nearby; and the protection of daylighting of adjoining land for future development."*

The BRE Guide also notes that:

> *"1.6 The guide is intended for building designers and their clients, consultants, and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high-rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings. Alternatively, where natural light is of special importance, less obstruction and hence more sunlight and daylight may be deemed necessary. The calculation methods in Appendices A and B are entirely flexible in this respect. Appendix F gives advice on how to develop a consistent set of target values for skylight under such circumstances."*

> *"1.7 The guidance here is intended for use in the United Kingdom and in the Republic of Ireland, though recommendations in the Irish Standard IS EN 17037 may vary from those in BS EN 17037. Many of the principles outlined will apply to other temperate climates. More specific guidance for other locations and climate types is given in BRE Report Environmental site layout planning."*

Therefore, if the situation arises where the targets identified within the Guide are not achieved, these should be highlighted and either justified in the context of the development / site or where relevant and applicable, compensatory measures will be proposed. However, the Guide does not impose absolute standards that must be achieved under all circumstances. In the context of this report, any deviations from the Guide's recommendations have therefore been identified, with an approach throughout to ensure that good quality daylight/sunlight in achieved through analysis and design improvements as far as practicable and viable as detailed in the report as relevant.

The main sections in the guide that the assessments within this report will reference (as applicable) are:

1. Light from the Sky (Daylight).
    1.1. New Development – Within Appendix C of the BRE Guide, the targets for internal daylight are provided for both optional methodologies, Climate Based Daylight Modelling (CBDM) with targets provided for Lux levels as determined through Spatial Daylight Autonomy (SDA), and Daylight Sky analysis with targets provided for Medium Daylight Factor (MDF), please refer to methodology section for detailed explanation of the methods utilised in this report.
    1.2. Existing Buildings – The guide sets a quantitative assessment method for determining the impact of new developments on light from the sky (VSC) on existing neighbouring buildings.
2. Sunlighting – *Based on site location, longitude and latitude, and solar azimuths. i.e. buildings south of a site will not be impacted for sunlight in the northern hemisphere.*
    2.1. New Development – The guide sets a quantitative method for determining sunlight to a habitable room within a dwelling.
    2.2. Existing Buildings – The guide sets a quantitative assessment method for determining the impact of new developments on sunlight, annual probable sunlight hours (APSH) and winter probable sunlight hours (WPSH), on existing neighbouring buildings.
    2.3. Gardens and open spaces – The amenity criteria set out is used for both proposed new amenity and the impact on existing neighbouring amenities.

The specific methodology for each topic (as relevant) is detailed in the relevant section in the body of this report.

The 2018 British and Irish Versions of the EN Standards

The EN 17037:2018 standard—which is the basis of both the 2018 British EN Standard and the 2018 Irish EN Standard considers a metric based on **median** daylight, in order to ensure both extent and a degree of uniformity of daylight.

> *"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."*

The National Annex

As is noted above, the 2018 British Standard includes a "National Annex", containing "Further recommendations and data for daylight provision in the UK and Channel Islands". This is referenced further in the appendix of this report. As there is no equivalent in the 2018 Irish Standard, the 2018 British Standard National Annex will be referenced, which states:

> *"NA.1 Introduction: 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."*

NA.2 addresses minimum daylight provision in UK dwellings. It contains a table, in which target illuminance, ET (lx), levels are recommended for different room types. These are: bedroom at 100 lx; living room at 150 lx; and kitchen at 200 lx, which may be compared to EN 17037's recommendation of 300 lux (irrespective of room application). The commentary is as follows:

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

3.0 Glossary

Working Plane

The working plane is the notional plane where visual tasks, and on which predicted light levels would normally be undertaken. For a residential assessment, the working plane is defined by BR209 at 850mm above floor level.

Daylight Factor

The Daylight Factor (DF) is the ratio of the illuminance at a point on a working plane in a room, due to the combination of light received directly and indirectly from a sky, over the illuminance on an external horizontal plane based on an unobstructed sky. Daylight factor, as defined here, excludes the contribution of direct sunlight. The sky utilised for ADF and MDF assessments, as defined below, is the (theoretical) CIE Overcast Sky, which is unidirectional, therefore a north facing window is assumed to receive the same light as south etc.

Average Daylight Factor

Average Daylight Factor, also referred to as ADF, is a measure of daylight availability to a room based on the average values of multiple calculation points at the working plane within a space. ADF was utilised in BS.8206-2 standard, inferred also in BR.209, where it is used for daylight assessment of proposed developments (with impact on existing utilising VSC/ NSL as defined below).

Median Daylight Factor

Median Daylight Factor, also referred to as MDF, is a measure of daylight availability to a room based on the median daylight value, i.e., the value that is achieved for at least 50% of the space (50% of the calculation points on the working plane). MDF is calculated for compliance with EN 17037 Method 1.

Climate Based Daylight Modelling –

Spatial Daylight Autonomy

Climate based daylight modelling, also referred to as CBDM, involves the use of a detailed daylight calculation methods where hourly (or sub-hourly) internal daylight illuminance values for a typical year are computed using hourly (or sub-hourly) sky and sun conditions derived from climate data appropriate to the site. Unlike the DF methodology, CBDM assessments are therefore orientation dependent: i.e. a south facing window would be expected to receive more daylight than north facing etc.

This calculation method determines daylight provision directly from simulated illuminance values on the working plane with results determined in lux (a measure of light). CBDM is utilised for compliance with EN 17037 method 2 Spatial Daylight Autonomy (SDA).

Sunlight Exposure

Sunlight exposure is assessed on a window of at least one habitable room per dwelling (preferably a living room) for the number of hours of direct sunlight exposure on the 21st March.

Probable Sunlight Hours

Annual probable sunlight hours and winter probable sunlight hours, also referred to as APSH and WPSH, are used for the assessment of impact on neighbouring buildings by a proposed development. APSH and WPSH are a measure of probable direct sunlight to a window or surface and therefore are only relevant to windows within 90 degrees of south for buildings in the northern hemisphere. Therefore, any window with a northerly aspect (i.e. orientated between North and East and North and West) is therefore not assessed within the methodology.

Vertical Sky Component

Vertical Sky Component, also referred to as VSC, is used for the assessment of impact on neighbouring buildings by a proposed development with respect to daylight availability. VSC is a measure of the percentage of illuminance that a point can receive from the CIE Overcast Sky as a percentage of that received at unobstructed horizontal locations. In simple terms, how much of the sky that can be seen for a given point. VSC assessments do not included reflected light. VSC is calculated for compliance with BR209 as detailed below.

Amenity Sunlight

Amenity sunlight is a measure of direct daylight received on an area over the duration of 21st March based on the sun's solar position for a geographical location. As the 21st March is the solar equinox, the sun is at its mid-point of travel position through the year, therefore representing an average condition throughout the year of how well sunlit an amenity space will be. It may be noted that in the Northern Hemisphere, the sun rises due east and sets due west. Amenity sunlight is calculated for compliance with BR209 as detailed below.

4.0 Site Sunlight and Shading

Methodology

The BRE Site Layout Planning for Daylight and Sunlight Design Guide 209 provides guidance with regards to sunlighting and shading to external Amenity spaces within proposed developments.

The guidance recommends:

"*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 21st March*".

The methodology assesses sunlight performance at the Equinox, as this is the mid solar position throughout the year (as illustrated in Figure 4.1), with compliance indicative of spaces that will receive adequate sunlight and appealing useful spaces, including that the following attributes will be achieved as identified in BRE.209:

- Provide attractive sunlit views (all year)
- Make Outdoor Activities like sitting out and children's play more pleasant (mainly warmer months).
- Encourage plant growth (mainly spring and summer).
- Dry out the ground, reducing moss and slime (mainly in colder months).

Results

Figure 4.2 demonstrates that all amenity space was found to be compliant with the guidelines. Light green contours indicate areas which receive sunlight, darker contours indicate some degree of overshadowing. 81% of proposed communal open space is predicted to receive at least 2 hours of direct sunlight on the 21st March.

100% of the public open space to the south of the site is predicted to receive at least 2 hours of direct sunlight on the 21st March.

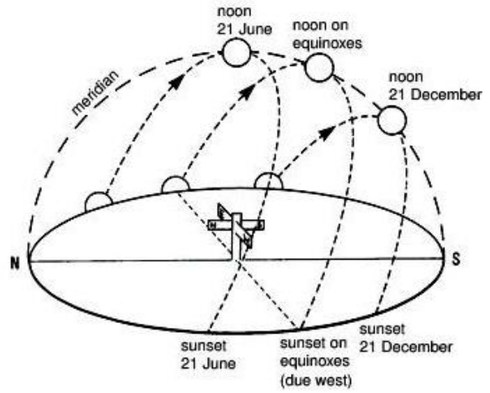


Fig 4.1 – Solar Position Throughout the Year

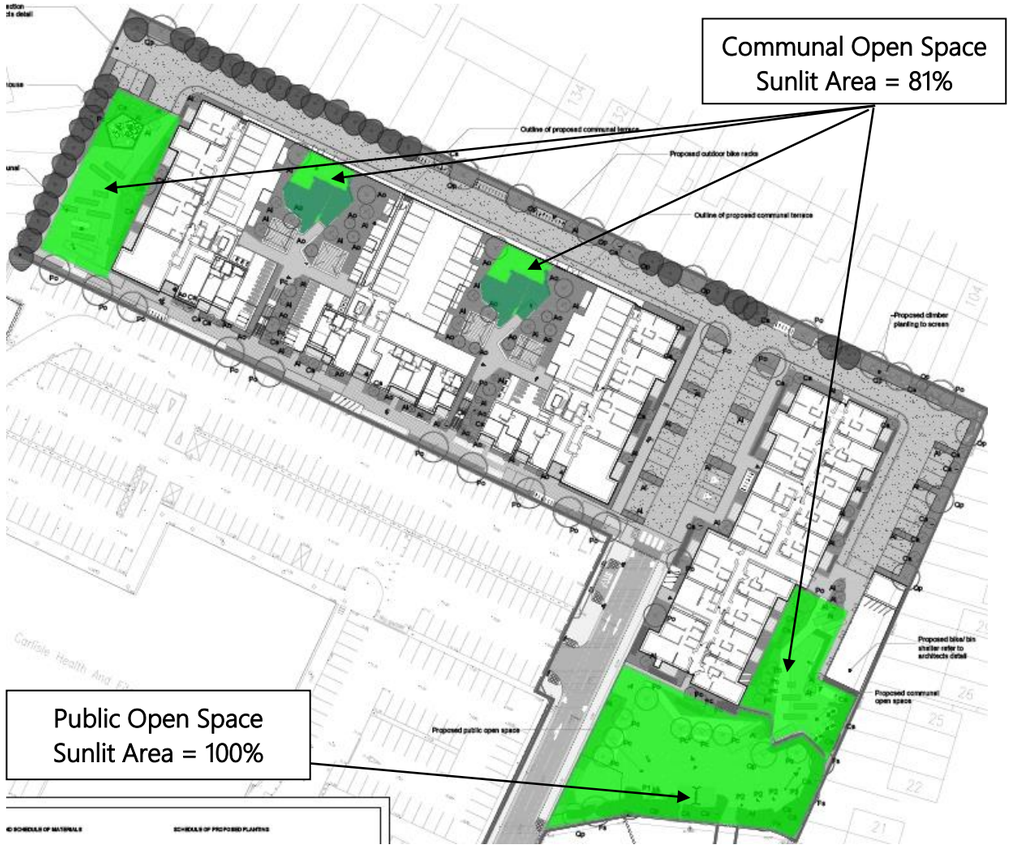


Fig 4.2 –Sunlight Availability to Podium Amenity Spaces for Proposed Development

5.0 Impact on Neighbouring Buildings

5.1 Guidance

As set out within the introduction, the impact on existing buildings can be assessed utilising quantitative assessment method as detailed in the BRE publication "Site Layout Planning for Daylight and Sunlight – A guide to good Practice (Third Edition)" which includes the following methodologies:

Light from the Sky

"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if either:

- *The VSC (Vertical Sky Component) measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value."*

The analysis is based on measuring the VSC at the existing main windows. As per the BRE Guide, main windows included, living rooms, kitchens, and bedrooms. Existing windows with VSC above 27% after proposed development are considered to still receive good daylight availability and therefore not adversely affected.

Sunlighting

"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, or less than 5% of annual probable sunlight hours between 21 September and 21 March and*
- *receives less than 0.8 times its former sunlight hours during either period and*
- *has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours."*

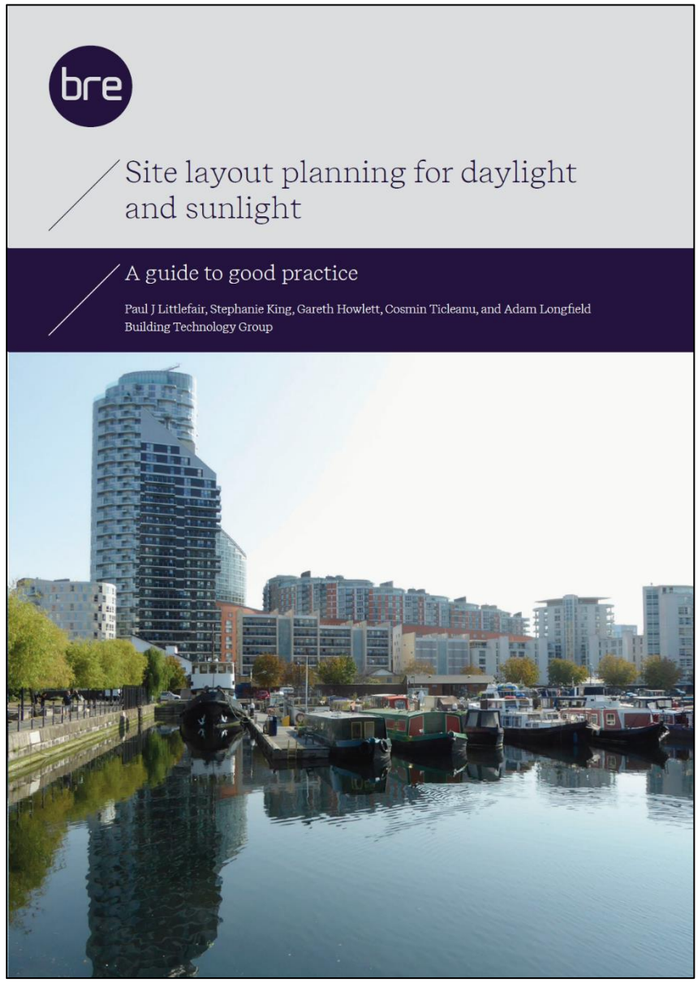


Fig 5.1 – BRE publication "Site Layout Planning for Daylight and Sunlight – A guide to good practice (Third Edition)

5.2 Methodology

The following neighbouring buildings were assessed:

- Park Crescent
- Captain's Road
- Brookfield Green
- Brookfield

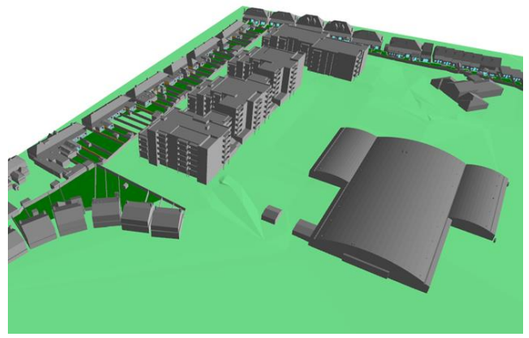


Fig 5.2.1 – Proposed Development

Analysis was undertaken by calculating daylight and sunlight availability pre and post-development for indicative window locations centred on the façade of each dwelling as illustrated in Figure 5.2.2 below.

Windows on extensions and conservatories in all existing buildings have been accounted for in the analysis.

Roof lights or skylights on existing neighbouring buildings will not be impacted by the proposed development, as it will not obstruct their direct view of the sky.

It can be noted from the Google Maps image, Fig 5.2.3, that the existing mature trees would have significant impact on the daylight and sunlight availability to the dwellings on Park Crescent throughout the year, however, for the purpose of the analysis these trees have been excluded from this assessment as per BRE Guide recommendations.

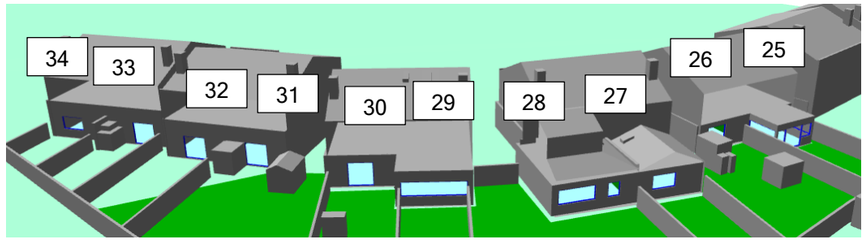


Fig 5.2.2 – Indicative Window Locations assessed for adjacent dwellings at Park Crescent West of Proposed Development

Fig 5.2.3 – Google Maps Image of for Neighboring Dwellings on Park Crescent And Existing Mature Evergreen Trees Along Boundary

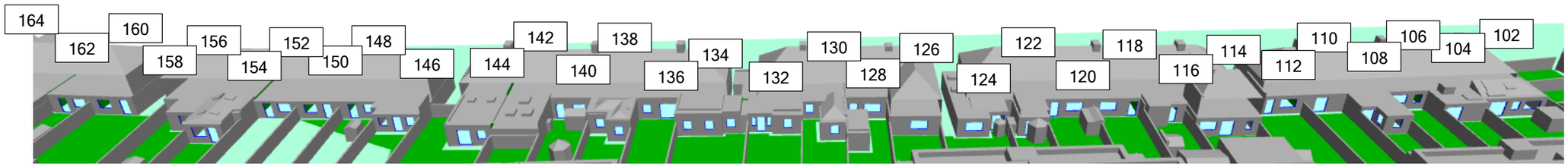


Fig 5.2.4 – Indicative Window Locations assessed for adjacent dwellings at Captain's Road North of Proposed Development

Fig 5.2.5 – Google Maps Image for Neighboring Dwellings on Captain's Road

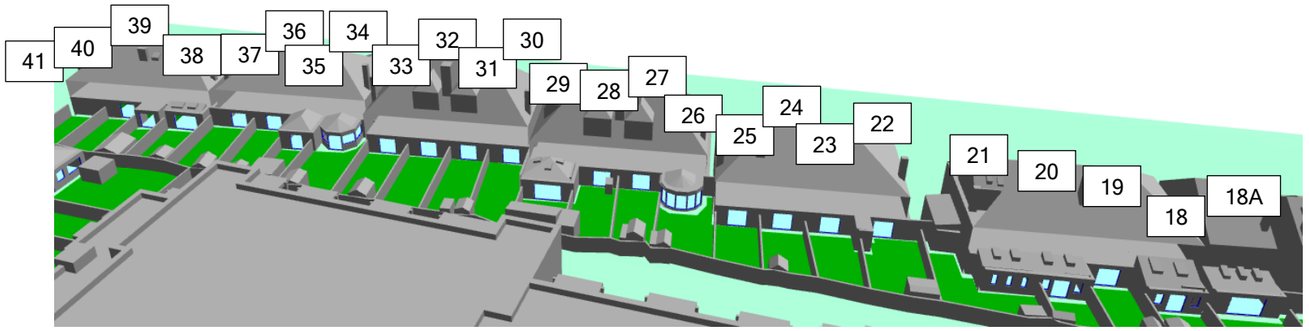


Fig 5.2.6 – Indicative Window Locations assessed for adjacent dwellings at Brookfield Green West of Proposed Development

Fig 5.2.7 – Google Maps Image for Neighboring Dwellings on Brookfield Green

Fig 5.2.8 – Indicative Window Locations assessed for adjacent dwellings at Brookfield West of Proposed Development

5.2.9 – Google Maps Image for Neighboring Dwellings on Brookfield

5.3 Results – VSC Daylight

The analysis indicated that all existing residences assessed for daylight impact were found to achieve compliance with BRE recommendations. Almost all dwellings were determined to have VSC values above 27% or a reduction of no less than 0.8 times its former value and therefore were determined not be adversely affected by the proposed new development in terms of receipt of natural light as per BRE guidance.

No. 33 Park Crescent experiences a minor adverse impact on its daylight availability. The VSC value at this dwelling is 25.6% under proposed conditions, which is slightly less than the 27% target value. The VSC value under proposed conditions is 77% of the value under existing conditions, which is marginally below the 80% maximum reduction set out in BR209 Guide. Sunlight (APSH) to No. 33 Park Crescent is not determined to be impacted by the proposed development. It should be noted that these calculations exclude the existing mature evergreen trees bordering Park Crescent, (as shown in Fig 5.2.3 above) which have the potential to significantly decrease daylight to the dwellings throughout the year in the existing condition. These trees will be maintained in the proposed development to provide screening to the adjoining properties.

Room Ref	VSC Existing (%)	VSC Proposed (%)	Proposed/ Existing		Criterion 1 VSC Proposed >27%	Criterion 2 Ann or Win >80% of Existing	OVERALL COMPLIANCE
Brookfield 1	35.1	34.2	0.98		Pass	Pass	Pass
Brookfield 1	29.4	28.4	0.97		Pass	Pass	Pass
Brookfield 1	34.3	33.3	0.98		Pass	Pass	Pass
Brookfield 2	32.0	31.6	0.99		Pass	Pass	Pass
Brookfield 2	32.0	32.0	1.00		Pass	Pass	Pass
Brookfield 2	26.7	26.0	0.98		Fail	Pass	Pass
Brookfield 3	26.6	26.6	1.00		Fail	Pass	Pass
Brookfield 4	26.1	26.1	1.00		Fail	Pass	Pass
Brookfield 4	29.0	29.0	1.00		Pass	Pass	Pass
Brookfield 5	31.6	31.6	1.00		Pass	Pass	Pass
Brookfield 5	24.5	24.1	0.99		Fail	Pass	Pass
Brookfield 5	31.7	31.6	1.00		Pass	Pass	Pass
Brookfield 6	29.8	29.8	1.00		Pass	Pass	Pass
Brookfield 7	30.7	30.7	1.00		Pass	Pass	Pass
Brookfield 7	33.2	33.2	1.00		Pass	Pass	Pass
Brookfield 7	33.7	33.7	1.00		Pass	Pass	Pass
Brookfield 7	33.7	33.7	1.00		Pass	Pass	Pass
Brookfield 8	32.9	32.9	1.00		Pass	Pass	Pass
Brookfield 8	35.0	35.0	1.00		Pass	Pass	Pass
Brookfield 8	29.2	29.0	1.00		Pass	Pass	Pass
Brookfield 9	32.9	32.8	1.00		Pass	Pass	Pass
Brookfield 9	29.5	29.4	1.00		Pass	Pass	Pass
Brookfield 9	32.0	32.0	1.00		Pass	Pass	Pass
Brookfield 10	34.5	34.5	1.00		Pass	Pass	Pass
Brookfield 10	27.6	27.6	1.00		Pass	Pass	Pass
Brookfield 10	26.9	26.9	1.00		Fail	Pass	Pass
Brookfield 11	32.6	32.6	1.00		Pass	Pass	Pass
Brookfield 11	33.0	33.0	1.00		Pass	Pass	Pass
Brookfield 11	29.2	29.2	1.00		Pass	Pass	Pass
Brookfield 12	32.6	32.6	1.00		Pass	Pass	Pass
Brookfield 12	32.7	32.7	1.00		Pass	Pass	Pass
Brookfield 12	28.6	28.6	1.00		Pass	Pass	Pass
Brookfield 13	34.4	34.4	1.00		Pass	Pass	Pass
Brookfield 13	34.8	34.8	1.00		Pass	Pass	Pass
Brookfield 13	33.9	33.9	1.00		Pass	Pass	Pass
Brookfield 14	21.5	21.5	1.00		Fail	Pass	Pass
Brookfield 14	1.2	1.2	1.00		Fail	Pass	Pass
Brookfield 14	16.2	16.2	1.00		Fail	Pass	Pass
Brookfield 14	31.8	31.8	1.00		Pass	Pass	Pass
Brookfield 14	33.6	33.6	1.00		Pass	Pass	Pass

Room Ref	VSC Existing (%)	VSC Proposed (%)	Proposed/ Existing		Criterion 1 VSC Proposed >27%	Criterion 2 Ann or Win >80% of Existing	OVERALL COMPLIANCE
Brookfield Green 18A	35.0	34.1	0.98		Pass	Pass	Pass
Brookfield Green 18	32.0	31.3	0.98		Pass	Pass	Pass
Brookfield Green 18	32.0	31.6	0.99		Pass	Pass	Pass
Brookfield Green 18	32.6	31.4	0.97		Pass	Pass	Pass
Brookfield Green 19	28.2	27.8	0.99		Pass	Pass	Pass
Brookfield Green 20	31.9	30.8	0.97		Pass	Pass	Pass
Brookfield Green 20	30.6	30.4	1.00		Pass	Pass	Pass
Brookfield Green 20	33.2	30.8	0.93		Pass	Pass	Pass
Brookfield Green 21	34.5	30.9	0.90		Pass	Pass	Pass
Brookfield Green 21	34.2	30.9	0.91		Pass	Pass	Pass
Brookfield Green 21	33.2	29.9	0.91		Pass	Pass	Pass
Brookfield Green 22	28.7	26.2	0.92		Fail	Pass	Pass
Brookfield Green 23	32.7	28.2	0.87		Pass	Pass	Pass
Brookfield Green 24	33.6	28.2	0.84		Pass	Pass	Pass
Brookfield Green 25	33.6	26.6	0.80		Fail	Pass	Pass
Brookfield Green 26	29.1	23.6	0.82		Fail	Pass	Pass
Brookfield Green 27	31.4	25.0	0.80		Fail	Pass	Pass
Brookfield Green 28	28.8	23.0	0.80		Fail	Pass	Pass
Brookfield Green 29	29.7	24.5	0.83		Fail	Pass	Pass
Brookfield Green 30	28.8	23.2	0.81		Fail	Pass	Pass
Brookfield Green 31	33.3	26.5	0.80		Fail	Pass	Pass
Brookfield Green 32	34.2	27.0	0.79		Pass	Fail	Pass
Brookfield Green 33	33.2	27.0	0.82		Fail	Pass	Pass
Brookfield Green 34	6.0	4.9	0.83		Fail	Pass	Pass
Brookfield Green 34	29.9	24.4	0.82		Fail	Pass	Pass
Brookfield Green 34	34.0	28.3	0.84		Pass	Pass	Pass
Brookfield Green 34	19.5	16.9	0.87		Fail	Pass	Pass
Brookfield Green 34	0.0	0.0	1.00		Fail	Pass	Pass
Brookfield Green 35	30.3	27.1	0.90		Pass	Pass	Pass
Brookfield Green 36	31.2	28.5	0.92		Pass	Pass	Pass
Brookfield Green 37	33.3	30.8	0.93		Pass	Pass	Pass
Brookfield Green 38	34.0	31.9	0.94		Pass	Pass	Pass
Brookfield Green 39	31.3	29.8	0.96		Pass	Pass	Pass
Brookfield Green 40	31.1	30.2	0.98		Pass	Pass	Pass

5.3 Results – VSC Daylight (Cont'd)

Room Ref	VSC Existing (%)	VSC Proposed (%)	Proposed/ Existing		Criterion 1 VSC Proposed >27%	Criterion 2 Ann or Win >80% of Existing	OVERALL COMPLIANCE
Captains Road 102	30.0	27.3	0.92		Pass	Pass	Pass
Captains Road 102	34.8	31.1	0.90		Pass	Pass	Pass
Captains Road 102	33.0	30.5	0.93		Pass	Pass	Pass
Captains Road 104	32.0	29.1	0.92		Pass	Pass	Pass
Captains Road 106	31.1	28.2	0.91		Pass	Pass	Pass
Captains Road 106	28.9	24.9	0.87		Fail	Pass	Pass
Captains Road 108	35.0	27.9	0.80		Pass	Pass	Pass
Captains Road 108	27.2	25.5	0.94		Fail	Pass	Pass
Captains Road 108	20.6	16.9	0.82		Fail	Pass	Pass
Captains Road 110	33.2	28.1	0.85		Pass	Pass	Pass
Captains Road 112	30.3	25.4	0.84		Fail	Pass	Pass
Captains Road 112	33.6	28.2	0.85		Pass	Pass	Pass
Captains Road 114	29.7	26.1	0.88		Fail	Pass	Pass
Captains Road 114	31.2	27.2	0.88		Pass	Pass	Pass
Captains Road 114	30.3	25.7	0.85		Fail	Pass	Pass
Captains Road 116	18.8	17.9	0.96		Fail	Pass	Pass
Captains Road 118	26.0	22.3	0.86		Fail	Pass	Pass
Captains Road 118	34.2	28.8	0.85		Pass	Pass	Pass
Captains Road 120	32.1	27.9	0.87		Pass	Pass	Pass
Captains Road 120	28.3	24.4	0.87		Fail	Pass	Pass
Captains Road 124	5.6	5.6	1.00		Fail	Pass	Pass
Captains Road 124	36.4	27.0	0.75		Pass	Fail	Pass
Captains Road 126	36.1	27.0	0.75		Pass	Fail	Pass
Captains Road 128	15.7	15.2	0.97		Fail	Pass	Pass
Captains Road 128	23.7	20.6	0.87		Fail	Pass	Pass
Captains Road 130	26.0	23.3	0.90		Fail	Pass	Pass
Captains Road 130	20.1	17.7	0.89		Fail	Pass	Pass
Captains Road 132	35.5	27.0	0.77		Pass	Fail	Pass
Captains Road 134	36.5	27.1	0.75		Pass	Fail	Pass
Captains Road 136	25.3	20.8	0.83		Fail	Pass	Pass
Captains Road 136	26.9	21.9	0.82		Fail	Pass	Pass
Captains Road 138	28.2	22.5	0.80		Fail	Pass	Pass
Captains Road 140	19.3	16.7	0.87		Fail	Pass	Pass
Captains Road 140	19.6	19.6	1.00		Fail	Pass	Pass
Captains Road 144	35.5	27.0	0.76		Pass	Fail	Pass
Captains Road 146	33.1	27.2	0.83		Pass	Pass	Pass
Captains Road 148	30.5	25.7	0.85		Fail	Pass	Pass
Captains Road 148	29.6	25.0	0.85		Fail	Pass	Pass
Captains Road 150	33.1	27.9	0.85		Pass	Pass	Pass
Captains Road 150	35.5	28.8	0.82		Pass	Pass	Pass
Captains Road 152	34.8	28.5	0.82		Pass	Pass	Pass
Captains Road 152	29.8	24.1	0.81		Fail	Pass	Pass
Captains Road 154	33.5	27.1	0.81		Pass	Pass	Pass
Captains Road 154	35.9	28.4	0.80		Pass	Pass	Pass
Captains Road 156	29.2	25.0	0.86		Fail	Pass	Pass
Captains Road 158	35.9	31.9	0.89		Pass	Pass	Pass
Captains Road 158	35.9	31.9	0.89		Pass	Pass	Pass
Captains Road 160	33.8	31.2	0.93		Pass	Pass	Pass
Captains Road 160	29.3	26.9	0.92		Fail	Pass	Pass
Captains Road 162	31.3	29.5	0.95		Pass	Pass	Pass

Room Ref	VSC Existing (%)	VSC Proposed (%)	Proposed/ Existing		Criterion 1 VSC Proposed >27%	Criterion 2 Ann or Win >80% of Existing	OVERALL COMPLIANCE
Park Crescent 25	31.3	33.4	1.07		Pass	Pass	Pass
Park Crescent 25	29.8	33.4	1.13		Pass	Pass	Pass
Park Crescent 25	29.9	33.2	1.11		Pass	Pass	Pass
Park Crescent 25	16.1	16.1	1.00		Fail	Pass	Pass
Park Crescent 26	30.8	30.8	1.00		Pass	Pass	Pass
Park Crescent 27	35.4	35.0	0.99		Pass	Pass	Pass
Park Crescent 28	35.7	34.9	0.98		Pass	Pass	Pass
Park Crescent 28	34.4	33.7	0.99		Pass	Pass	Pass
Park Crescent 29	18.5	18.6	1.01		Fail	Pass	Pass
Park Crescent 29	35.3	32.5	0.92		Pass	Pass	Pass
Park Crescent 30	34.2	30.6	0.90		Pass	Pass	Pass
Park Crescent 31	29.8	25.1	0.85		Fail	Pass	Pass
Park Crescent 32	36.5	28.3	0.78		Pass	Fail	Pass
Park Crescent 33	33.6	25.6	0.77		Fail	Fail	Fail
Park Crescent 34	36.9	28.8	0.79		Pass	Fail	Pass

5.4 Results – Annual Probable Sunlight Hours

Similarly, analysis undertaken for sunlight availability determined BRE compliance with regards to all existing dwellings assessed, confirming their currently received sunlight would not be adversely affected by the proposed new development, except in the case of Park Crescent 31, which experiences a minor impact.

Park Crescent 31 experiences a minor adverse impact on its sunlight availability. The Annual Probable Sunlight Hours (APSH) under proposed conditions is predicted to be 77% of the value under existing conditions, slightly below the 80% maximum reduction set out in BRE209 Guide. Daylight (VSC) to No. 31 Park Crescent is not determined to be impacted by the proposed development. It should be noted that these calculations exclude the existing mature evergreen trees bordering Park Crescent, (as shown in Fig 5.2.4 above) which have the potential to significantly decrease sunlight to the dwellings throughout the year.

Floor Ref	Room Ref	Window Ref		Annual Existing (%)	Annual Proposed (%)	Proposed/ Existing	Winter Existing (%)	Winter Proposed (%)	Winter Proposed/ Existing	Total Potential Annual Sunny Hours	Max Allowable Annual Reduction	Actual Annual Reduction		Criterion 1 Annual >25% or Winter >5%	Criterion 2 Annual or Winter >80% of Existing	Criterion 3 Annual reduction <4%	**OVERALL COMPLIANCE**
Ground Floor	Brookfield 6	W53		1	0	0	0	0	1	1277	51	13		Fail	Fail	Pass	**Pass**
Ground Floor	Brookfield 6	W54		8	8	1	0	0	1	1277	51	0		Fail	Pass	Pass	**Pass**
Ground Floor	Brookfield 10	W66		42	42	1	1	1	1	1277	51	0		Fail	Pass	Pass	**Pass**
Ground Floor	Brookfield 14	W79		60	60	1	12	12	1	1277	51	0		Pass	Pass	Pass	**Pass**
Ground Floor	Brookfield Green 26	W8		5	2	0.44	0	0	1	1277	51	38		Fail	Fail	Pass	**Pass**
Ground Floor	Brookfield Green 26	W10		20	16	0.78	0	0	1	1277	51	51		Fail	Fail	Pass	**Pass**
Ground Floor	Brookfield Green 34	W3		40	34	0.84	7	6	0.91	1277	51	77		Pass	Pass	Fail	**Pass**
Ground Floor	Captains Road 102	W135		66	64	0.97	13	12	0.92	1277	51	26		Pass	Pass	Pass	**Pass**
Ground Floor	Captains Road 102	W136		77	73	0.95	24	21	0.87	1277	51	51		Pass	Pass	Pass	**Pass**
Ground Floor	Captains Road 106	W84		67	62	0.93	23	19	0.81	1277	51	64		Pass	Pass	Fail	**Pass**
Ground Floor	Captains Road 106	W85		59	53	0.9	14	8	0.55	1277	51	77		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 108	W86		79	69	0.87	26	17	0.63	1277	51	128		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 110	W89		72	63	0.88	22	14	0.63	1277	51	115		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 112	W90		67	59	0.88	28	20	0.71	1277	51	102		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 112	W91		73	63	0.87	27	18	0.67	1277	51	128		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 114	W138		70	63	0.9	18	13	0.69	1277	51	89		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 114	W139		73	66	0.91	22	16	0.73	1277	51	89		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 114	W140		70	61	0.86	18	10	0.56	1277	51	115		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 116	W92		34	32	0.92	12	8	0.68	1277	51	26		Pass	Fail	Pass	**Pass**
Ground Floor	Captains Road 118	W96		49	45	0.91	11	7	0.68	1277	51	51		Pass	Fail	Pass	**Pass**
Ground Floor	Captains Road 118	W97		76	65	0.86	25	15	0.58	1277	51	140		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 120	W98		68	62	0.92	20	15	0.74	1277	51	77		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 120	W99		61	53	0.86	23	15	0.64	1277	51	102		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 122	W93		0	0	N/A	0	0	1	1277	51	0		Fail	Pass	Pass	**Pass**
Ground Floor	Captains Road 124	W94		5	5	1	0	0	1	1277	51	0		Fail	Pass	Pass	**Pass**
Ground Floor	Captains Road 124	W95		81	66	0.81	29	15	0.49	1277	51	192		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 126	W150		81	65	0.79	29	14	0.47	1277	51	204		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 128	W105		56	43	0.78	23	11	0.48	1277	51	166		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 128	W106		50	39	0.78	23	12	0.51	1277	51	140		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 130	W102		64	53	0.82	16	5	0.33	1277	51	140		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 130	W104		40	36	0.89	11	7	0.6	1277	51	51		Pass	Fail	Pass	**Pass**
Ground Floor	Captains Road 132	W107		78	64	0.82	26	13	0.51	1277	51	179		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 132	W108		70	56	0.8	26	12	0.47	1277	51	179		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 132	W109		55	44	0.8	16	6	0.39	1277	51	140		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 132	W110		75	62	0.82	27	14	0.51	1277	51	166		Pass	Fail	Fail	**Pass**

5.4 Results – Annual Probable Sunlight Hours (Cont'd)

Floor Ref	Room Ref	Window Ref		Annual Existing (%)	Annual Proposed (%)	Proposed/ Existing	Winter Existing (%)	Winter Proposed (%)	Winter Proposed/ Existing	Total Potential Annual Sunny Hours	Max Allowable Annual Reduction	Actual Annual Reduction		Criterion 1 Annual >25% or Winter >5%	Criterion 2 Annual or Winter >80% of Existing	Criterion 3 Annual reduction <4%	**OVERALL COMPLIANCE**
Ground Floor	Captains Road 134	W151		76	60	0.8	28	13	0.48	1277	51	204		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 134	W152		80	64	0.8	30	14	0.48	1277	51	204		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 134	W153		82	65	0.8	30	14	0.48	1277	51	217		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 136	W117		48	42	0.86	12	5	0.43	1277	51	77		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 136	W118		56	48	0.85	19	11	0.56	1277	51	102		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 138	W115		76	61	0.8	25	10	0.42	1277	51	192		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 138	W116		0	46	N/A	0	5	1	1277	51	-587		Pass	Pass	Pass	**Pass**
Ground Floor	Captains Road 140	W114		40	40	1	1	1	1	1277	51	0		Fail	Pass	Pass	**Pass**
Ground Floor	Captains Road 144	W111		79	63	0.8	27	13	0.47	1277	51	204		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 144	W112		80	63	0.79	28	13	0.45	1277	51	217		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 146	W154		73	62	0.84	23	12	0.52	1277	51	140		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 146	W155		67	59	0.88	17	9	0.56	1277	51	102		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 146	W156		77	63	0.81	29	15	0.53	1277	51	179		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 148	W122		64	54	0.85	19	10	0.49	1277	51	128		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 148	W123		58	51	0.88	12	5	0.42	1277	51	89		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 150	W126		71	62	0.88	19	10	0.55	1277	51	115		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 150	W127		80	67	0.83	29	16	0.54	1277	51	166		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 152	W124		77	65	0.85	28	16	0.58	1277	51	153		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 152	W125		66	53	0.81	28	15	0.54	1277	51	166		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 154	W120		74	61	0.83	22	10	0.44	1277	51	166		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 154	W121		81	66	0.81	30	14	0.47	1277	51	192		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 156	W119		59	52	0.87	14	6	0.43	1277	51	89		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 158	W157		79	70	0.87	29	19	0.65	1277	51	115		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 158	W158		80	70	0.88	30	20	0.69	1277	51	128		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 160	W128		75	68	0.92	26	20	0.76	1277	51	89		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 160	W129		64	57	0.9	25	19	0.75	1277	51	89		Pass	Fail	Fail	**Pass**
Ground Floor	Captains Road 162	W130		65	61	0.94	20	16	0.8	1277	51	51		Pass	Pass	Pass	**Pass**
Ground Floor	Park Crescent 25	W149		20	20	1	0	0	1	1277	51	0		Fail	Pass	Pass	**Pass**
Ground Floor	Park Crescent 31	W162		30	23	0.77	1	0	1	1277	51	89		Fail	Fail	Fail	**Fail**
Ground Floor	Park Crescent 32	W142		50	36	0.72	17	13	0.76	1277	51	179		Pass	Fail	Fail	**Pass**
Ground Floor	Park Crescent 33	W163		42	28	0.68	9.0	8	0.79	1277	51	179		Pass	Fail	Fail	**Pass**
Ground Floor	Park Crescent 34	W141		47	34	0.72	17	17	0.99	1277	51	166		Pass	Fail	Fail	**Pass**

6.0 Site Shading Diagrams

Equinox March 21st

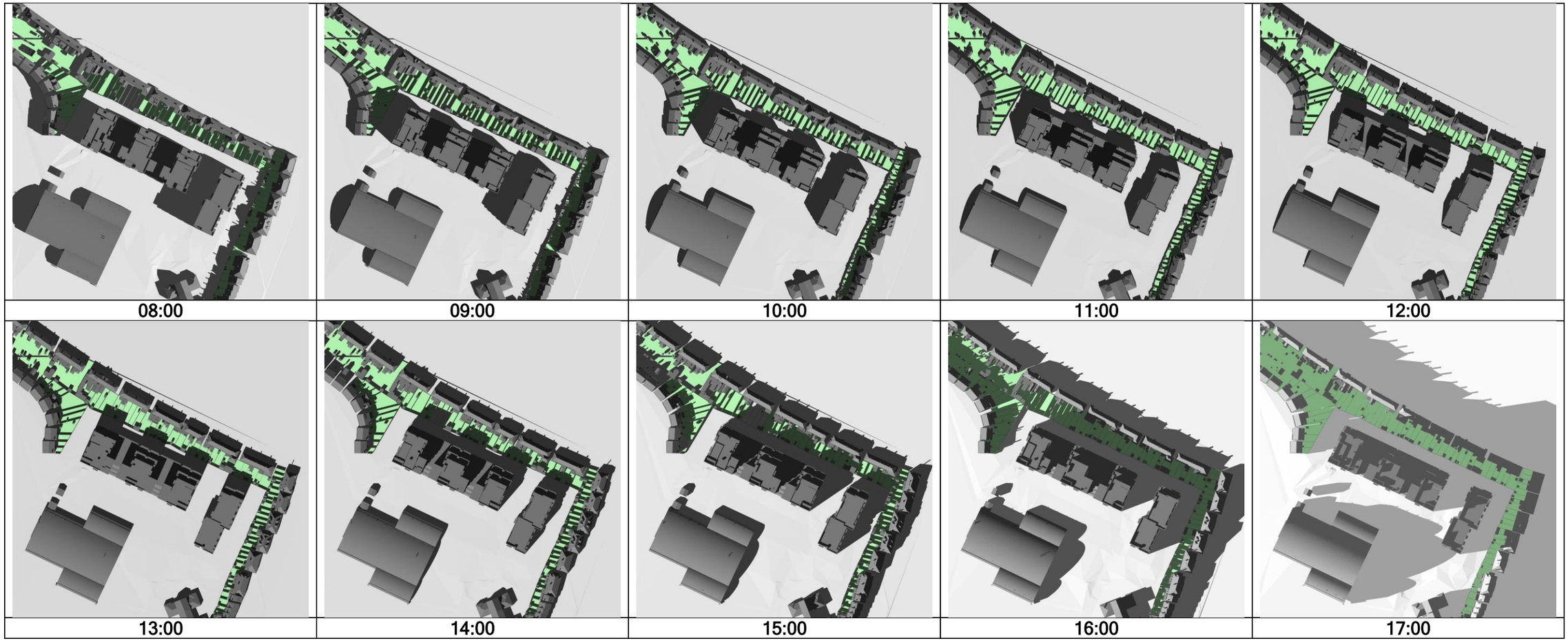


Fig 6.1: Sunlight and Site Shading Diagrams - Equinox (March 21st): 08:00-17:00 hrs

The images in Fig 6.1 detail Site Shading at the Equinox (March 21st). These illustrate that the proposed development is predicted to not overshadow neighbouring residential garden amenity spaces. All neighbouring residential amenity spaces are determined to maintain at least 2 hours of sunlight on 21st March.
In addition, both winter and summer solstices site shading diagrams have been included overleaf.

Summer Solstice June 21st

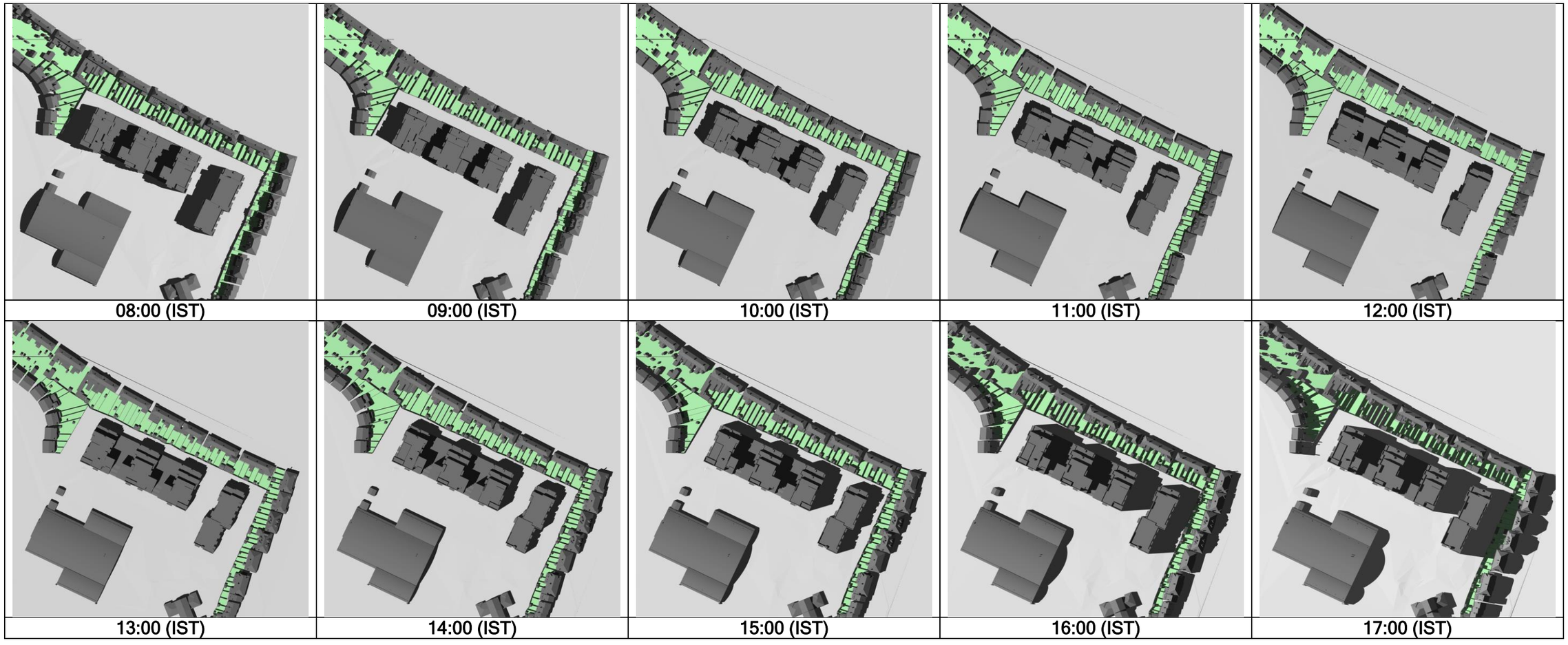


Fig 6.2: Sunlight and Site Shading Diagrams - Summer Solstice (June 21st): 08:00-17:00 hrs

Whilst both winter and summer solstices have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Winter Solstice December 21st

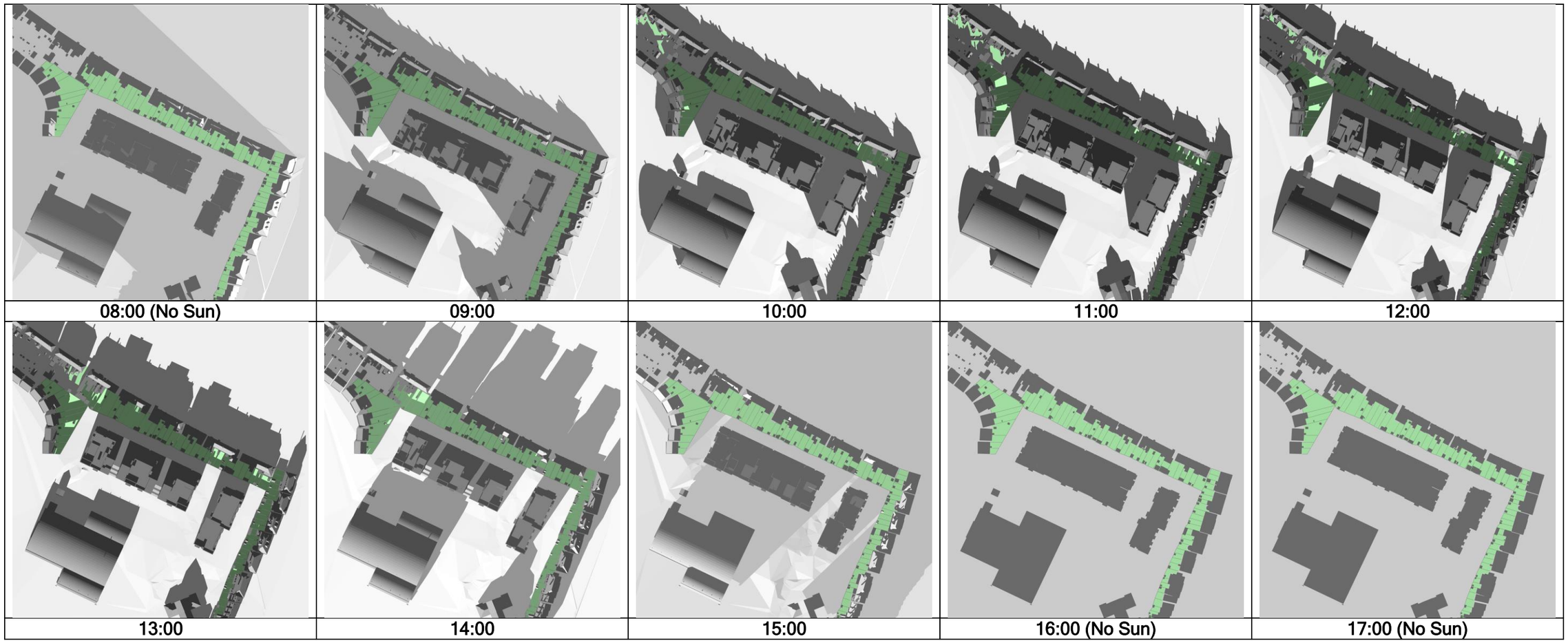


Fig 6.3: Sunlight and Site Shading Diagrams - Winter Solstice (December 21st): 08:00-17:00 hrs

Whilst both winter and summer solstices have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

7.0 Internal Daylight Analysis

7.1 Spatial Daylight Autonomy Methodology

Spatial Daylight Autonomy (SDA) is a climate-based daylight assessment methodology utilised in the BRE Guide. These guidelines and standards have been outlined in Section 2.0.

The methodology utilises historic climate data (Dublin IWEC file 039690 was used for this assessment) predicting internal illumination due to natural light on an hour-by-hour basis, accounting for not only diffuse skylight (as solely assessed in ADF) but also the direct sunlight element. SDA results will differ for façade orientation, with those elevations with southerly aspect (correctly) being deemed to receive more daylight.

Fig 7.1.1 indicates overall compliance comparison, with green contours illustrating where daylight was predicted to achieve 100 Lux for bedrooms and 200 Lux for KLD's. These are the illuminance recommendations for dwellings included in Section C16 of the BR.209 2022 edition, based on BS.EN.17037:2018. Compliance for a room is then defined in the BRE Guide if at least 50% of the room achieves this target.

The daylighting models were calculated based on the following assumptions regarding transmittance and reflectance (as prescribed in the BRE Guide):

- Glazing Transmission = 68% with maintenance factor of 96%
- Ceilings: 80% reflectance
- Walls: 70% reflectance
- Floors: 40% reflectance

The daylight analysis accounted for all aspects that can potentially restrict natural light availability including any adjacent / opposing buildings, along with explicitly modelling Building Details as illustrated in Figure 7.1.2 such as balcony structures, window frames, reveal and cill depth etc. in accordance with the architectural design. As the window frames have been explicitly modelled there is no requirement to include framing factors as prescribed in the BRE Guide.

Daylight Factors for each space were then calculated for a working plane height of 0.85m on a 0.25 x 0.25m grid basis and a wall offset of 0.3m (as defined in BR.209 2022 edition) to enable a detailed calculation within each room, the medium of which was then determined the space compliance.

Fig 7.1.1 –Sample Daylight Analysis Results

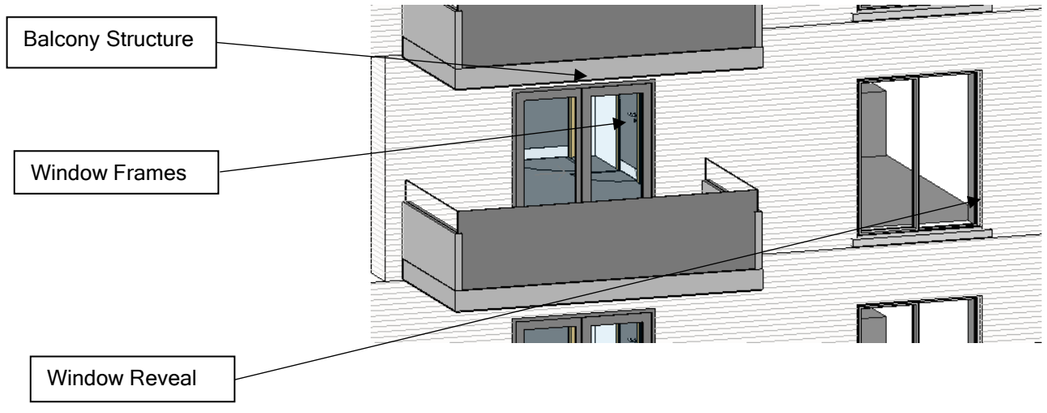


Fig 7.1.2 – Building Details included within Daylight Analysis (Sample)

7.2 Spatial Daylight Autonomy Methodology (Cont'd)

The rooms have been assessed to the minimum areas as prescribed in the 2020 Apartment Guidelines, Fig 6.1.3 taking consideration for the notes in the BRE Guide which stipulate:

> *"Where a room has a shared use, the highest target should apply. For example in a bed sitting room in student accommodation, the value for a living room should be used if students would often spend time in their rooms during the day. Local authorities could use discretion here. For example, the target for a living room could be used for a combined living/dining/kitchen area if the kitchens are not treated as habitable spaces, as it may avoid small separate kitchens in a design.* ***The kitchen space would still need to be included in the assessment area****" (****Emphasis added****)*

BR.209 2022 provides additional guidance on room definitions, identifying that corridors/ annexed entrances can be excluded from the assessment area as illustrated in Fig. 7.1.4.

Fig 7.1.5 illustrates an example of how the above has been interpreted to define areas of assessment (highlighted green) ensuring:

- Minimum required room area as defined in Apartment Guidelines (i.e., min. 30m^2 in this instance for 2 Bed Apartment KLD).
- Inclusion of kitchen area within KLD (i.e. assessment to rear of room).
- Exclusion of circulation/ annexed entrances (i.e., adjacent to doors illustrated).

Minimum aggregate floor areas for living/dining/kitchen rooms, and minimum widths for the main living/dining rooms

Apartment type ***	Width of living/dining room	Aggregate floor area of living / dining / kitchen area*
Studio	4m**	30 sq m**
One bedroom	3.3 m	23 sq m
Two bedrooms (3 person)	3.6m	28 sq m
Two bedrooms (4 person)	3.6 m	30 sq m
Three bedrooms	3.8 m	34 sq m

** Note: An enclosed (separate) kitchen should have a minimum floor area of 6.5 sq. metres*
***Note: Combined living/dining/bedspace, also includes circulation*
**** Note: Variation of up to 5% can be applied to room areas and widths subject to overall compliance with required minimum overall apartment floor areas.*

Fig 7.1.3 – Apartment Guidelines – Minimum Room Sizes

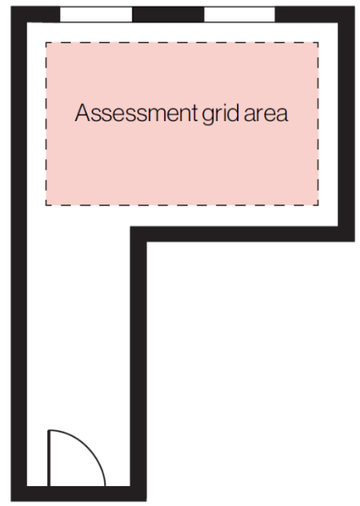


Fig 7.1.4 – BR 209 Figure C3 – Assessment Area excluding Corridor

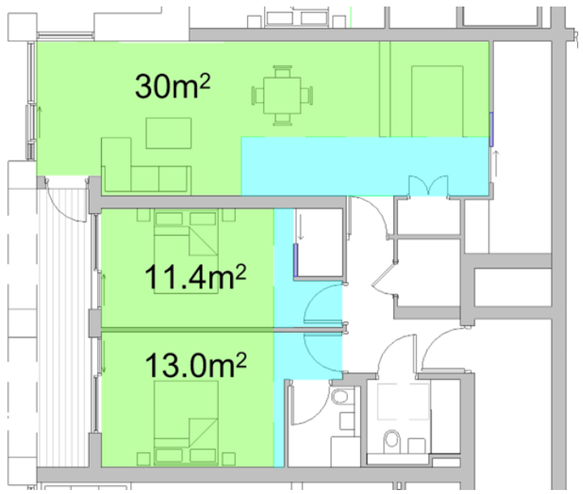


Fig 7.1.5 – Sample Assessment Space Delineation

7.2 Spatial Daylight Autonomy - Results Summary

The analysis determined that 97% of KLD spaces and bedrooms would achieve or exceed the BRE guidance targets in terms of SDA compliance.

Any space that has not achieved the target, has been clearly identified and compensatory measures provided.

The assessment has been carried out for KLD spaces and bedrooms on every floor.

The tables below give a breakdown of compliance rates for each block as well as the overall development.

Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	3	121
	98%	2%	

Block 4	Pass	Fail	Total
Ground Floor	16	2	18
First Floor	17	2	19
Second Floor	18	1	19
Third Floor	19	0	19
Fourth Floor	15	0	15
	85	5	90
	94%	6%	

Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	3	121
	98%	2%	

Block 5	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	14	0	14
Second Floor	14	0	14
Third Floor	14	0	14
Fourth Floor	14	0	14
	70	0	70
	100%	0%	

Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	4	118
	97%	3%	

Fig 7.2.1 Site Key Plan

	Pass	Fail	Total
Block 1	118	3	121
Block 2	118	3	121
Block 3	114	4	118
Block 4	85	5	90
Block 5	70	0	70
	505	15	520
	97%	3%	

Fig 7.2.2 – Overall SDA Compliance for Proposed Development

7.3 Compensatory Measures

The 2020 Apartment Guidelines state the following:

> *"[6.7] Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to a design constraint 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."*

Compensatory Design Solutions

The below compensatory design solutions have been identified for spaces which receive reduced levels of daylight. The specific compensatory measures provided to specific apartments are identified in section 7.4 onwards.

All units, which do not achieve the SDA target value for shared Kitchen/Living/Dining (KLD) rooms, have compensatory measures identified in accordance with the requirements of the *Sustainable Urban Housing – Design Standards for New Apartments 2020*.

The compensatory measures look to determine a balance between the spaces with reduced daylight by identifying how other metrics for sunlight and/or the unit's aspects can compensate for this reduced daylight.

The compensatory measures are summarised as follows: -

1. Daylight Adjacency

   In the cases where a room is below target, there are adjacent room/rooms with the apartment which were found to be comfortably compliant. Therefore, these units each have rooms that are well daylit, despite the room being slightly below target.

2. Sunlight

   The KLDs or bedrooms with below target Spatial Daylight Autonomy receive over 1.5 hours of sunlight. Therefore, whilst the rooms were found to be non-compliant for daylight, their apartment units achieve the requisite sunlight availability for compliance.

3. Dual Aspect

   Some units have the added benefit of dual aspect ensuring multiple options for aspect and sunlight / daylight availability.

4. Aspect

   In addition to their private amenity space, a number of units have direct aspect out onto landscaped communal or public open space providing an excellent view from the KLD space.

5. Direct Access to Courtyard

   A number of ground floor units have direct access to courtyard connecting with nature. It also provides a good ventilation through the units.

6. Unit Size

   The *Sustainable Urban Housing – Design Standards for New Apartments 2020* require that the majority of units in a development exceed the minimum floor area standards by 10%. Some of the units which receive reduced daylight might exceed the minimum floor areas by >10%.

7. Private Amenity Space

   All apartments have been designed to allow direct access to a balcony for private amenity space.

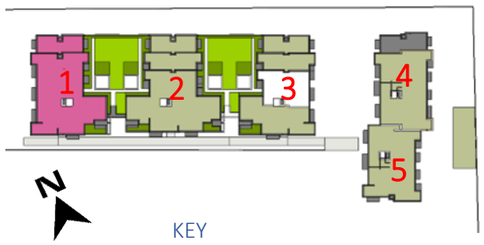
8. Sunlit Communal Open Space

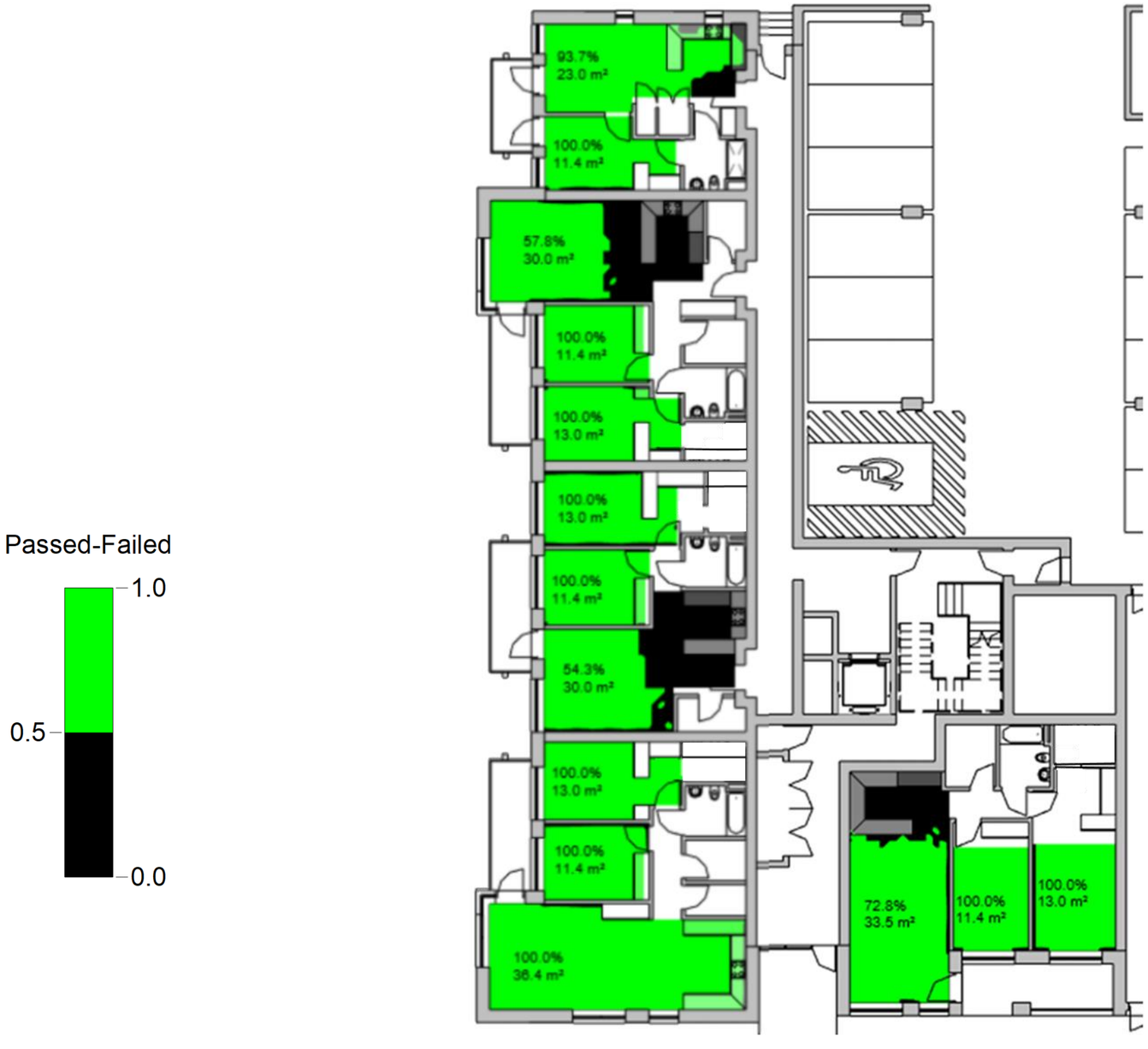
   Compensatory measures have been provided outside of the individual units with a large portion of the site being landscaped for communal open space. The proposed development includes the provision of a large quantum of communal open space. The standards in the Apartment Guidelines would require 1,248m2 of communal open space and the proposal includes 29.7% more than that at 1,619m2.

7.4 Spatial Daylight Autonomy Results

Block 1 – Ground Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA .





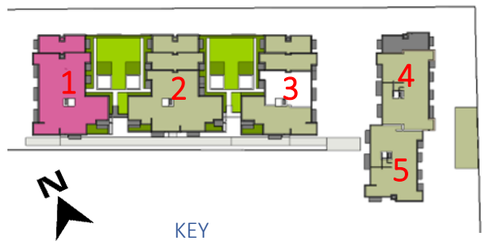
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	**3**	**121**
	98%	**2%**	

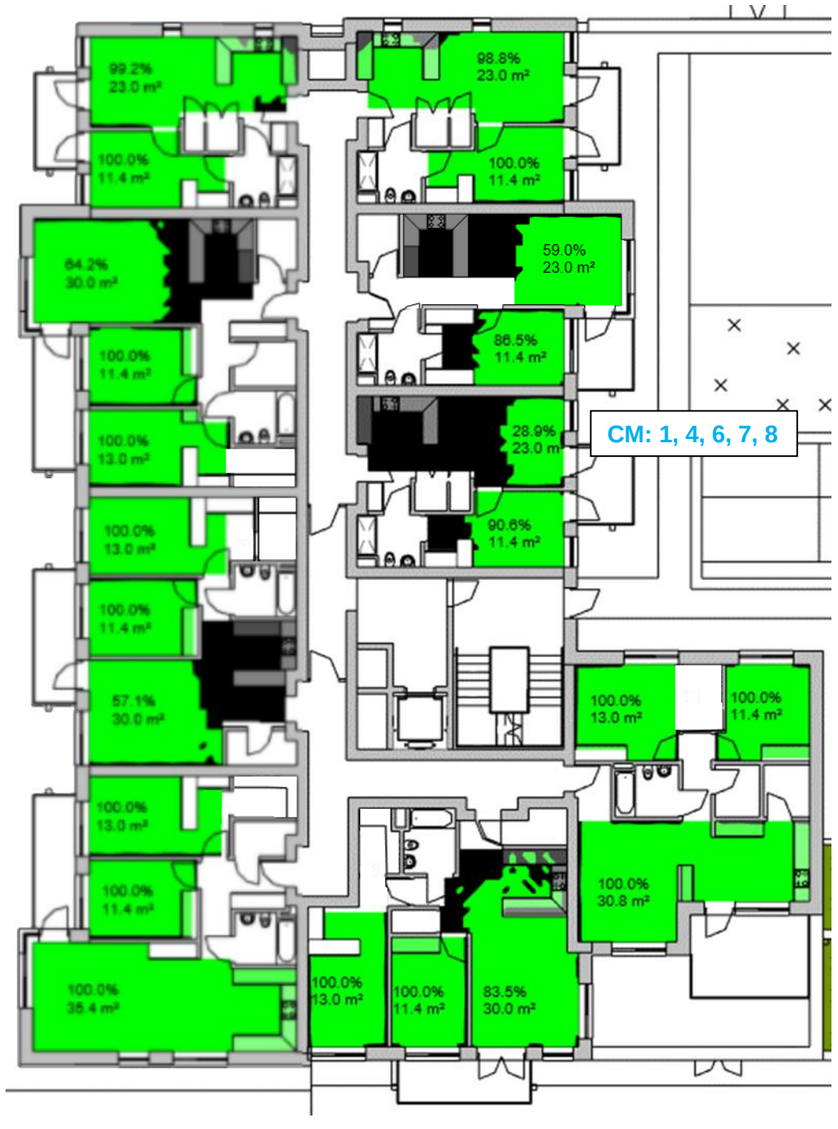
7.4 Spatial Daylight Autonomy Results

Block 1 – First Floor

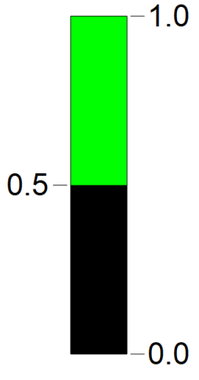
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
22 out of 23 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space



Passed-Failed



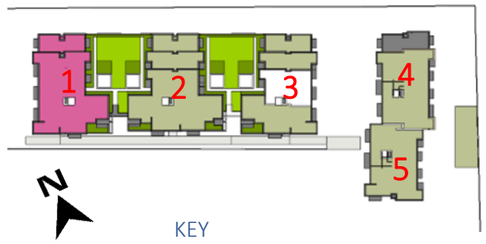
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	**3**	**121**
	98%	**2%**	

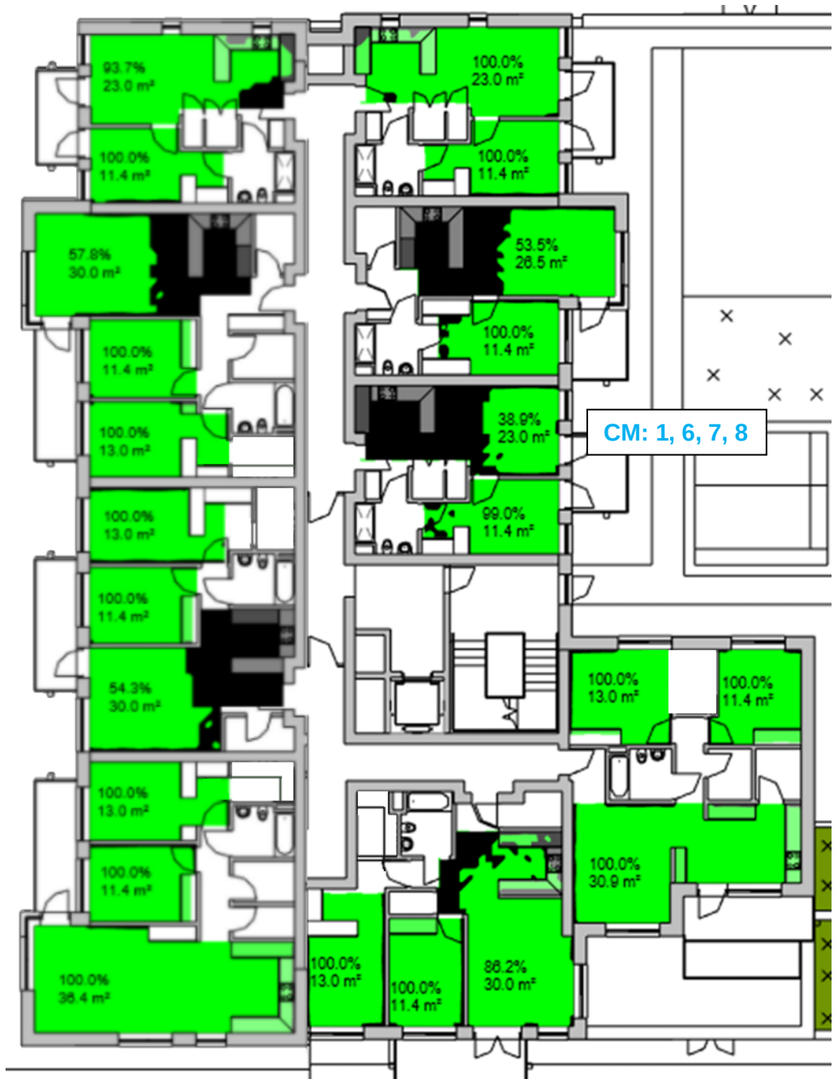
7.4 Spatial Daylight Autonomy Results

Block 1 – Second Floor

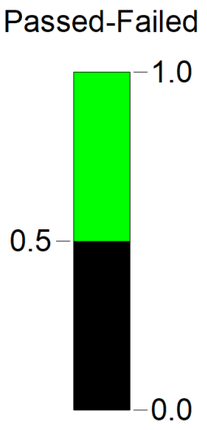
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
22 out of 23 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space



Passed-Failed



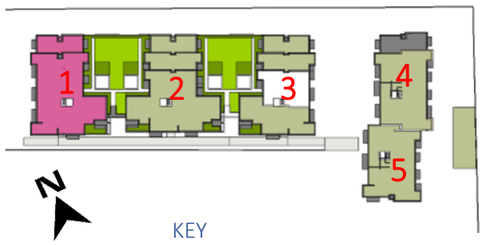
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	**3**	**121**
	98%	**2%**	

7.4 Spatial Daylight Autonomy Results

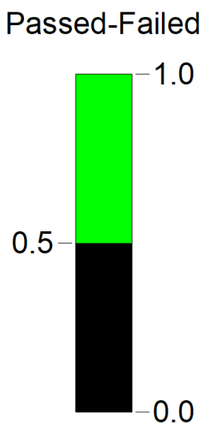
Block 1 – Third Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
22 out of 23 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space

SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

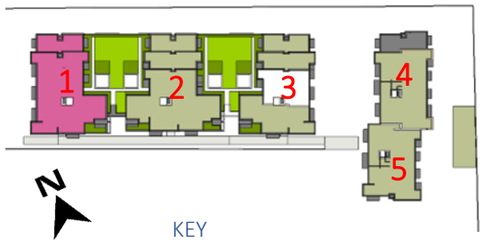


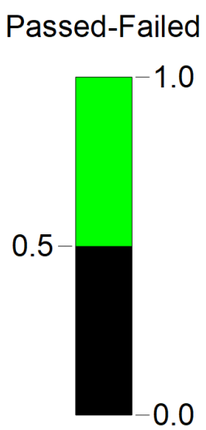
Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	3	121
	98%	2%	

7.4 Spatial Daylight Autonomy Results

Block 1 – Fourth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





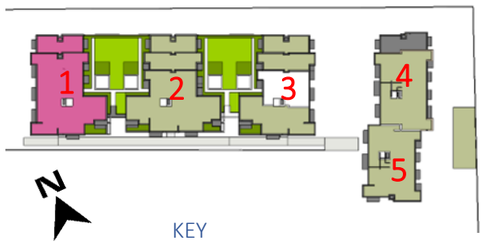
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

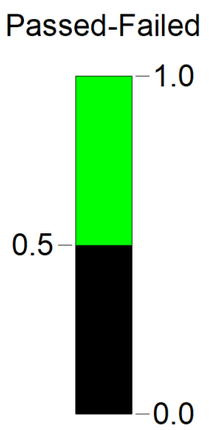
Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	**3**	**121**
	98%	**2%**	

7.4 Spatial Daylight Autonomy Results

Block 1 – Fifth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





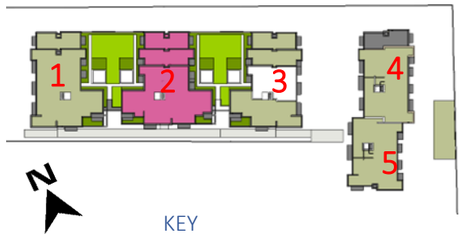
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

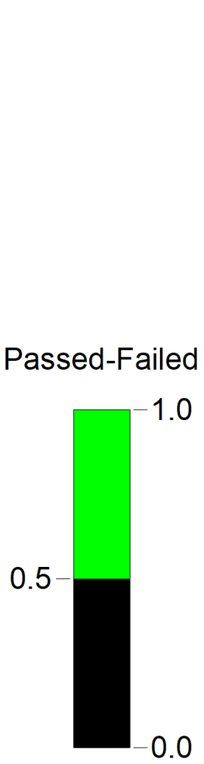
Block 1	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	22	1	23
Second Floor	22	1	23
Third Floor	22	1	23
Fourth Floor	19	0	19
Fifth Floor	19	0	19
	118	**3**	**121**
	98%	**2%**	

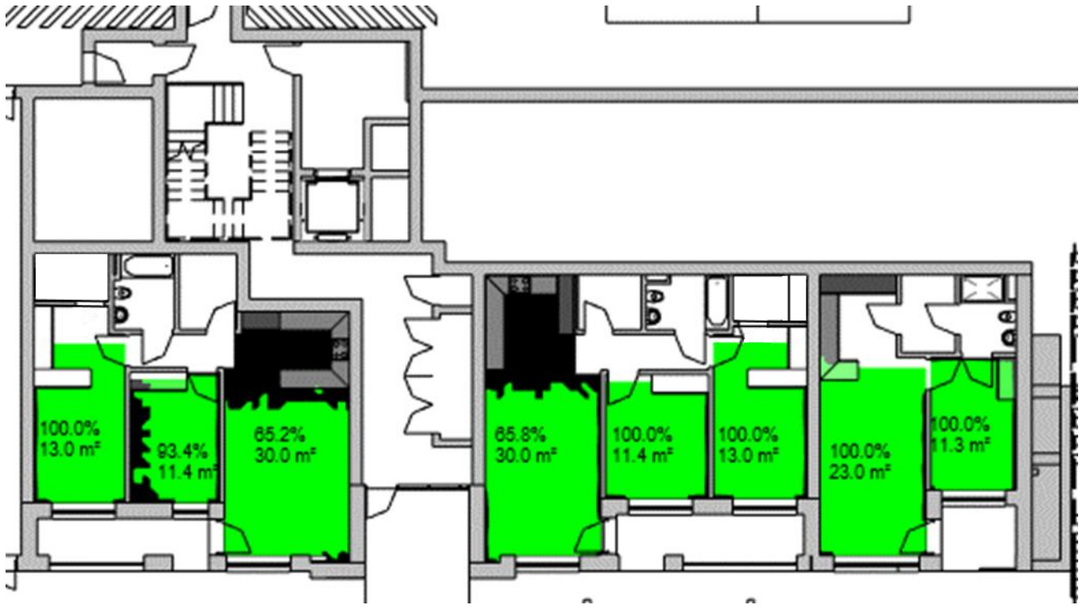
7.4 Spatial Daylight Autonomy Results

Block 2 – Ground Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.







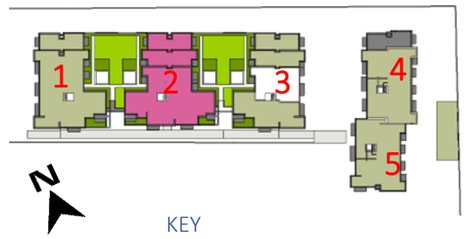
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	**3**	**121**
	98%	**2%**	

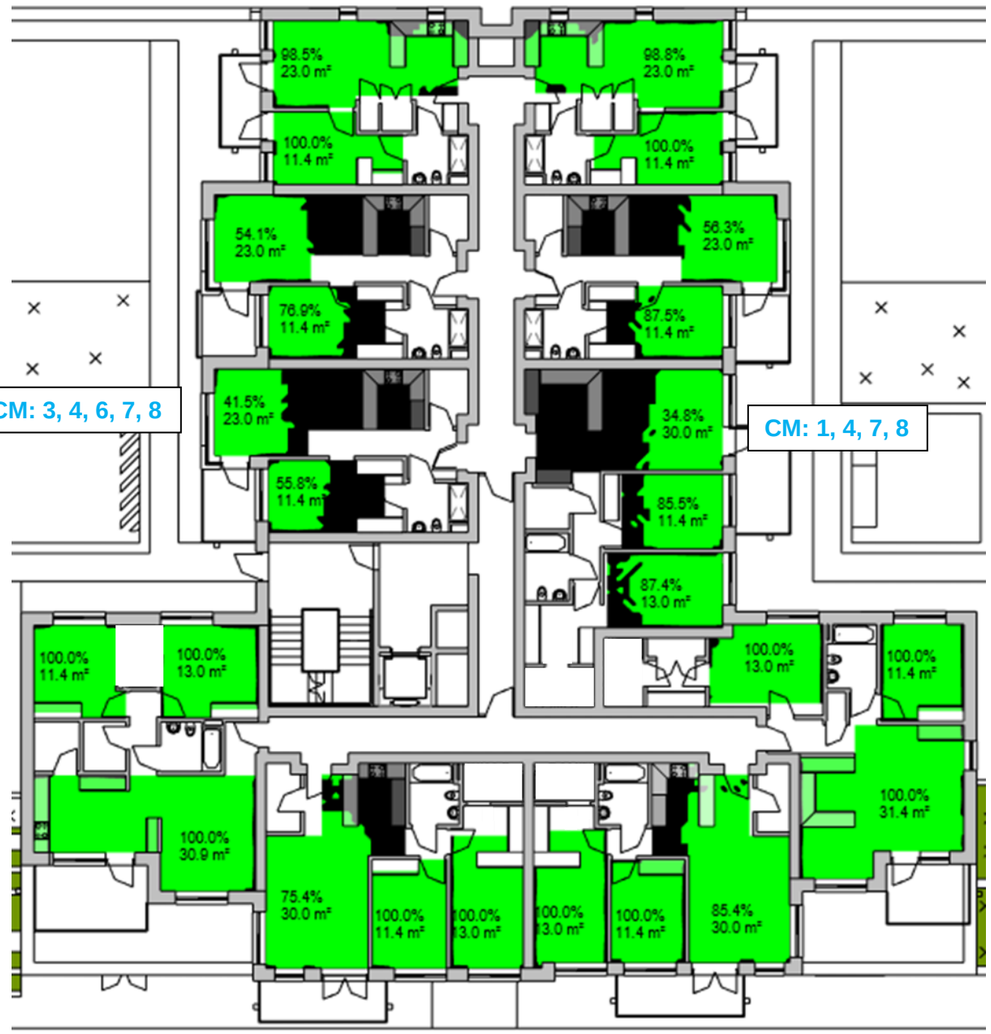
7.4 Spatial Daylight Autonomy Results

Block 2 – First Floor

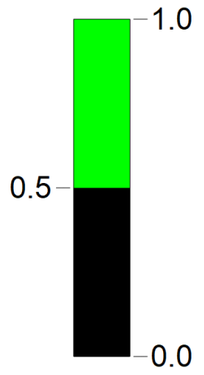
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
23 out of 25 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space



Passed-Failed



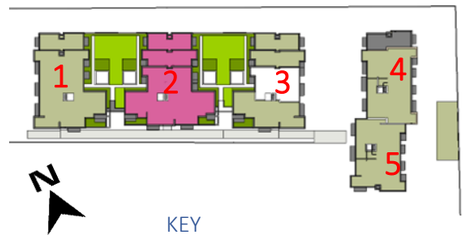
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	**3**	**121**
	98%	**2%**	

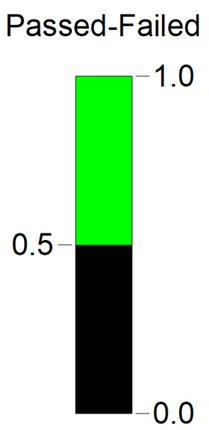
7.4 Spatial Daylight Autonomy Results

Block 2 – Second Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
24 out of 25 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space



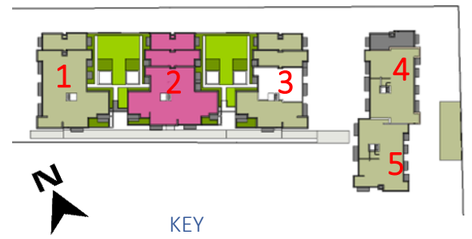
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

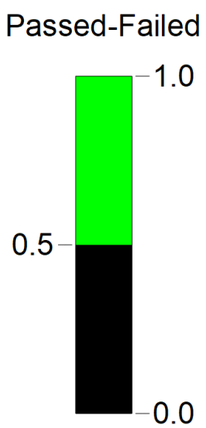
Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	**3**	**121**
	98%	**2%**	

7.4 Spatial Daylight Autonomy Results

Block 2 – Third Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





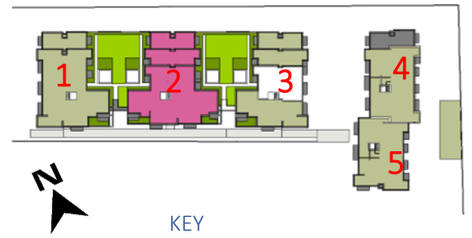
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

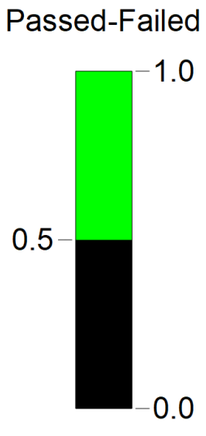
Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	**3**	**121**
	98%	**2%**	

7.4 Spatial Daylight Autonomy Results

Block 2 – Fourth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





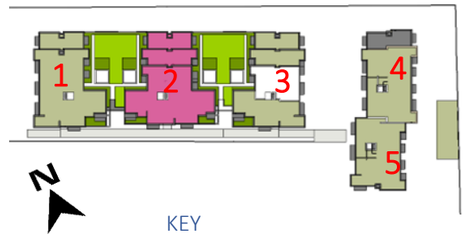
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

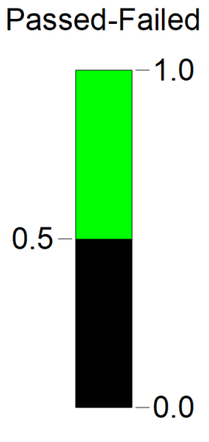
Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	**3**	**121**
	98%	**2%**	

7.4 Spatial Daylight Autonomy Results

Block 2 – Fifth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





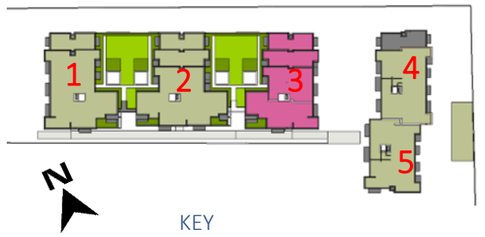
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 2	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	23	2	25
Second Floor	24	1	25
Third Floor	25	0	25
Fourth Floor	21	0	21
Fifth Floor	17	0	17
	118	**3**	**121**
	98%	**2%**	

7.4 Spatial Daylight Autonomy Results

Block 3 – Ground Floor

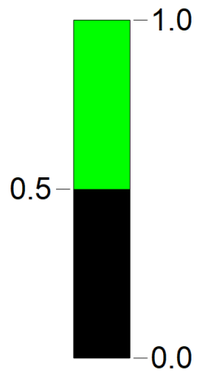
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
14 out of 15 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space

CM: 1, 2, 7, 8

Passed-Failed



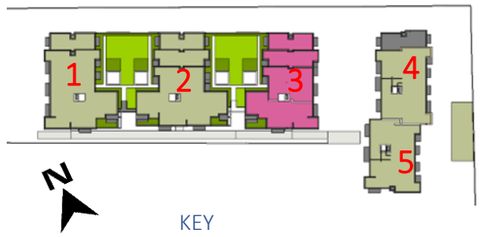
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	**4**	**118**
	97%	**3%**	

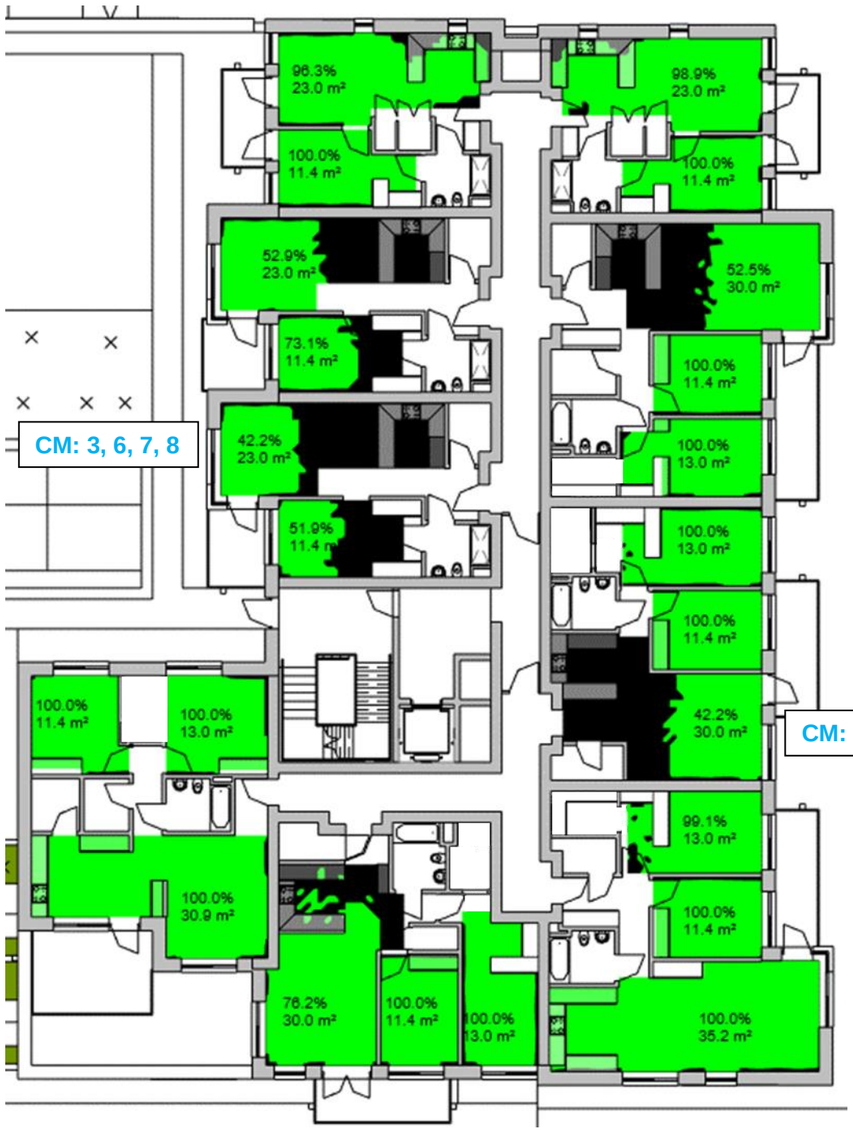
7.4 Spatial Daylight Autonomy Results

Block 3 – First Floor

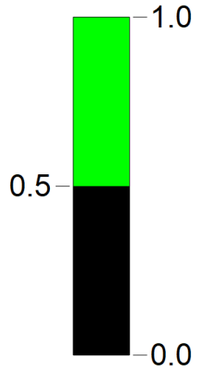
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
21 out of 23 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space



Passed-Failed



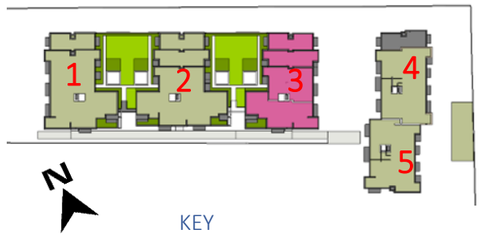
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	**4**	**118**
	97%	**3%**	

7.4 Spatial Daylight Autonomy Results

Block 3 – Second Floor

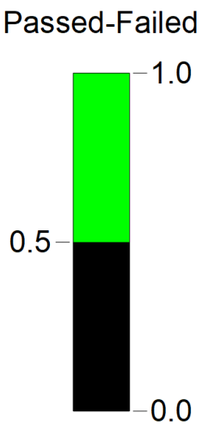
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
22 out of 23 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space

CM: 1, 2, 7, 8

Passed-Failed



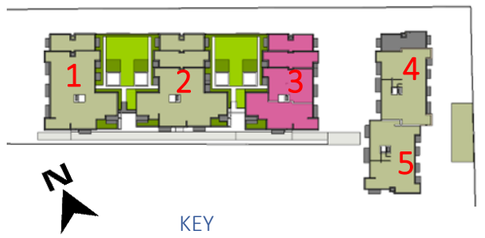
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

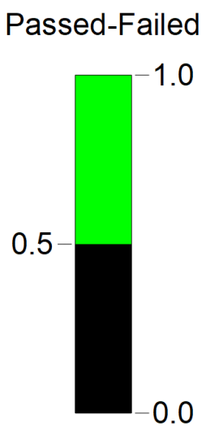
Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	**4**	**118**
	97%	**3%**	

7.4 Spatial Daylight Autonomy Results

Block 3 – Third Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





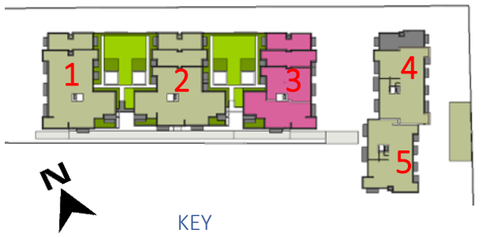
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

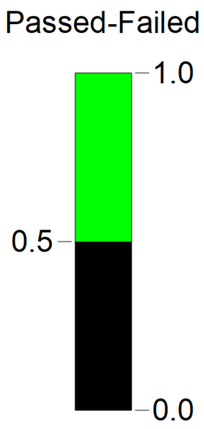
Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	**4**	**118**
	97%	**3%**	

7.4 Spatial Daylight Autonomy Results

Block 3 – Fourth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





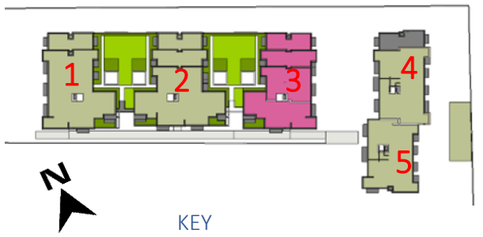
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

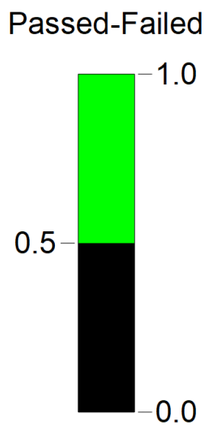
Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	**4**	**118**
	97%	**3%**	

7.4 Spatial Daylight Autonomy Results

Block 3 – Fifth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





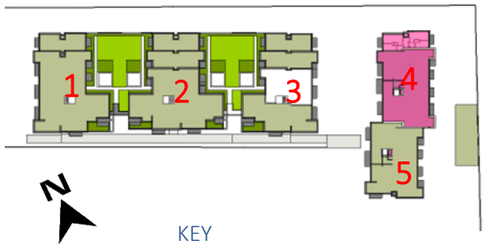
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 3	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	21	2	23
Second Floor	22	1	23
Third Floor	23	0	23
Fourth Floor	19	0	19
Fifth Floor	15	0	15
	114	**4**	**118**
	97%	**3%**	

7.4 Spatial Daylight Autonomy Results

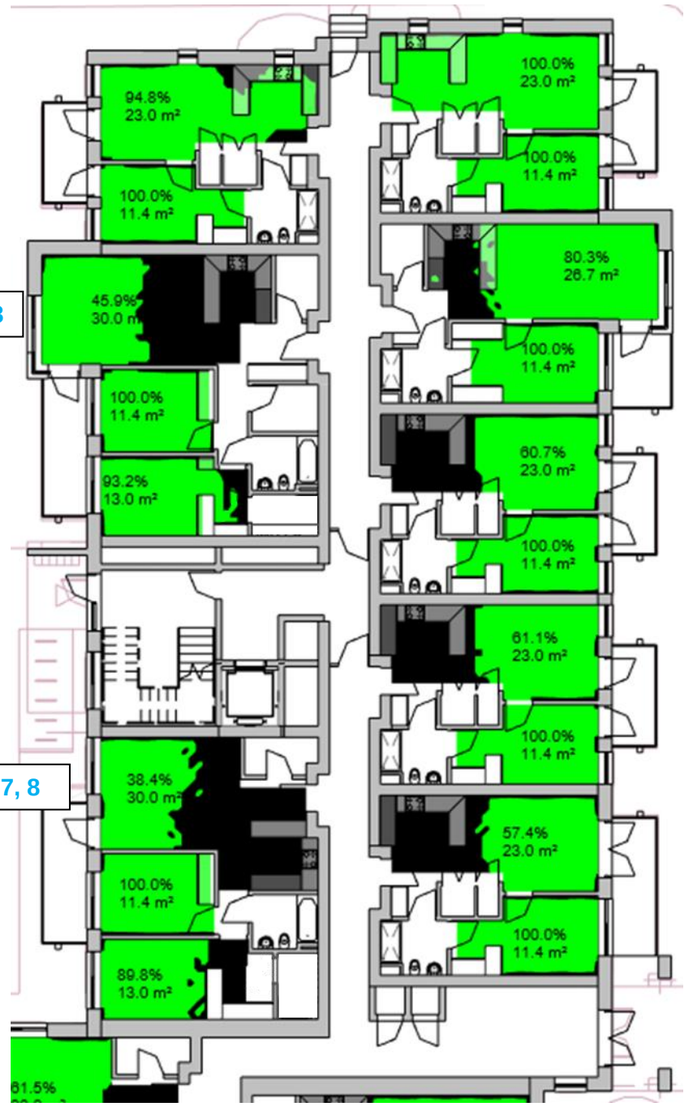
Block 4 – Ground Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
16 out of 18 rooms on this floor were determined to be compliant for SDA.

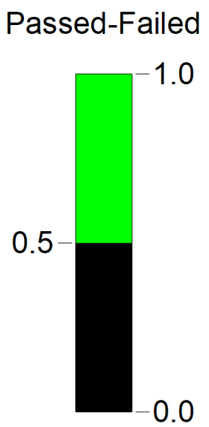


Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space

CM: 1, 2, 3, 7, 8



CM: 1, 2, 7, 8



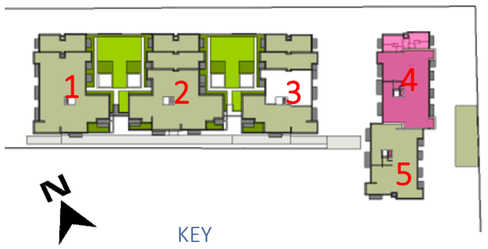
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 4	Pass	Fail	Total
Ground Floor	16	2	18
First Floor	17	2	19
Second Floor	18	1	19
Third Floor	19	0	19
Fourth Floor	15	0	15
	85	**5**	**90**
	94%	**6%**	

7.4 Spatial Daylight Autonomy Results

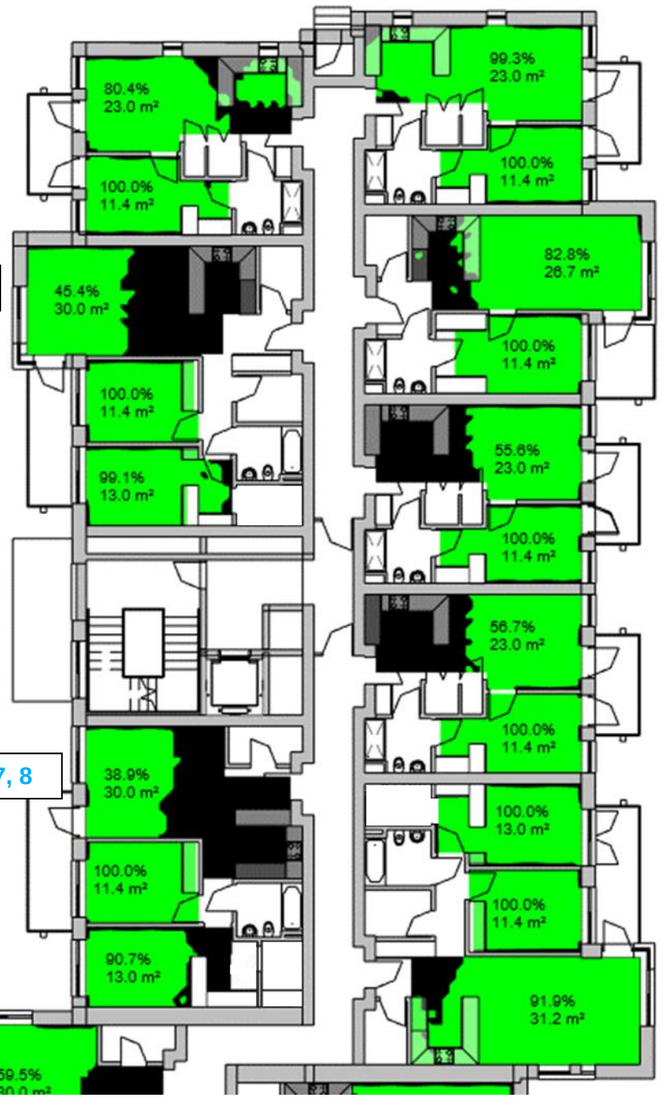
Block 4 – First Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
17 out of 19 rooms on this floor were determined to be compliant for SDA.

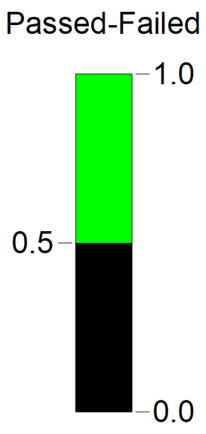


Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space

CM: 1, 2, 3, 7, 8



CM: 1, 2, 7, 8



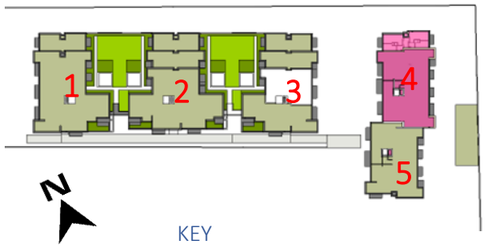
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 4	Pass	Fail	Total
Ground Floor	16	2	18
First Floor	17	2	19
Second Floor	18	1	19
Third Floor	19	0	19
Fourth Floor	15	0	15
	85	**5**	**90**
	94%	**6%**	

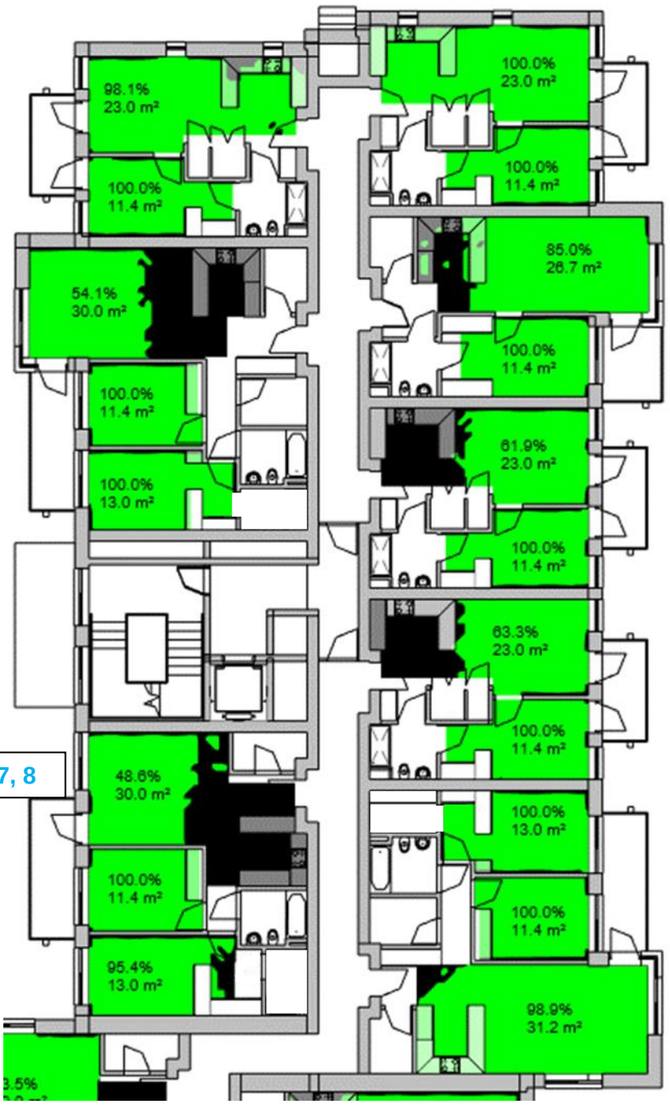
7.4 Spatial Daylight Autonomy Results

Block 4 – Second Floor

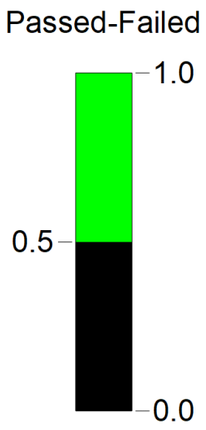
Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
18 out of 19 rooms on this floor were determined to be compliant for SDA.



Compensatory Measures
1: Daylight Adjacency
2: Sunlight
3: Dual Aspect
4: Aspect
5: Direct Access to Courtyard
6: Unit Size
7: Private Amenity Space
8: Communal Open Space



CM: 1, 2, 7, 8



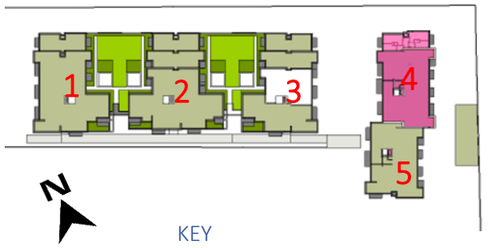
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

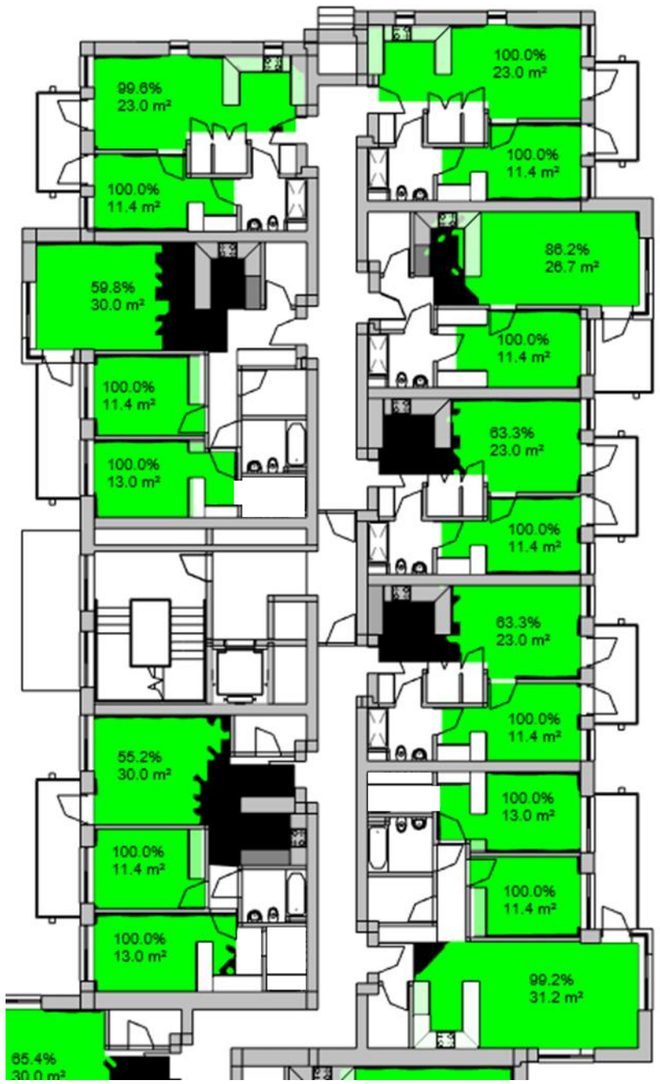
Block 4	Pass	Fail	Total
Ground Floor	16	2	18
First Floor	17	2	19
Second Floor	18	1	19
Third Floor	19	0	19
Fourth Floor	15	0	15
	85	**5**	**90**
	94%	**6%**	

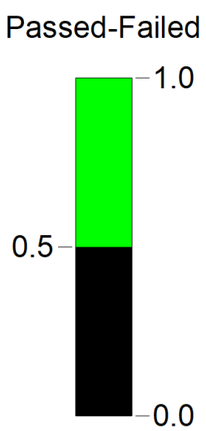
7.4 Spatial Daylight Autonomy Results

Block 4 – Third Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.







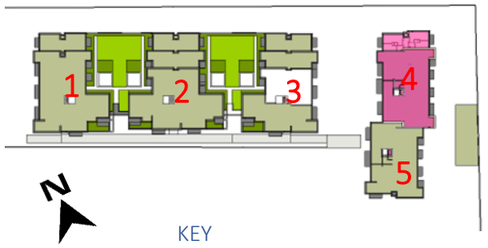
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

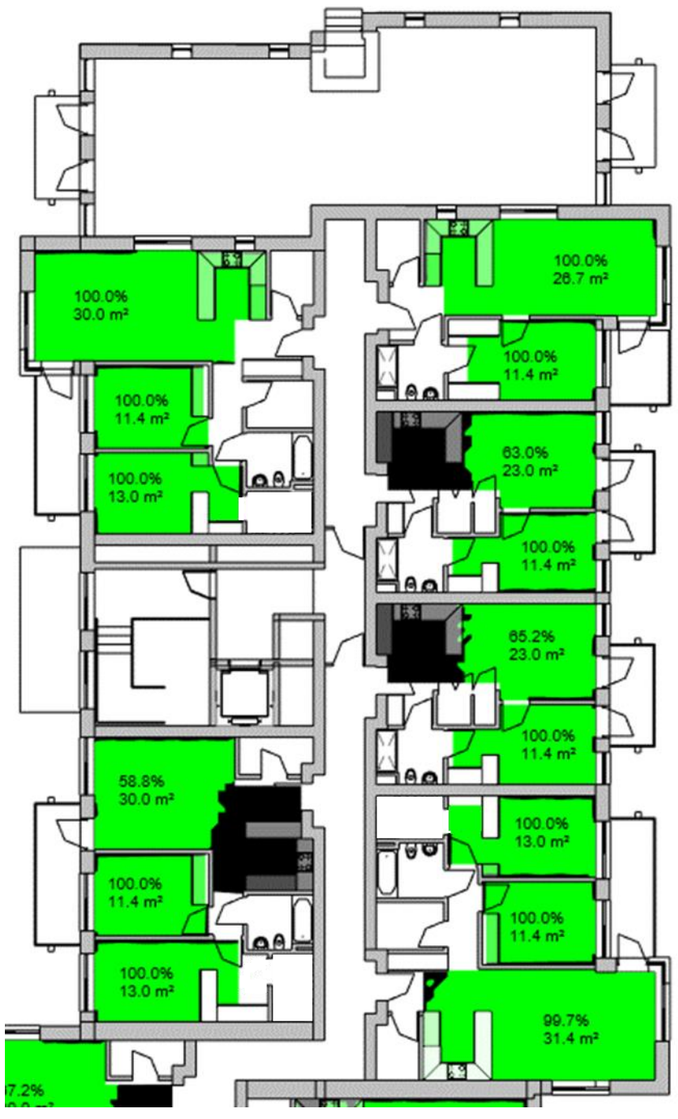
Block 4	Pass	Fail	Total
Ground Floor	16	2	18
First Floor	17	2	19
Second Floor	18	1	19
Third Floor	19	0	19
Fourth Floor	15	0	15
	85	**5**	**90**
	94%	**6%**	

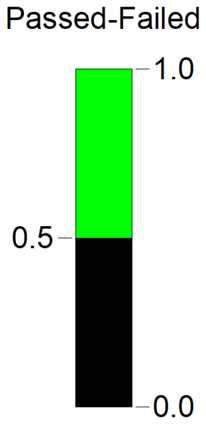
7.4 Spatial Daylight Autonomy Results

Block 4 – Fourth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.







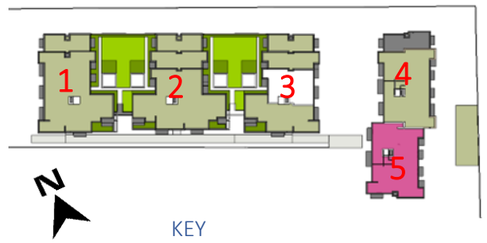
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

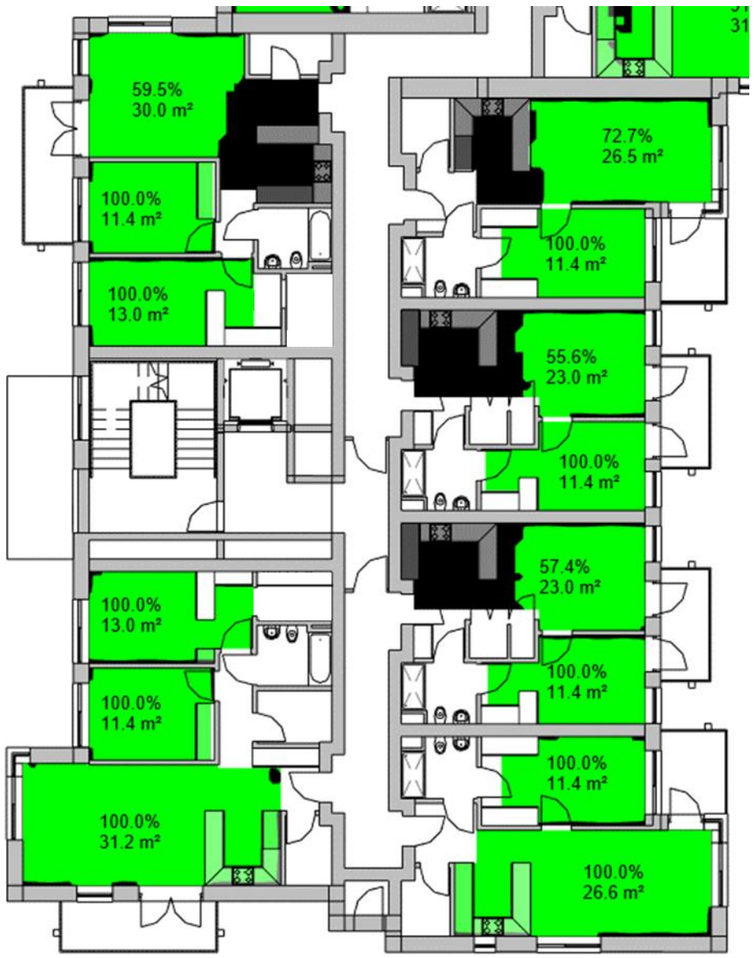
Block 4	Pass	Fail	Total
Ground Floor	16	2	18
First Floor	17	2	19
Second Floor	18	1	19
Third Floor	19	0	19
Fourth Floor	15	0	15
	85	**5**	**90**
	94%	**6%**	

7.4 Spatial Daylight Autonomy Results

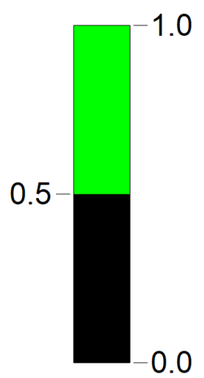
Block 5 – Ground Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





Passed-Failed



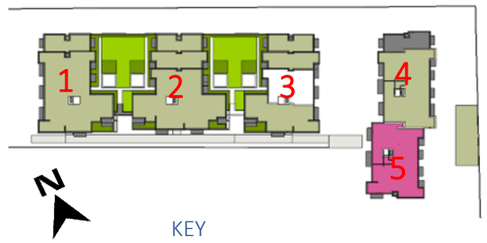
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

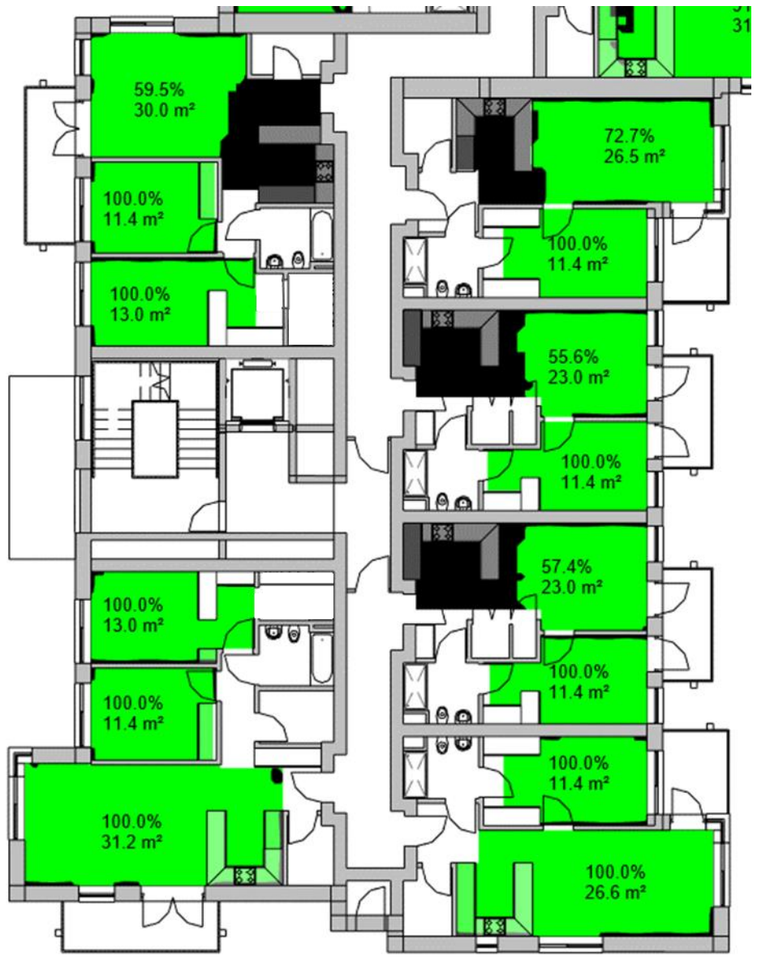
Block 5	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	14	0	14
Second Floor	14	0	14
Third Floor	14	0	14
Fourth Floor	14	0	14
	70	**0**	**70**
	100%	**0%**	

7.4 Spatial Daylight Autonomy Results

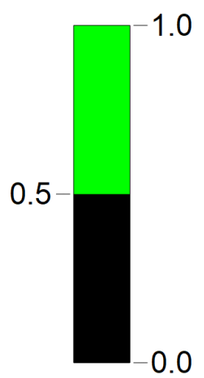
Block 5 – First Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





Passed-Failed



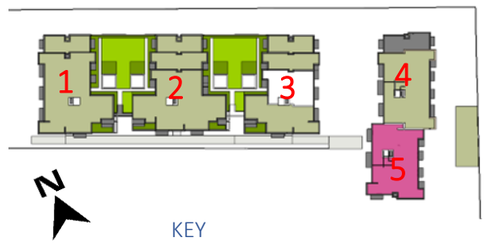
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

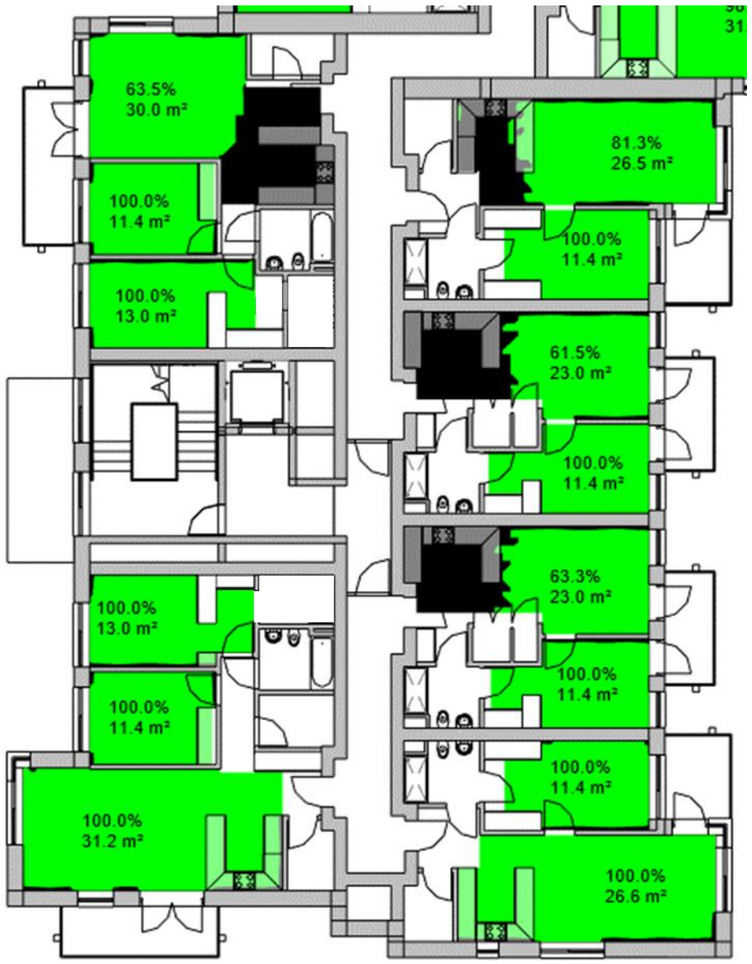
Block 5	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	14	0	14
Second Floor	14	0	14
Third Floor	14	0	14
Fourth Floor	14	0	14
	70	0	70
	100%	0%	

7.4 Spatial Daylight Autonomy Results

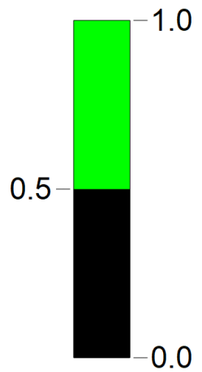
Block 5 – Second Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





Passed-Failed



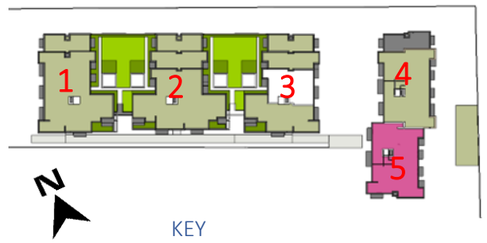
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

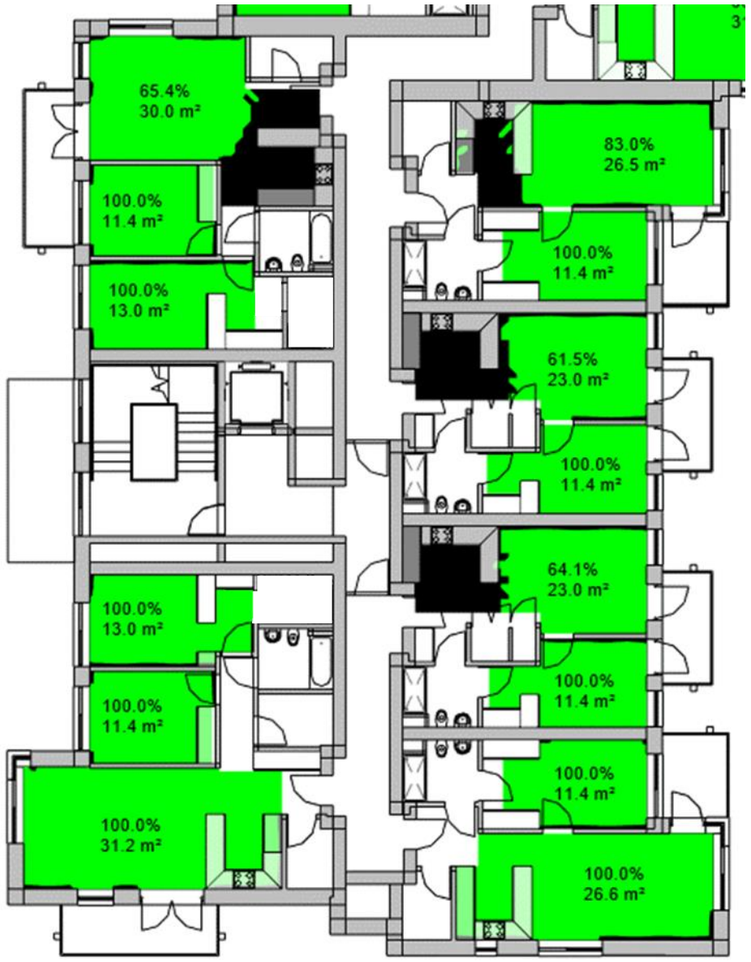
Block 5	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	14	0	14
Second Floor	14	0	14
Third Floor	14	0	14
Fourth Floor	14	0	14
	70	0	70
	100%	0%	

7.4 Spatial Daylight Autonomy Results

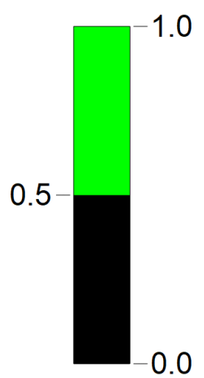
Block 5 – Third Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.





Passed-Failed



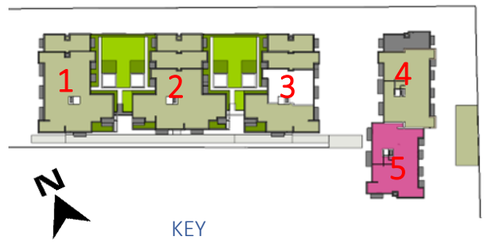
SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

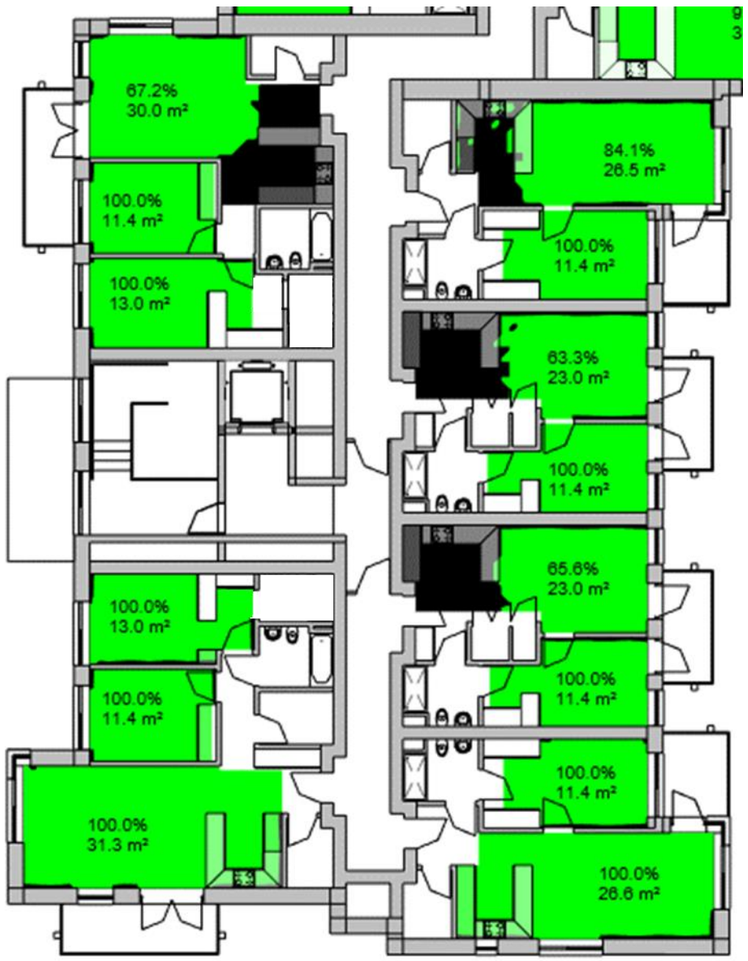
Block 5	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	14	0	14
Second Floor	14	0	14
Third Floor	14	0	14
Fourth Floor	14	0	14
	70	**0**	**70**
	100%	**0%**	

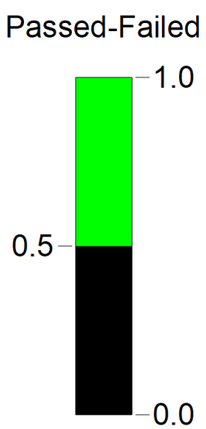
7.4 Spatial Daylight Autonomy Results

Block 5 – Fourth Floor

Daylight analysis is illustrated below with green shaded area receiving targeted illuminance, 200Lux for KLDs and 100Lux for Bedrooms.
Black shade is showing area where it's receiving less than targeted illuminance.
Every KLD and Bedroom on this floor were determined to be fully compliant for SDA.







SDA Targets	> 50% at
Bedrooms	> 100 Lux
Living Areas	> 150 Lux
K/L/D / Kitchen	> 200 Lux

Block 5	Pass	Fail	Total
Ground Floor	14	0	14
First Floor	14	0	14
Second Floor	14	0	14
Third Floor	14	0	14
Fourth Floor	14	0	14
	70	**0**	**70**
	100%	**0%**	

8.0 Exposure to Sunlight

The BRE Guide outlines that:

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

As with Sunlight Amenity, the BRE methodology therefore utilises the Equinox as being representative of the solar mid-position throughout the year, with the calculation of potential received sunlight during that day enabling a quantitative assessment in addition to idealised configuration of ensuring southerly aspect – preferably for living areas as described below:

> *3.1.16 Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations."*

The guide further notes that:

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

An analysis was undertaken for each unit in the proposed development to assess the exposure to sunlight that each unit can receive, assessing initially KLD's and where these were found to be non-compliant, a check was undertaken to determine whether a Bedroom could achieve adequate sunlight in accordance with the methodology. It may be noted therefore that the tables and diagrams below indicate compliance for Exposure to Sunlight based on assessment of each dwelling or apartment (i.e., 208 total no.) as opposed to individual rooms, as is the case for Daylight analysis.

Figure 8.1.1 below illustrates how the results as presented within the report to indicate their Exposure to Sunlight classification in accordance with BR.209/ EN.17037 may be interpreted as follows:

- Orange – High (4.0 hrs+)
- Yellow – Medium (3.0 - 4.0 hrs)
- Green – Minimum (1.5 - 3.0 hrs)
- Blue – Low/ Non-Compliant (<1.5 hrs)

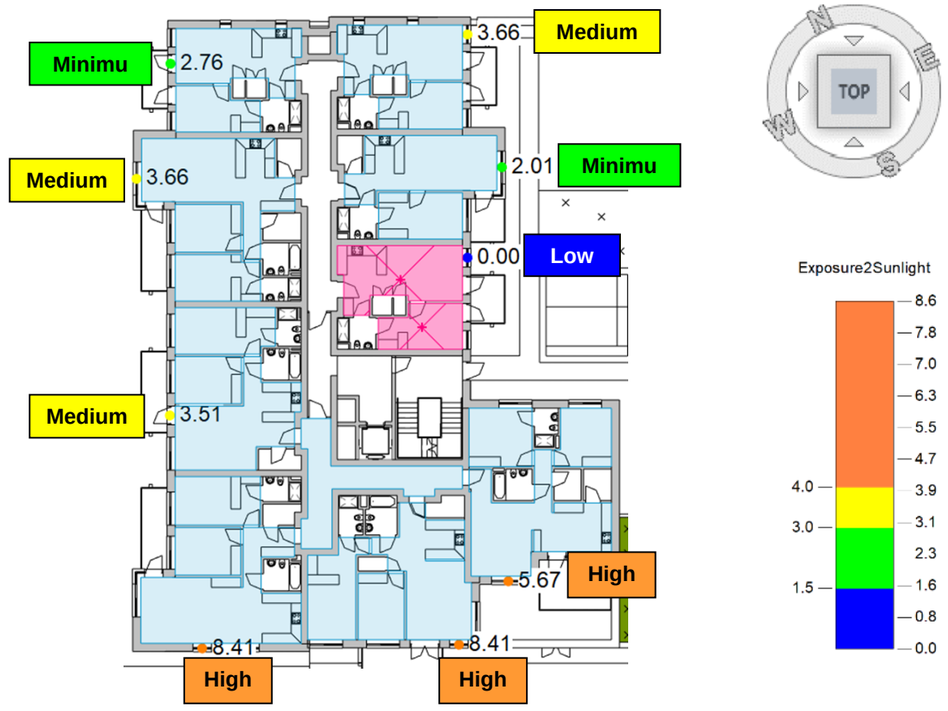


Fig 8.1.1 – Exposure to Sunlight Results – Example

In the example above, each KLD was determined to receive Low to High range of Exposure to Sunlight.

This overall apartment compliance has been illustrated in the detailed results below by highlighting compliant units in blue (as above) and non-compliant in pink.

8.1 Results Summary

The results tables give a breakdown of compliance rates for each block.

Fig 8.1.1 the compliance rate for Exposure to Sunlight. 87% of the units assessed were determined to be compliant as 180 out of 208 apartments were compliant. The following pages in this section provide full detailed results for all units as assessed.

Furthermore, as demonstrated in Fig. 8.1.2, the overall categorisation for the proposed development determined a high degree of overall sunlighting performance, with 61% of apartments predicted to enjoy a “High” degree of Exposure to Sunlight and a further 12% being in the “Medium” Category, and 13% above the minimum threshold, all of which are in accordance with the BR.209 classification.

	Pass	Fail	Total
Block 1	44	2	46
Block 2	36	12	48
Block 3	36	10	46
Block 4	34	4	38
Block 5	30	0	30
	180	**28**	**208**
	87%	**13%**	

Fig 8.1.1 –Exposure to Sunlight – Overall Compliance

Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	**2**	**46**
	96%	**4%**	

Block 4	Pass	Fail	Total
Ground Floor	7	1	8
First Floor	7	1	8
Second Floor	7	1	8
Third Floor	7	1	8
Fourth Floor	6	0	6
	34	**4**	**38**
	89%	**11%**	

Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 5	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	0	6
Second Floor	6	0	6
Third Floor	6	0	6
Fourth Floor	6	0	6
	30	**0**	**30**
	100%	**0%**	

Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	**10**	**46**
	78%	**22%**	

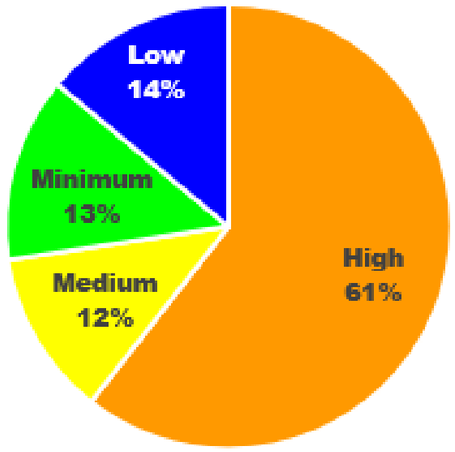
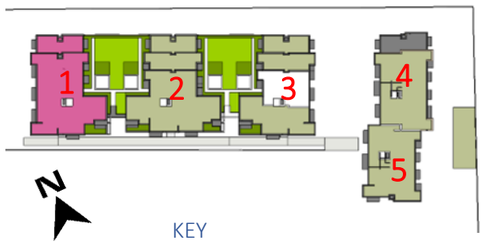
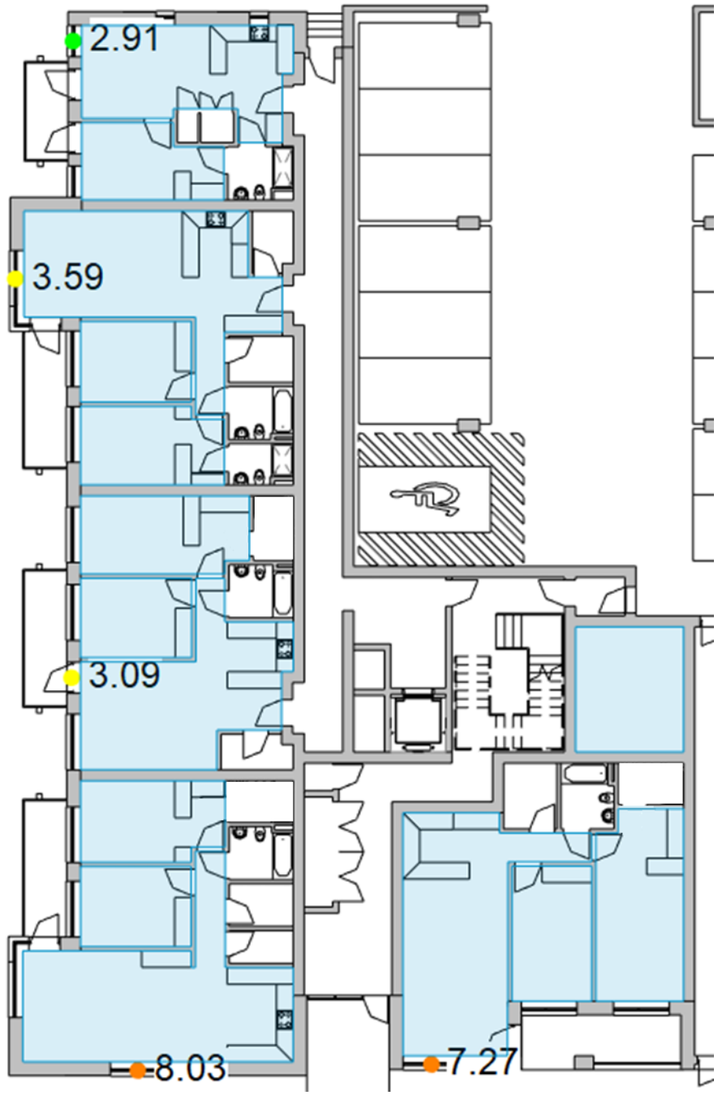


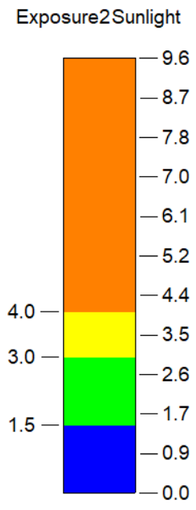
Fig 8.1.2 –Exposure to Sunlight – Overall Categorisation

Block 1 - Ground Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



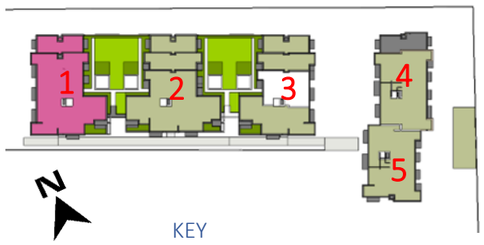


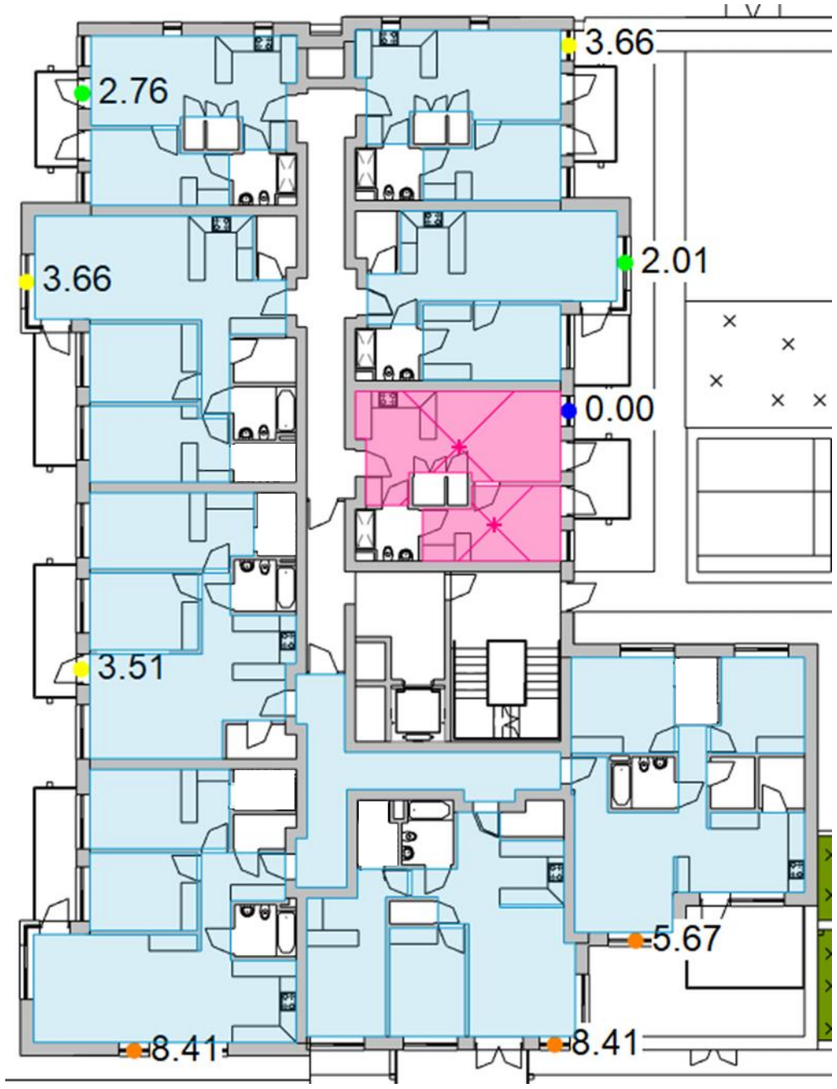


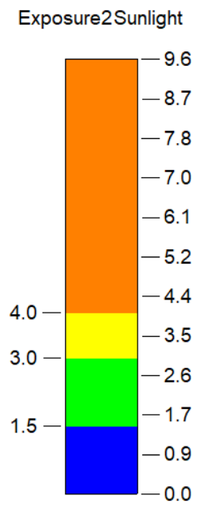
Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	2	46
	96%	4%	

Block 1 - First Floor

Sunlight Analysis as illustrated below, determined 8 out of 9 units on this floor achieve the minimum recommendations.



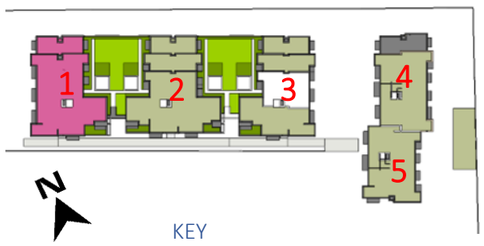


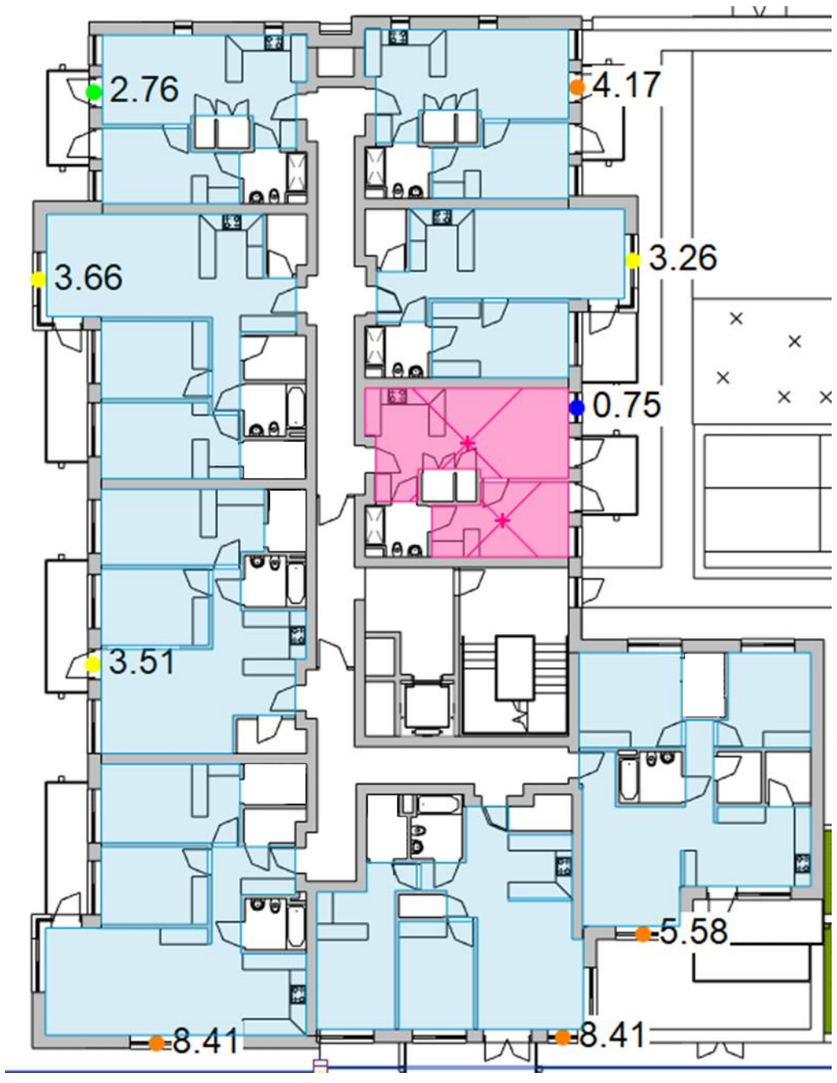


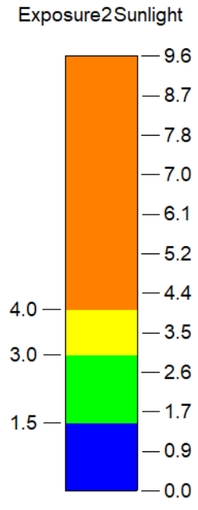
Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	**2**	**46**
	96%	**4%**	

Block 1 - Second Floor

Sunlight Analysis as illustrated below, determined 8 out of 9 units on this floor achieve the minimum recommendations.



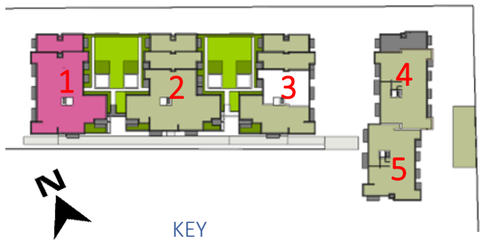


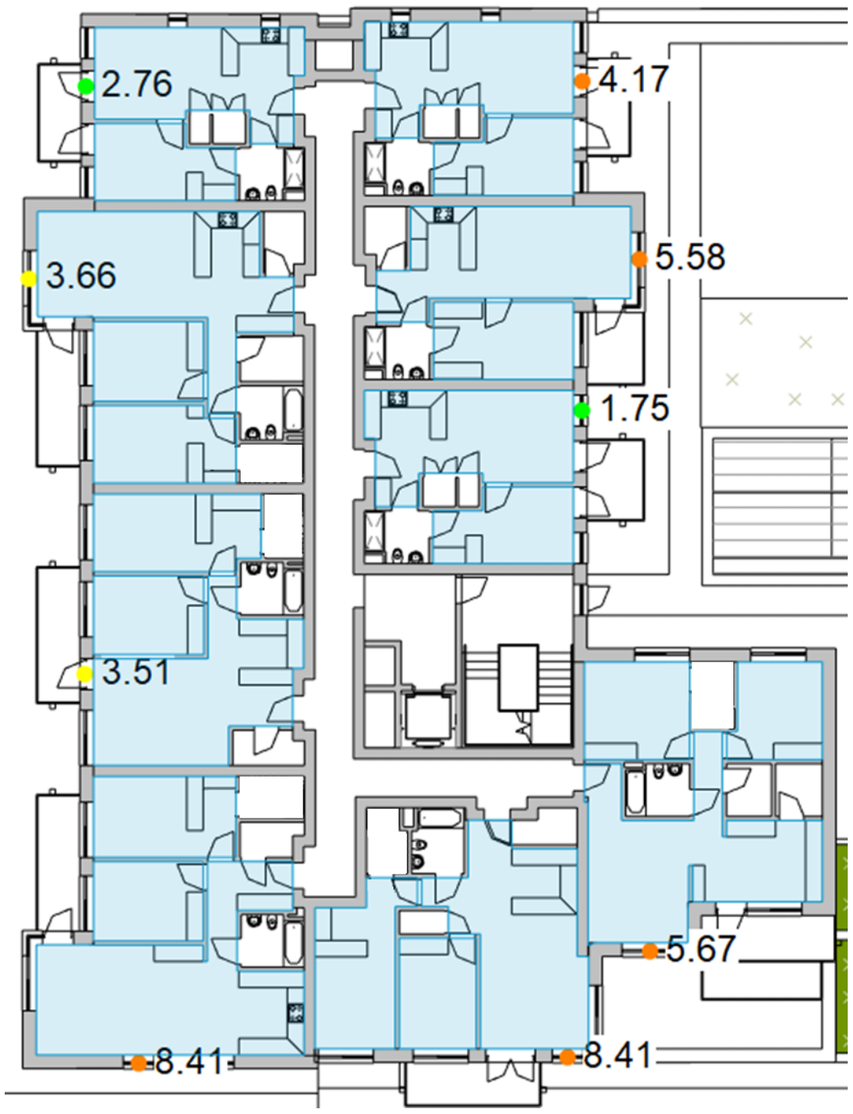


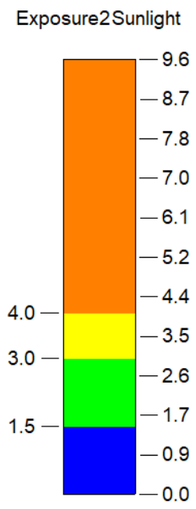
Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	**2**	**46**
	96%	**4%**	

Block 1 - Third Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



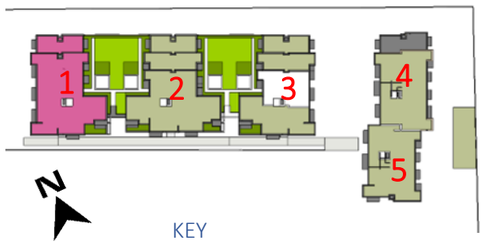


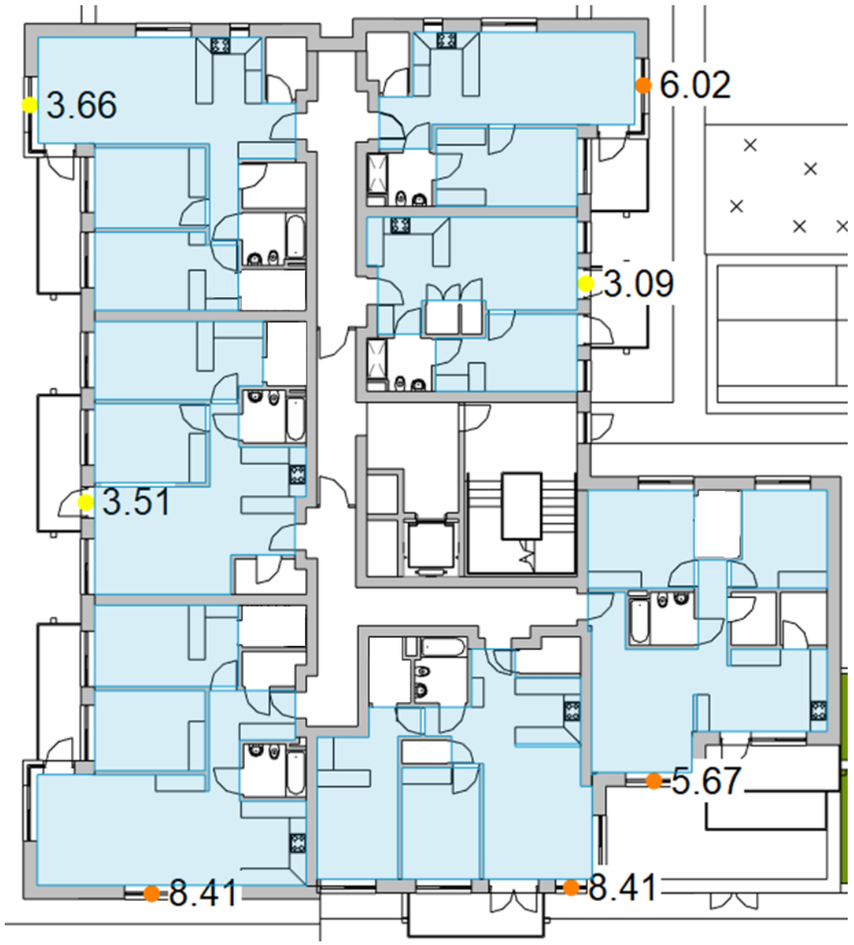


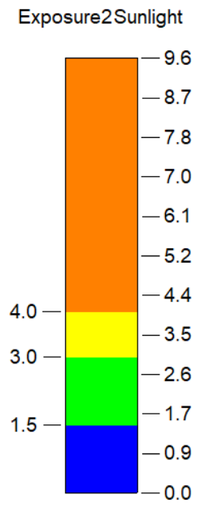
Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	**2**	**46**
	96%	**4%**	

Block 1 - Fourth Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



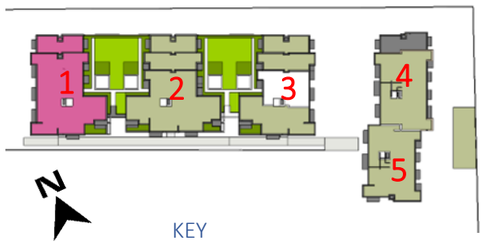


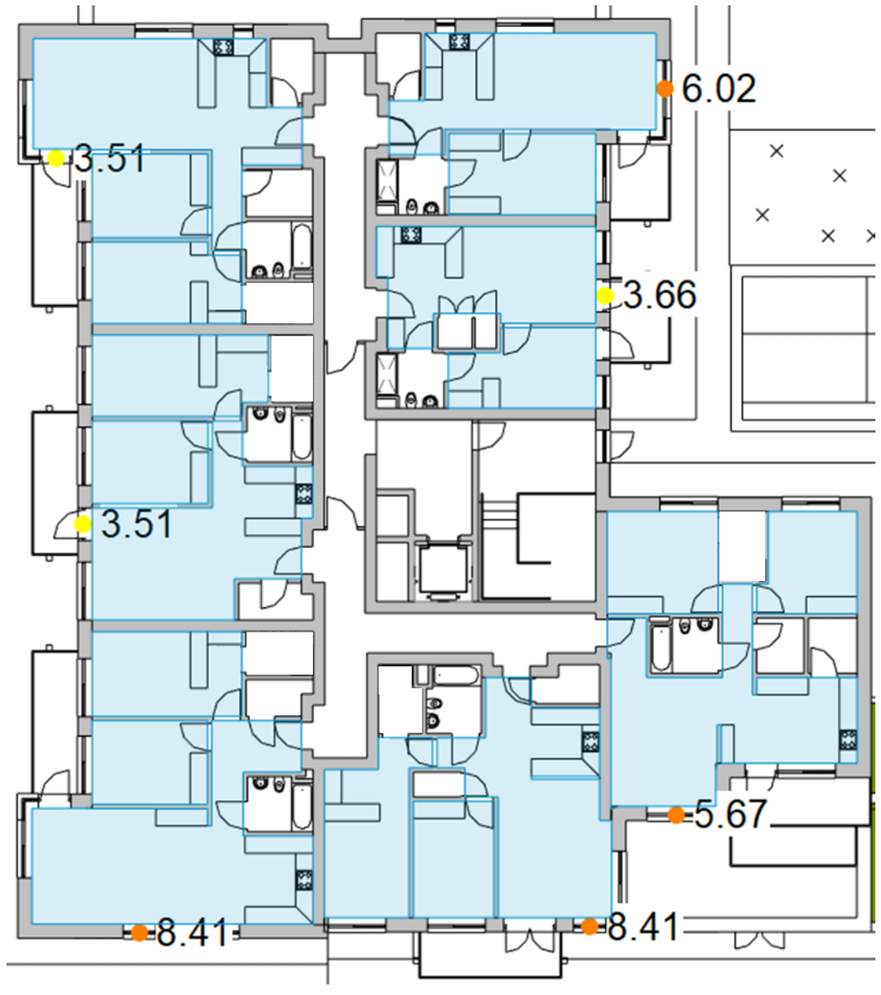


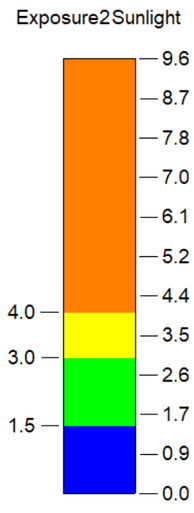
Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	2	46
	96%	4%	

Block 1 - Fifth Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



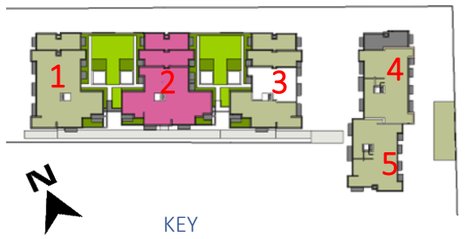


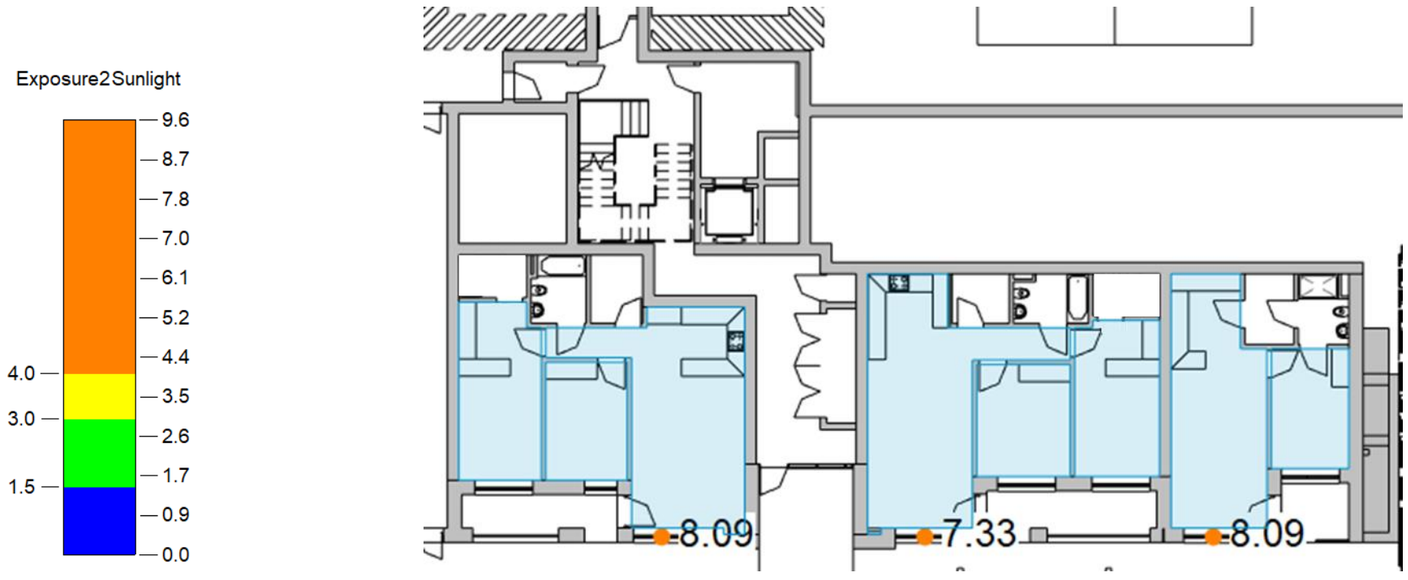


Block 1	Pass	Fail	Total
Ground Floor	5	0	5
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	7	0	7
Fifth Floor	7	0	7
	44	2	46
	96%	4%	

Block 2 - Ground Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

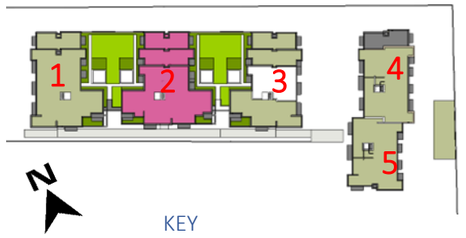


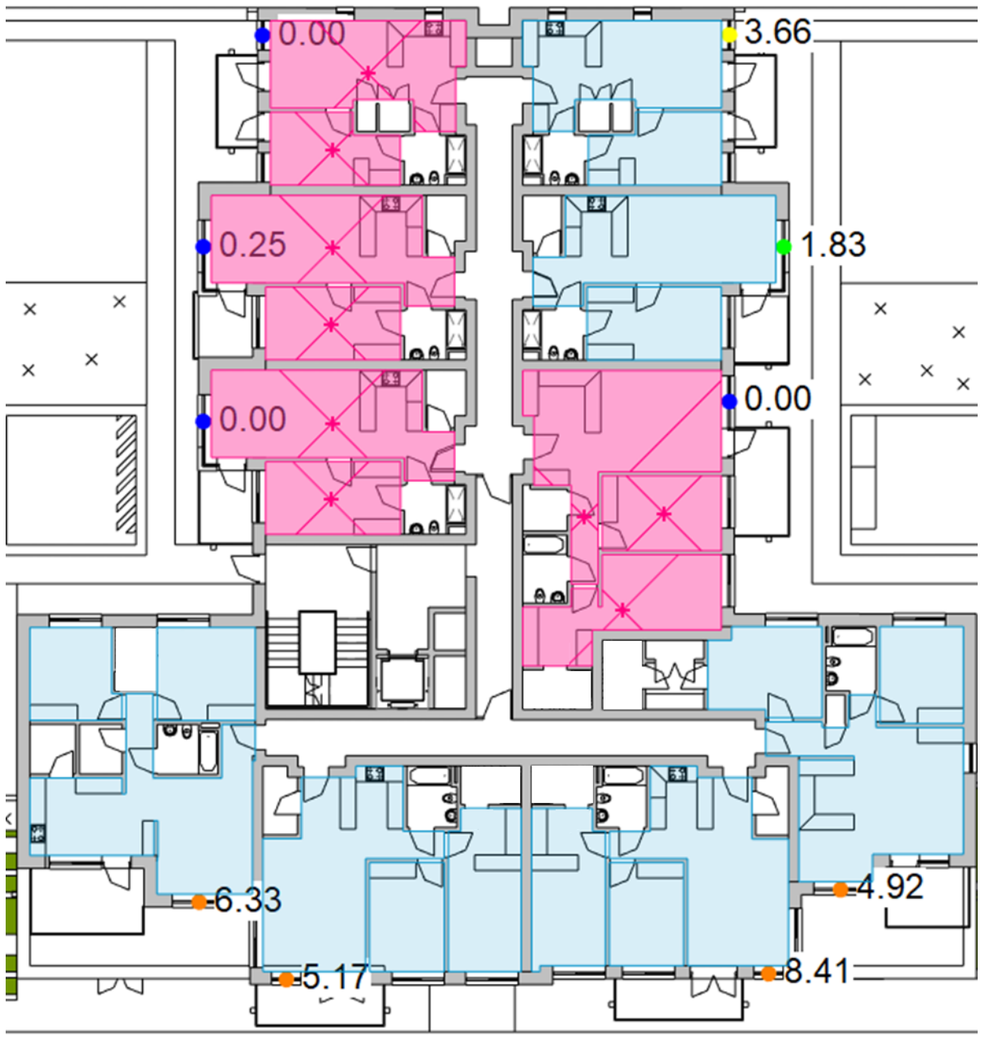


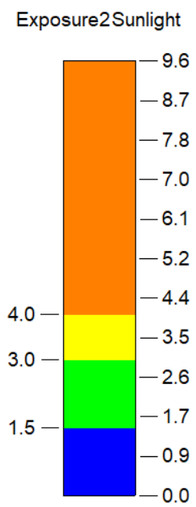
Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 2 - First Floor

Sunlight Analysis as illustrated below, determined 6 out of 10 units on this floor achieve the minimum recommendations.



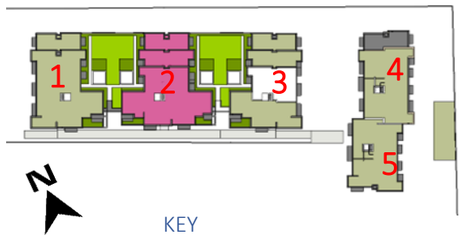


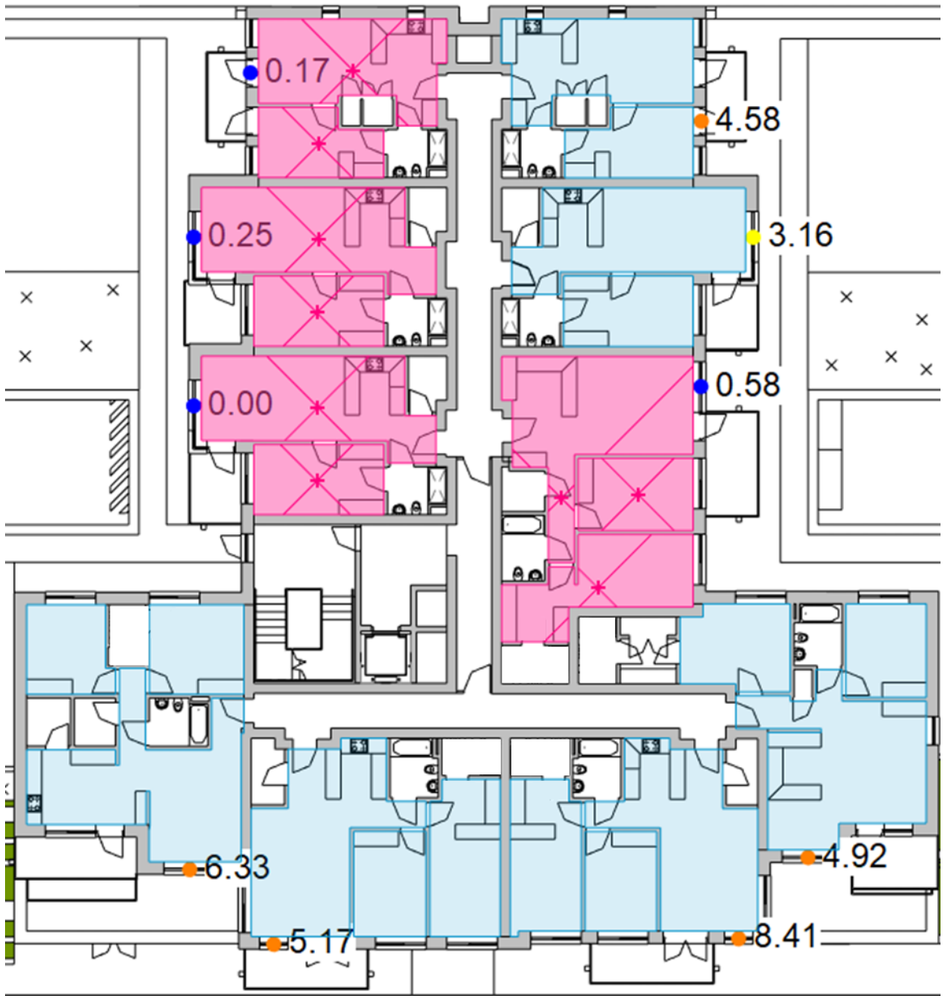


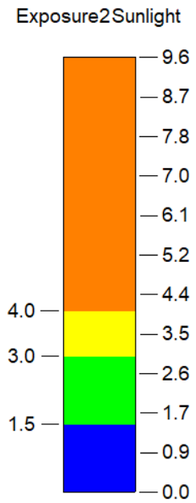
Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 2 - Second Floor

Sunlight Analysis as illustrated below, determined 6 out of 10 units on this floor achieve the minimum recommendations.



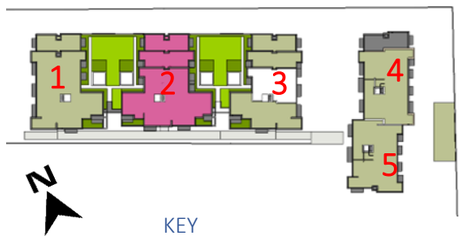


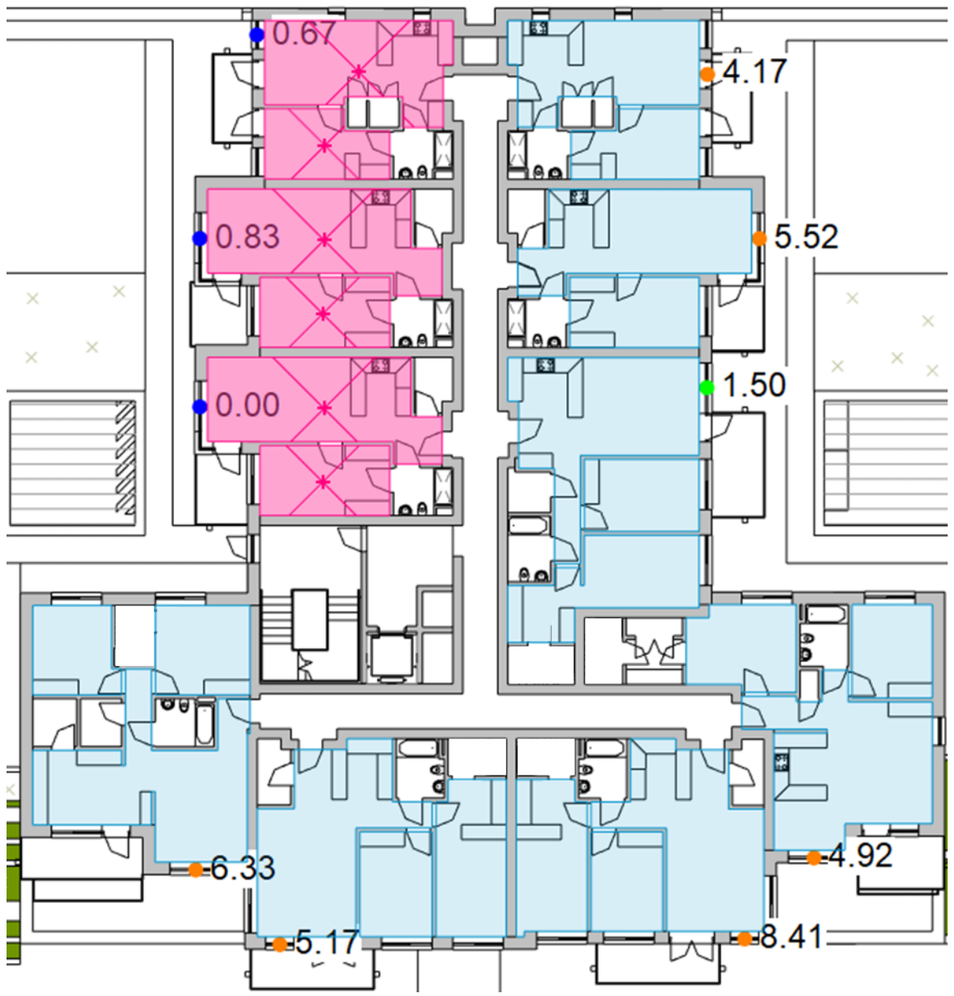


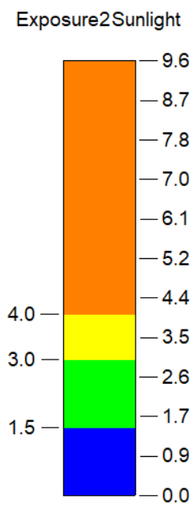
Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 2 - Third Floor

Sunlight Analysis as illustrated below, determined 7 out of 10 units on this floor achieve the minimum recommendations.



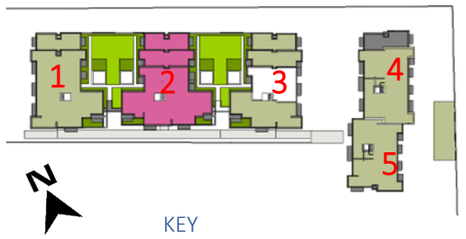


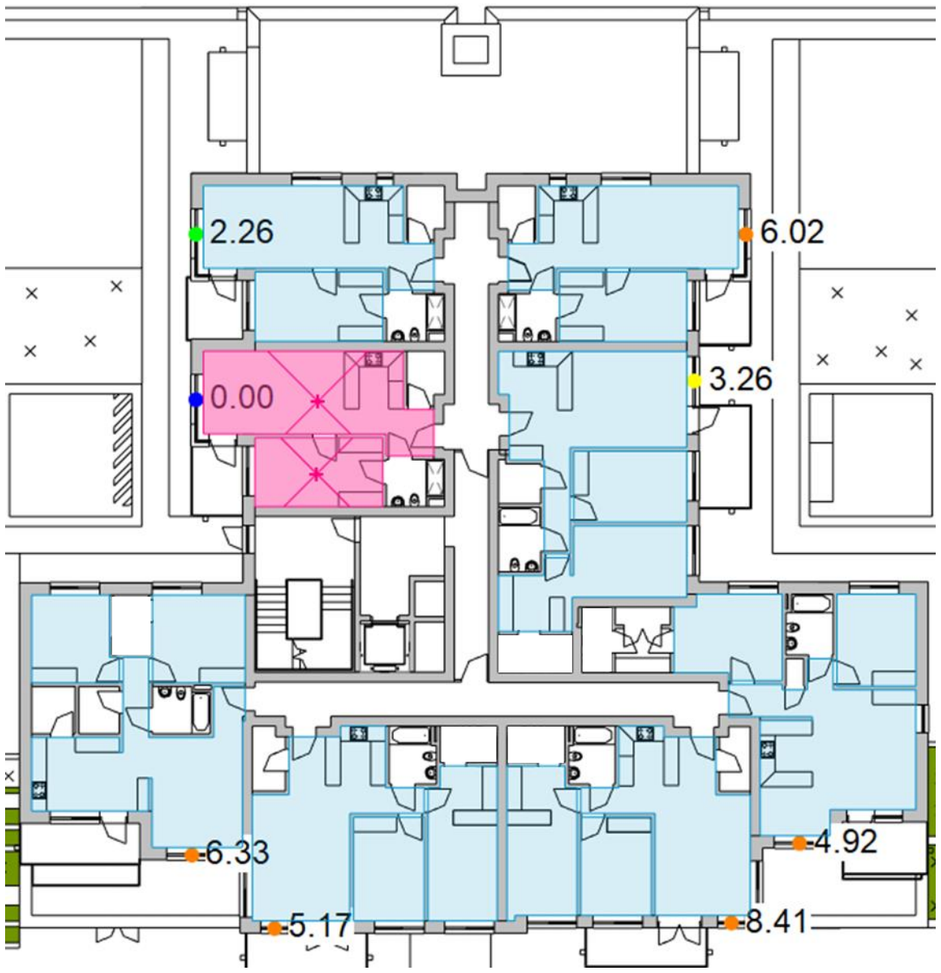


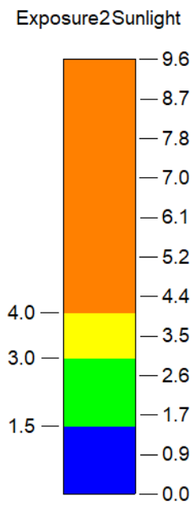
Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 2 - Fourth Floor

Sunlight Analysis as illustrated below, determined 7 out of 8 units on this floor achieve the minimum recommendations.



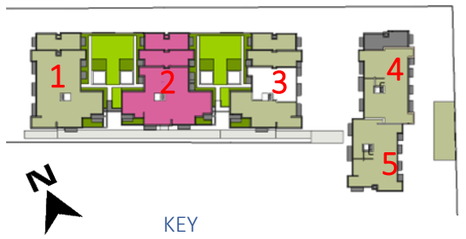


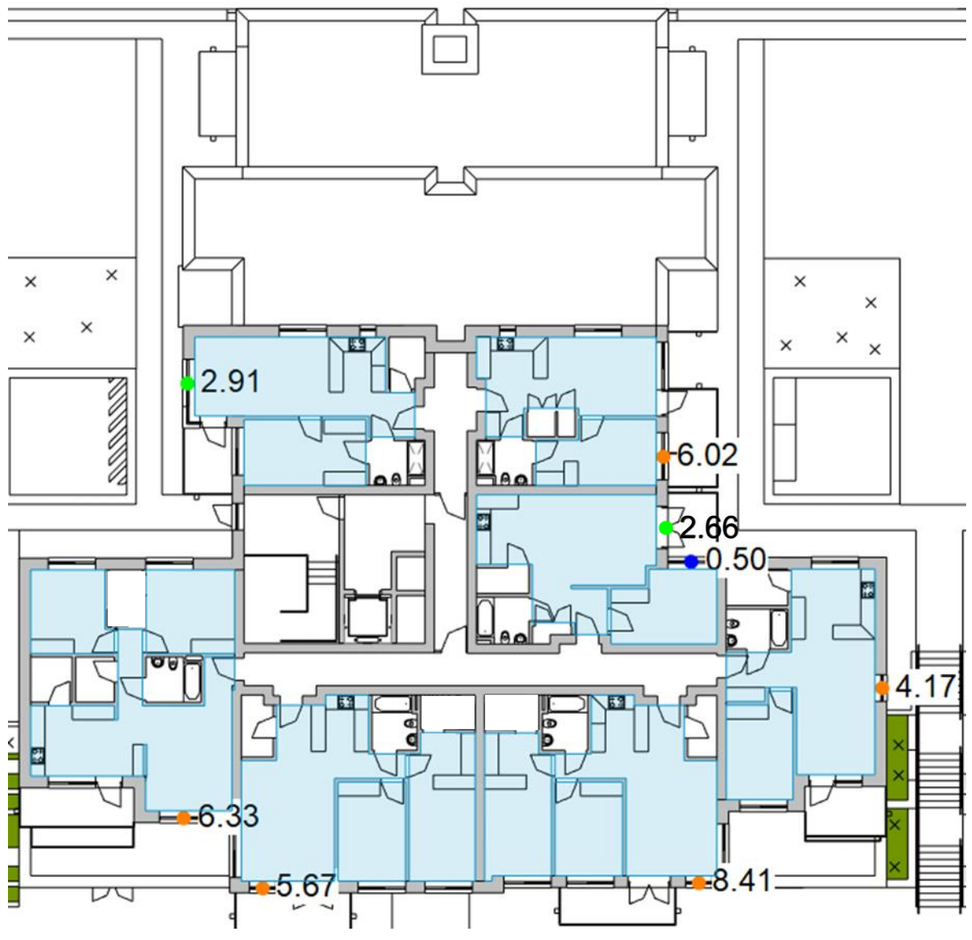


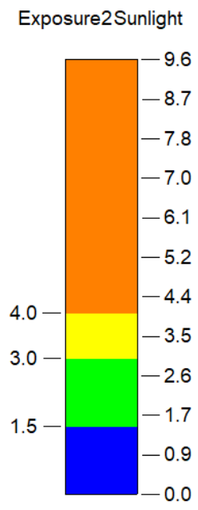
Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 2 - Fifth Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



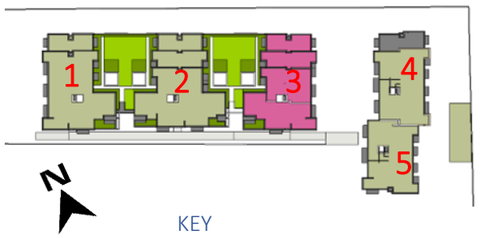


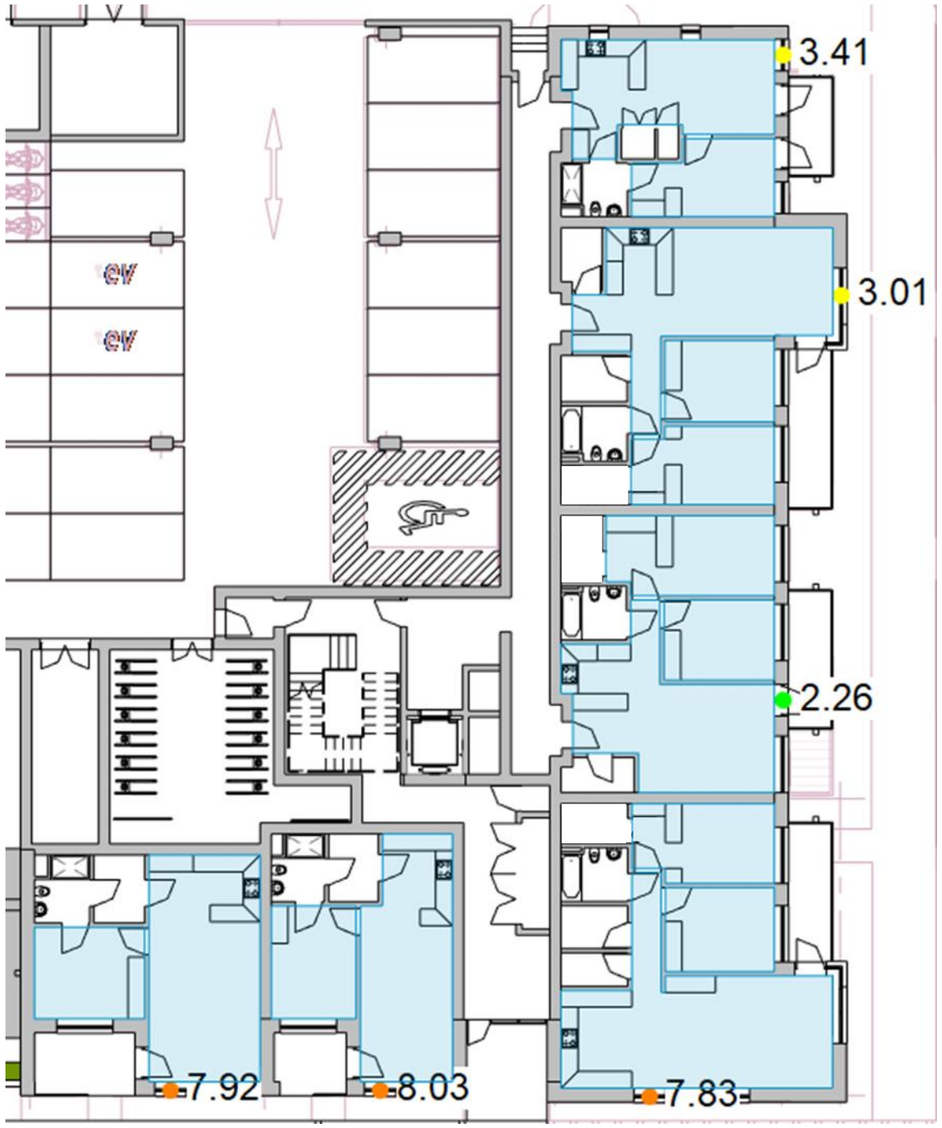


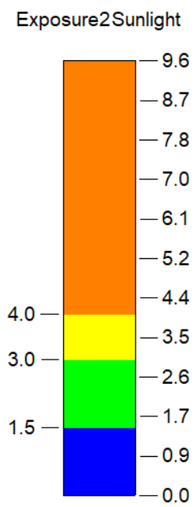
Block 2	Pass	Fail	Total
Ground Floor	3	0	3
First Floor	6	4	10
Second Floor	6	4	10
Third Floor	7	3	10
Fourth Floor	7	1	8
Fifth Floor	7	0	7
	36	**12**	**48**
	75%	**25%**	

Block 3 - Ground Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



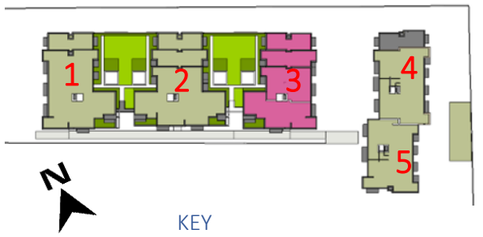


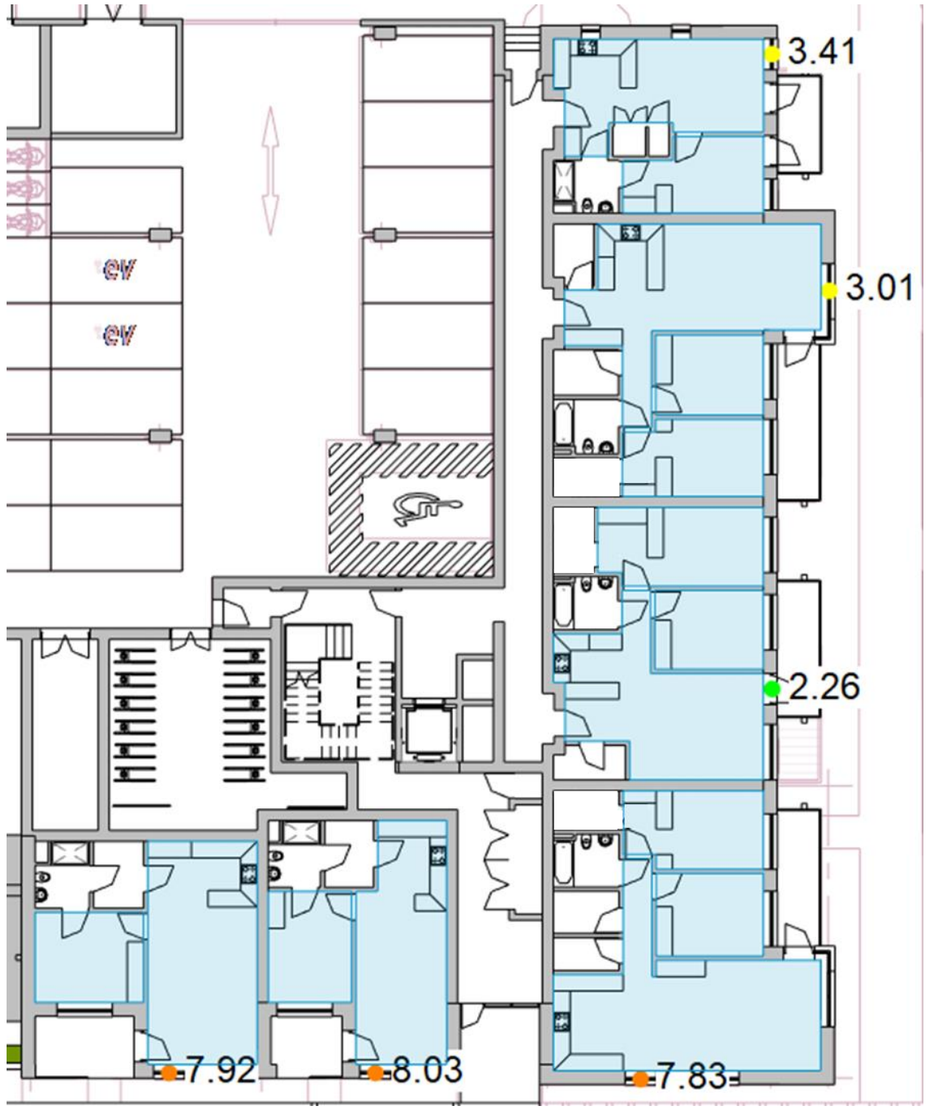


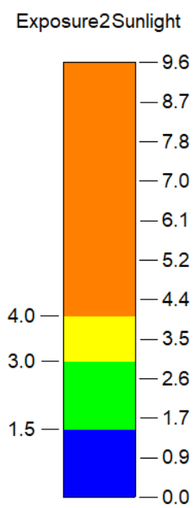
Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	**10**	**46**
	78%	**22%**	

Block 3 - First Floor

Sunlight Analysis as illustrated below, determined 6 out of 9 units on this floor achieve the minimum recommendations.



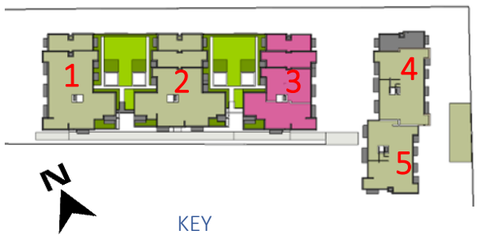


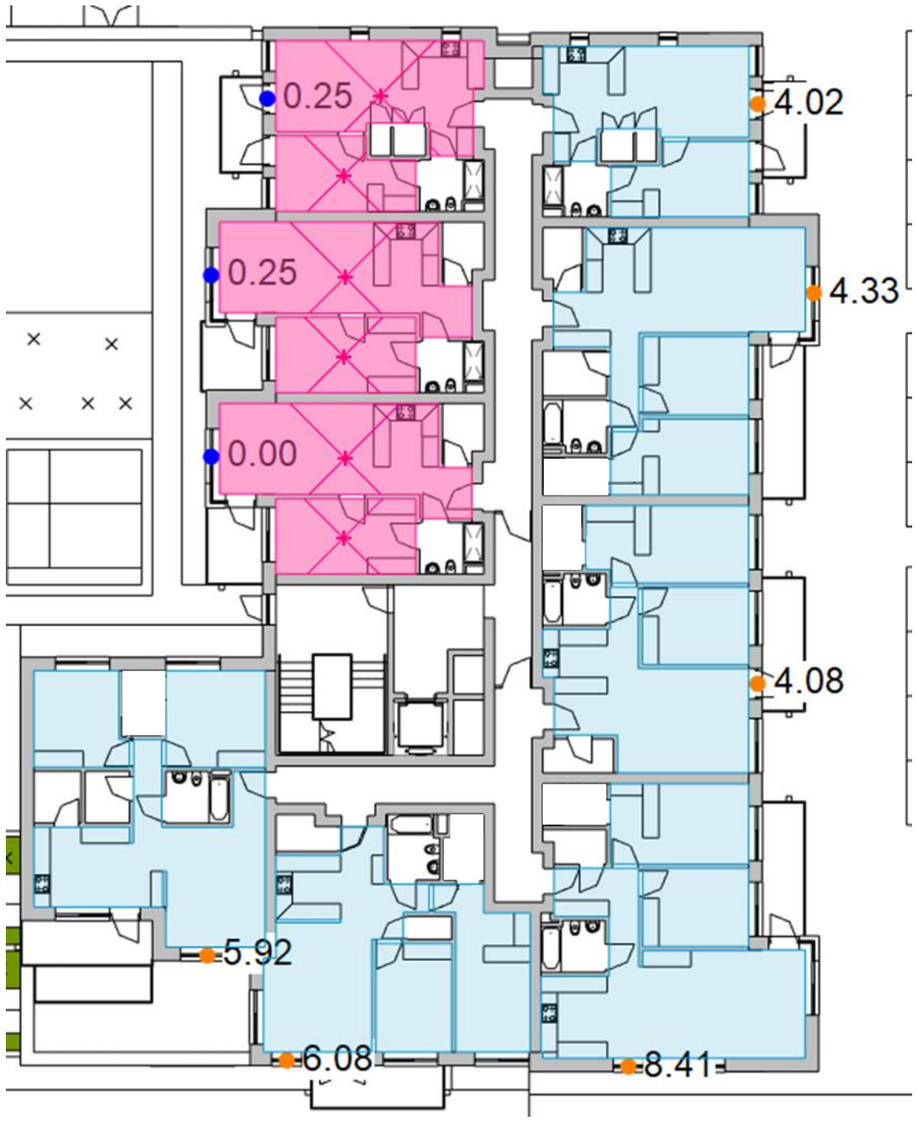


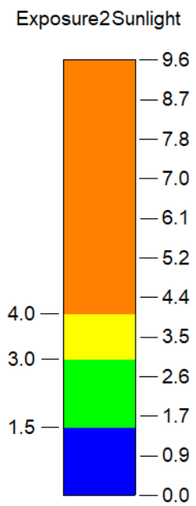
Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	10	46
	78%	22%	

Block 3 - Second Floor

Sunlight Analysis as illustrated below, determined 6 out of 9 units on this floor achieve the minimum recommendations.



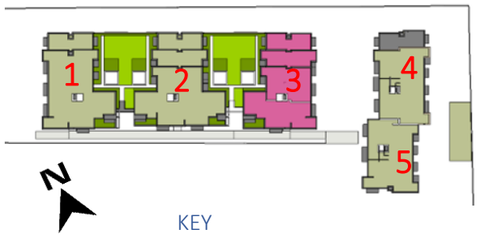


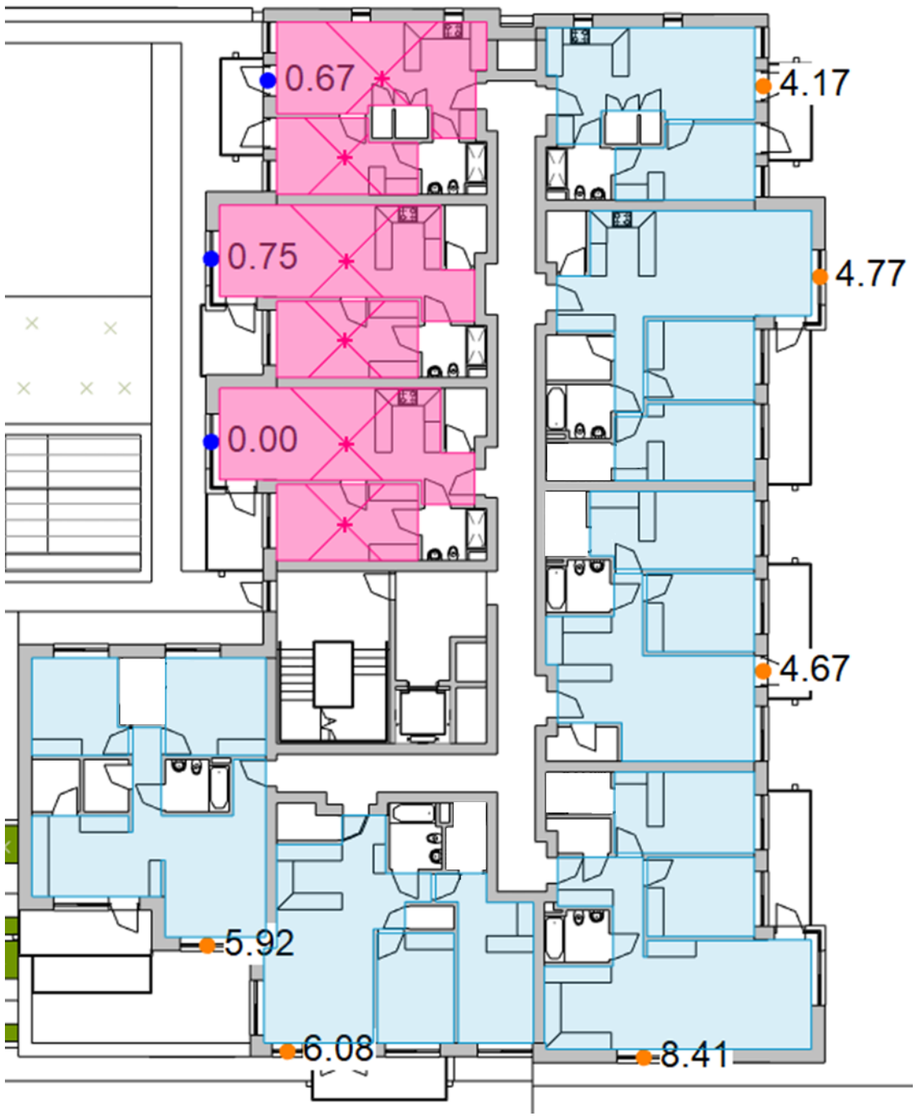


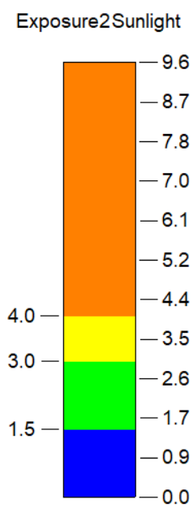
Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	**10**	**46**
	78%	**22%**	

Block 3 - Third Floor

Sunlight Analysis as illustrated below, determined 6 out of 9 units on this floor achieve the minimum recommendations.



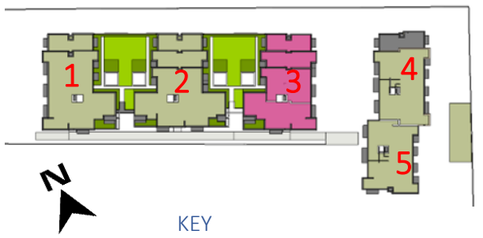


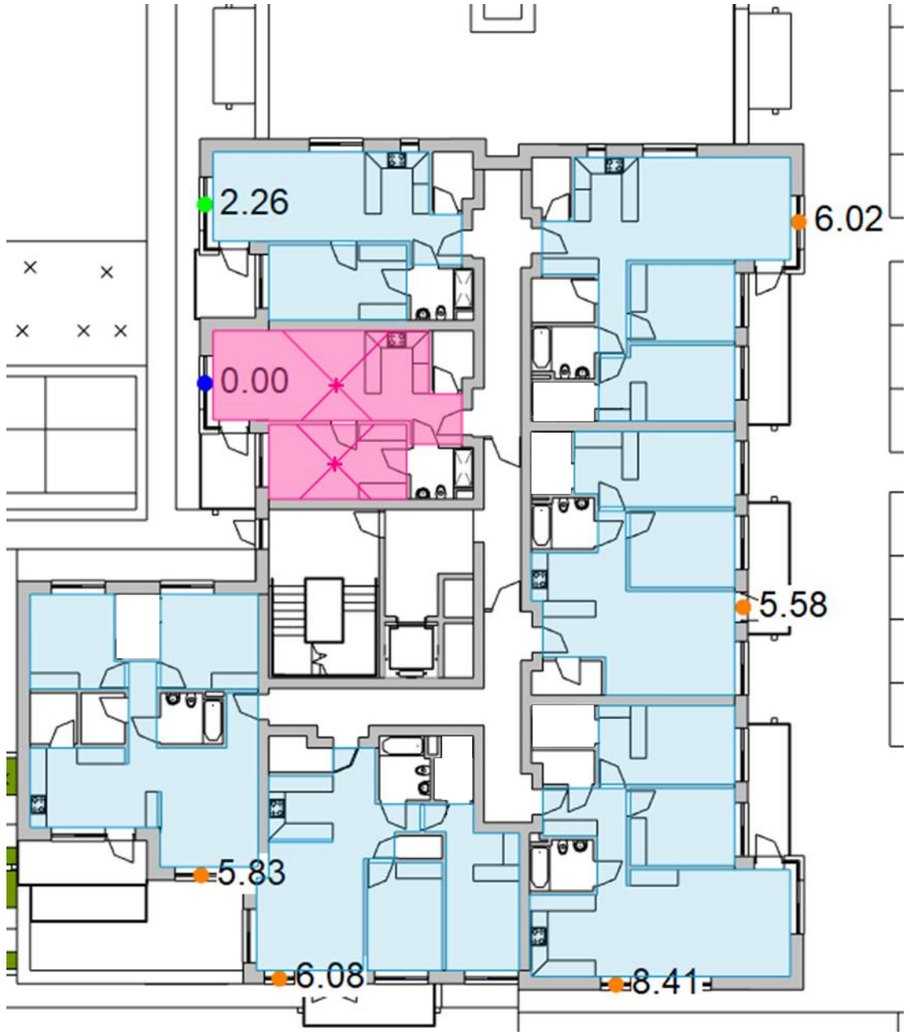


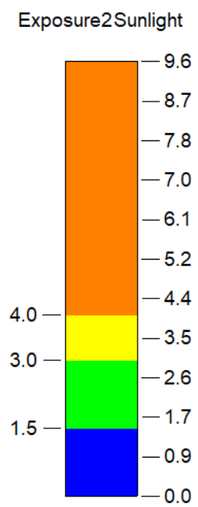
Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	10	46
	78%	22%	

Block 3 - Fourth Floor

Sunlight Analysis as illustrated below, determined 6 out of 7 units on this floor achieve the minimum recommendations.



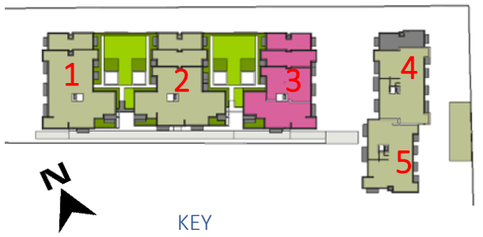


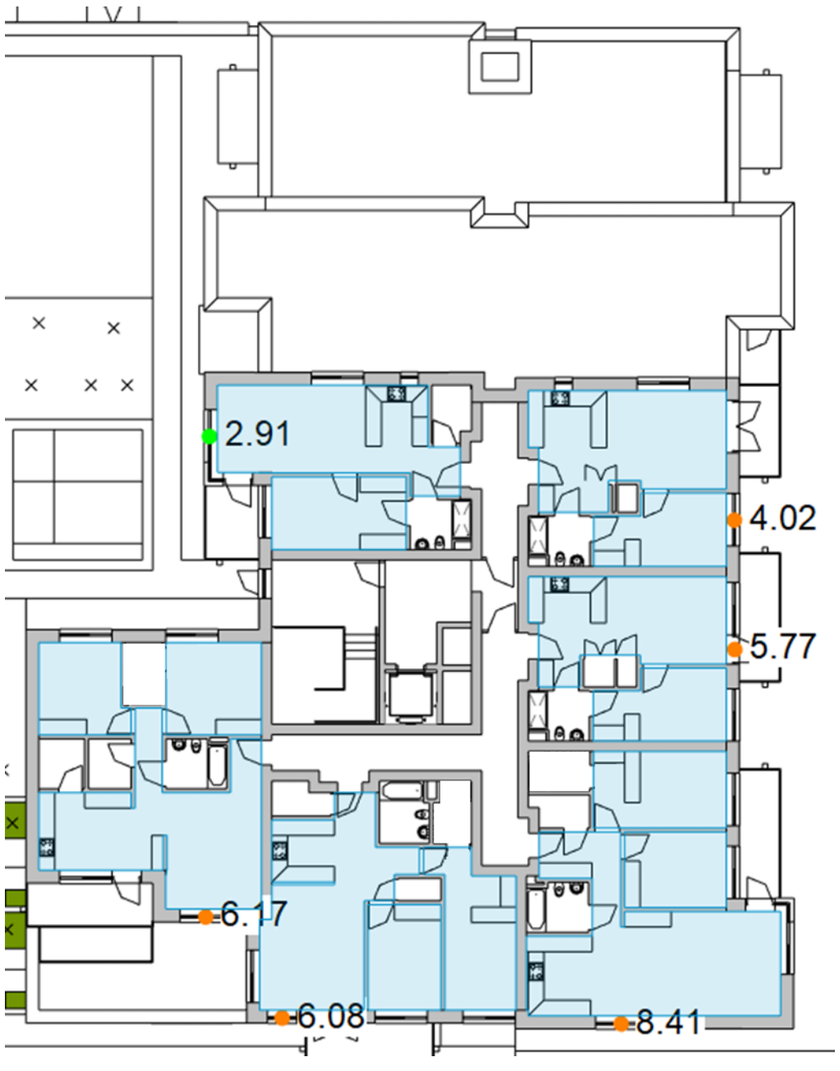


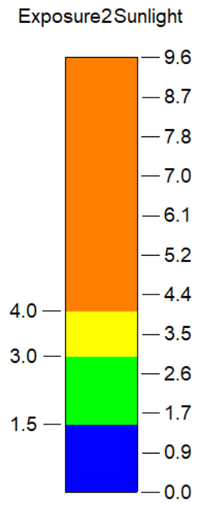
Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	**10**	**46**
	78%	**22%**	

Block 3 - Fifth Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



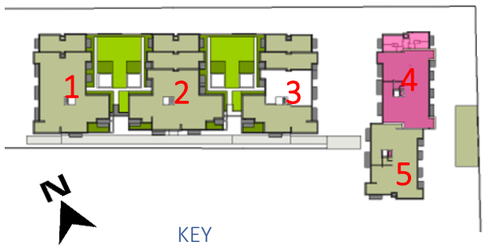


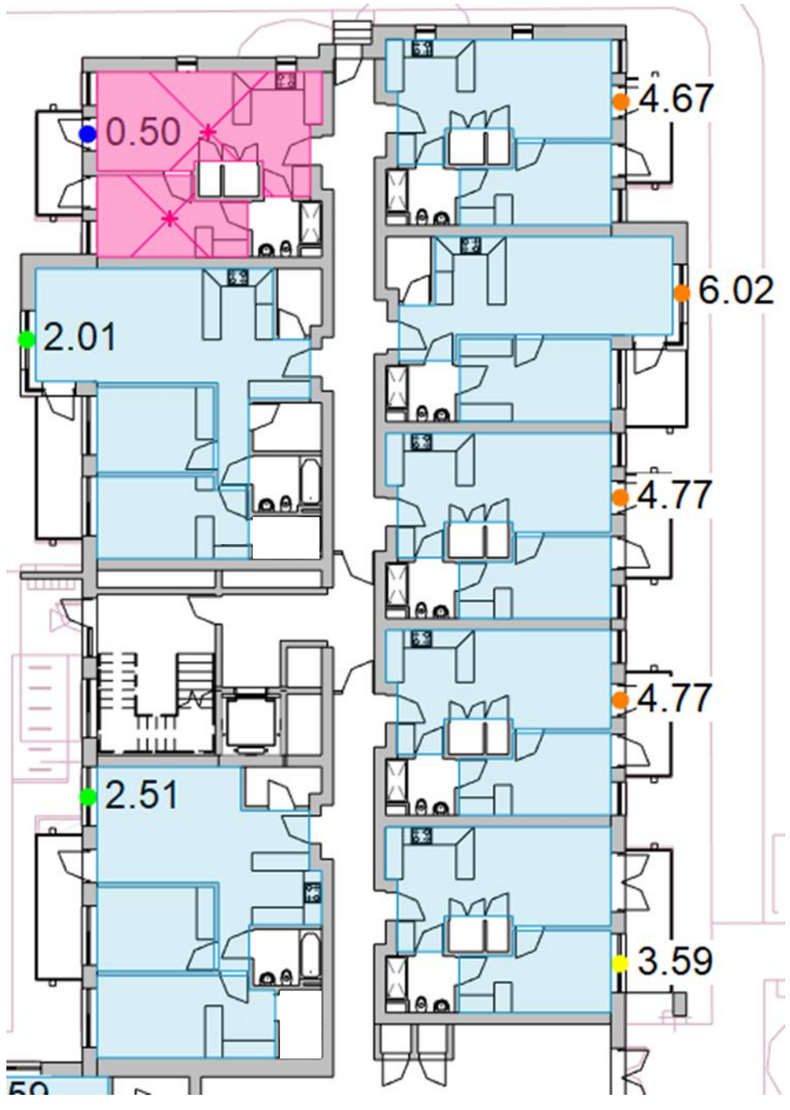


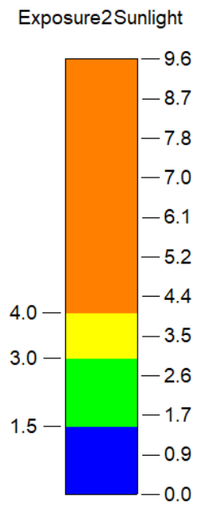
Block 3	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	3	9
Second Floor	6	3	9
Third Floor	6	3	9
Fourth Floor	6	1	7
Fifth Floor	6	0	6
	36	**10**	**46**
	78%	**22%**	

Block 4 - Ground Floor

Sunlight Analysis as illustrated below, determined 7 out of 8 units on this floor achieve the minimum recommendations.



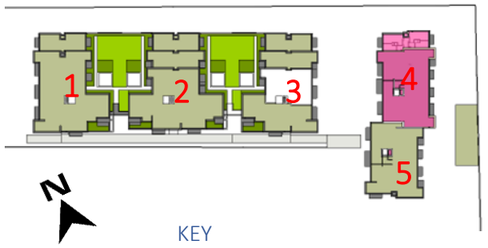


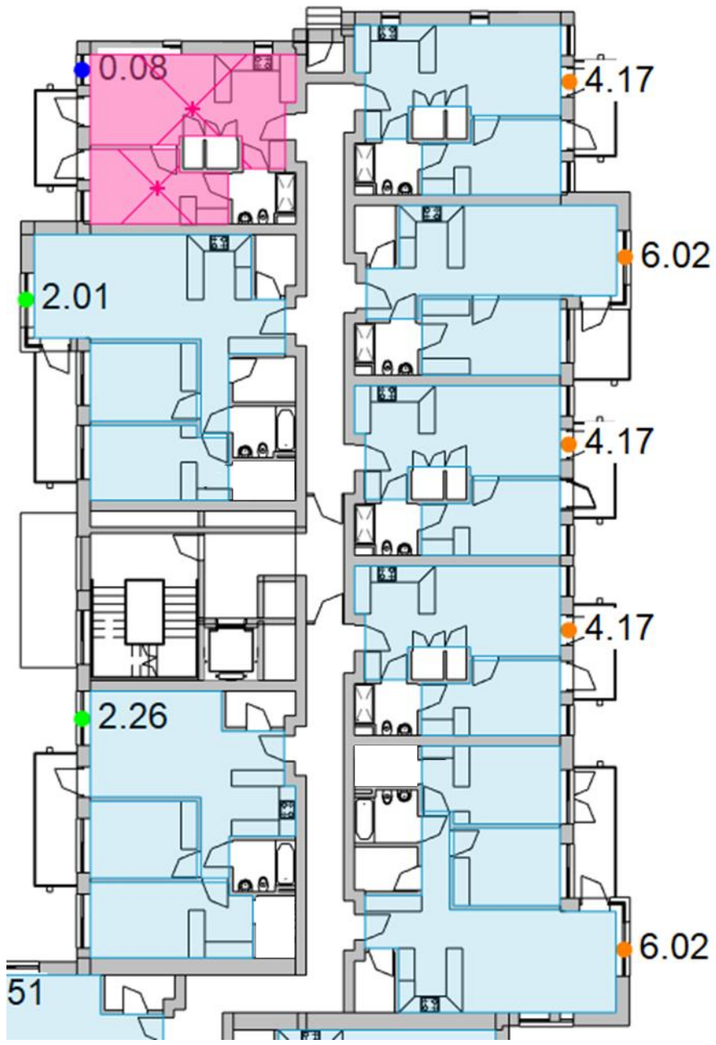


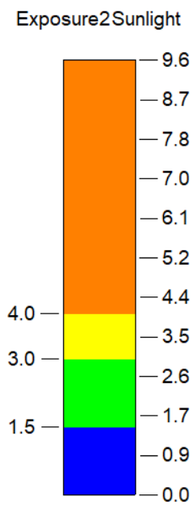
Block 4	Pass	Fail	Total
Ground Floor	7	1	8
First Floor	7	1	8
Second Floor	7	1	8
Third Floor	7	1	8
Fourth Floor	6	0	6
	34	**4**	**38**
	89%	**11%**	

Block 4 - First Floor

Sunlight Analysis as illustrated below, determined 7 out of 8 units on this floor achieve the minimum recommendations.



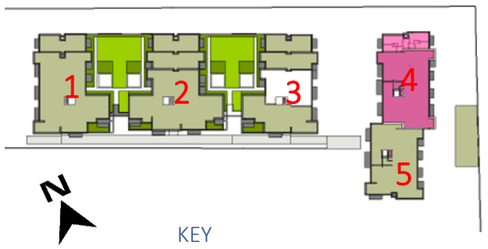


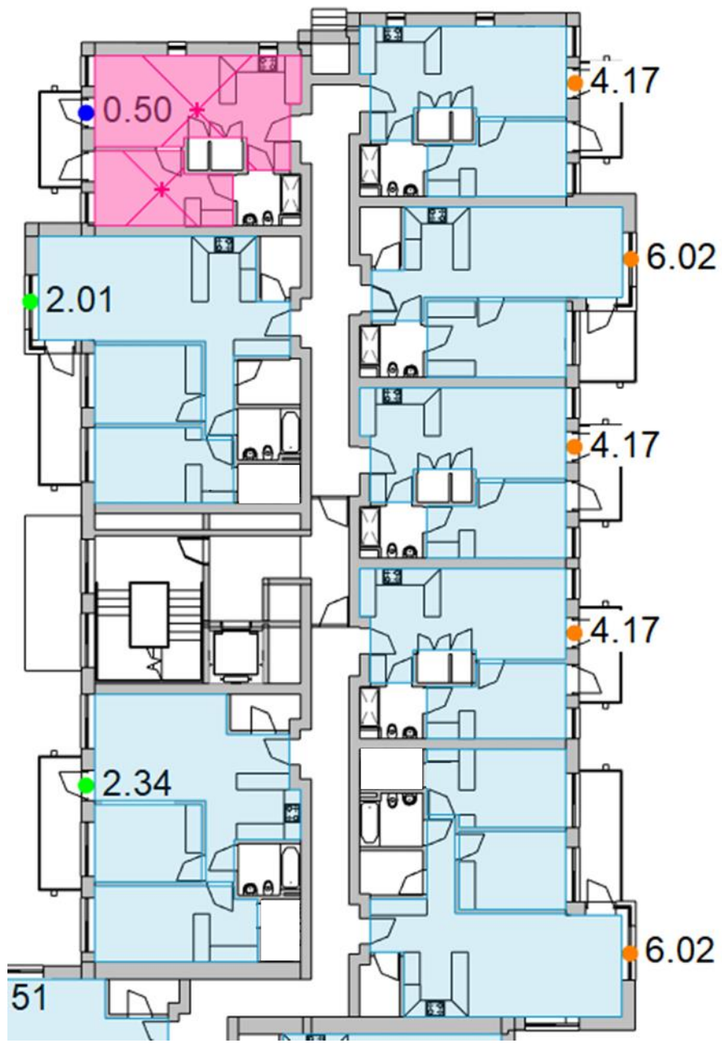


Block 4	Pass	Fail	Total
Ground Floor	7	1	8
First Floor	7	1	8
Second Floor	7	1	8
Third Floor	7	1	8
Fourth Floor	6	0	6
	34	**4**	**38**
	89%	**11%**	

Block 4 - Second Floor

Sunlight Analysis as illustrated below, determined 7 out of 8 units on this floor achieve the minimum recommendations.

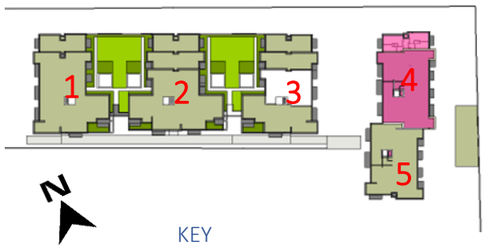


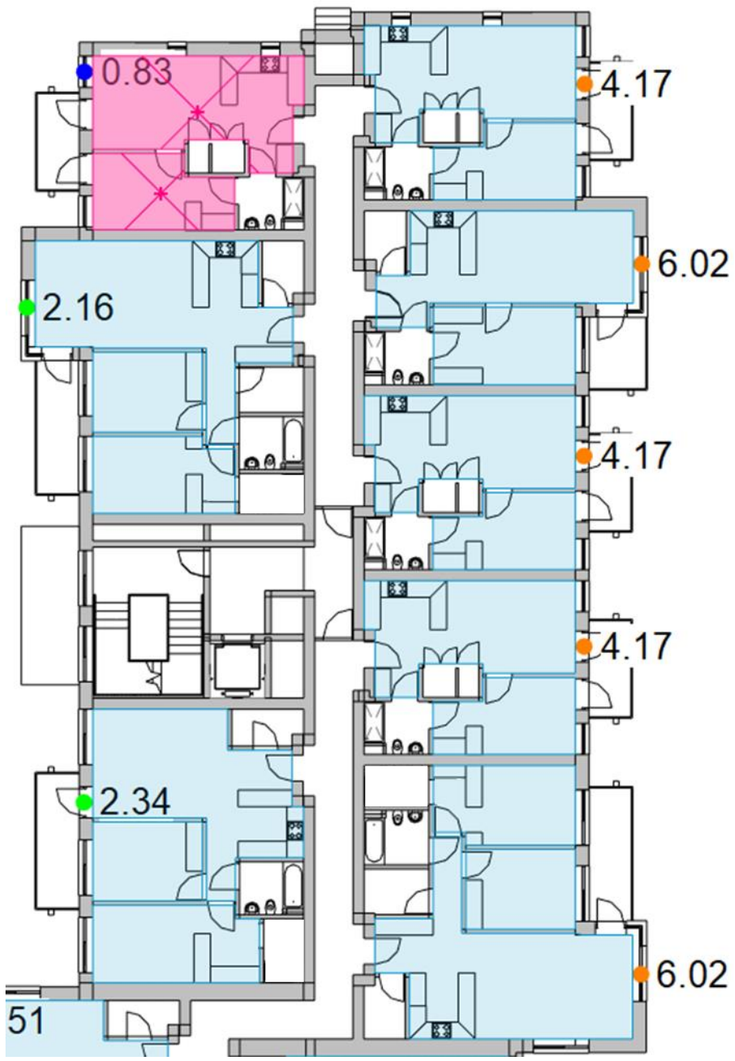


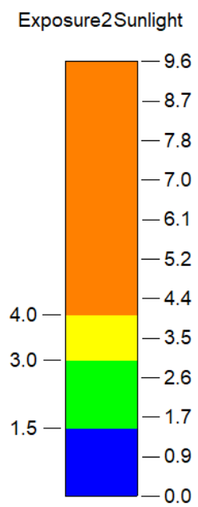
Block 4	Pass	Fail	Total
Ground Floor	7	1	8
First Floor	7	1	8
Second Floor	7	1	8
Third Floor	7	1	8
Fourth Floor	6	0	6
	34	4	38
	89%	11%	

Block 4 - Third Floor

Sunlight Analysis as illustrated below, determined 7 out of 8 units on this floor achieve the minimum recommendations.



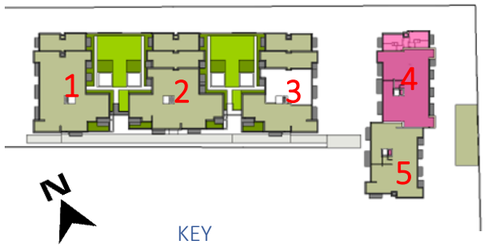


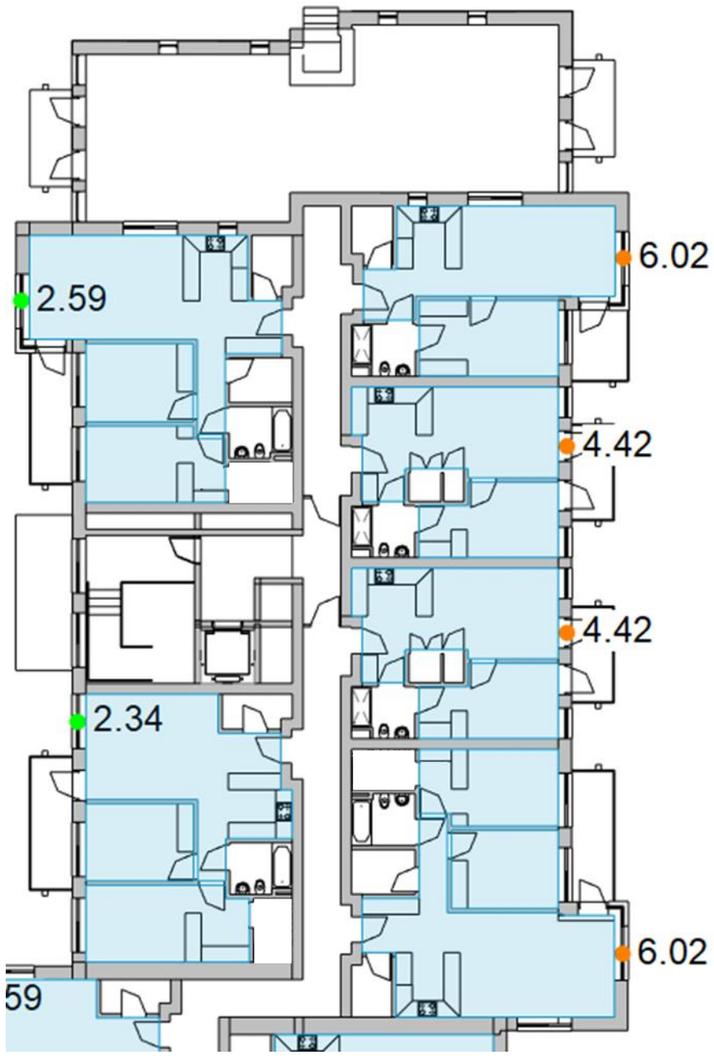


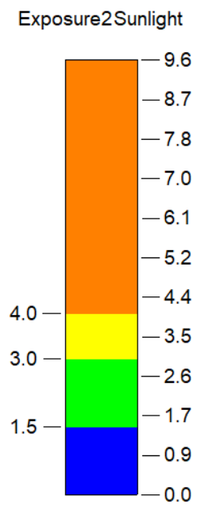
Block 4	Pass	Fail	Total
Ground Floor	7	1	8
First Floor	7	1	8
Second Floor	7	1	8
Third Floor	7	1	8
Fourth Floor	6	0	6
	34	**4**	**38**
	89%	**11%**	

Block 4 - Fourth Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



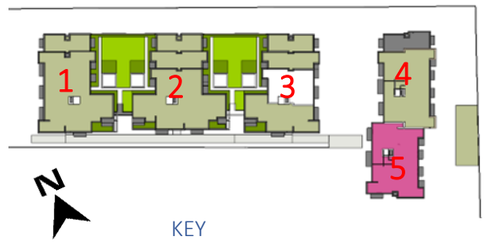


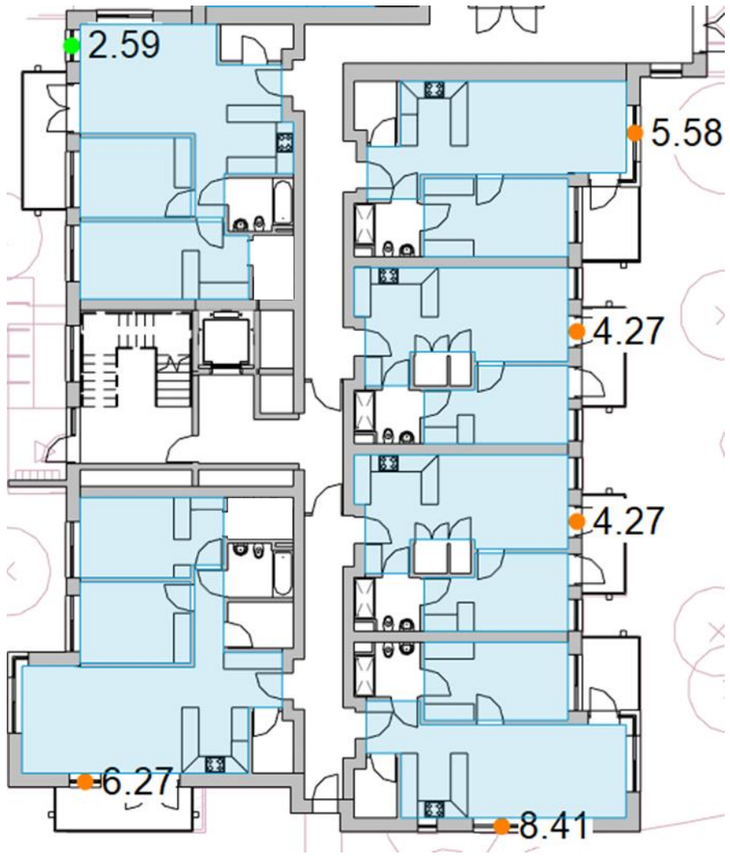


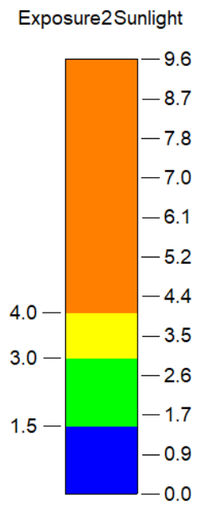
Block 4	Pass	Fail	Total
Ground Floor	7	1	8
First Floor	7	1	8
Second Floor	7	1	8
Third Floor	7	1	8
Fourth Floor	6	0	6
	34	**4**	**38**
	89%	**11%**	

Block 5 - Ground Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



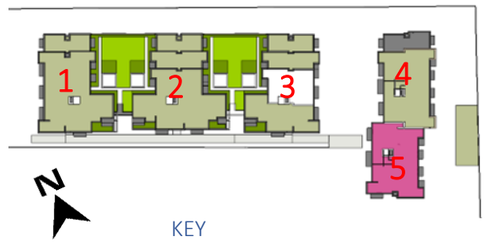


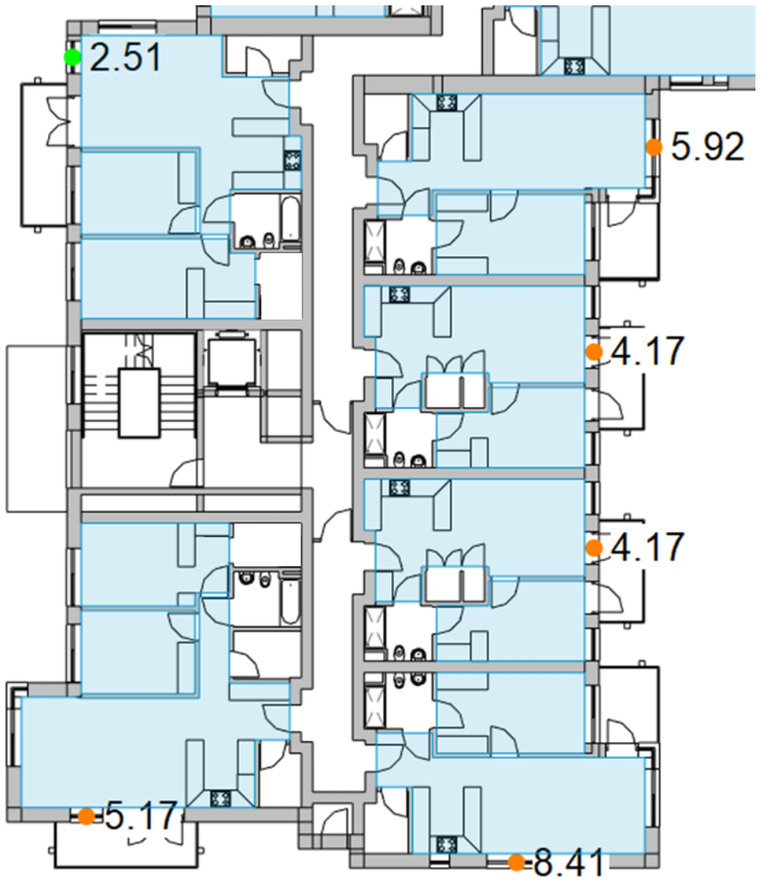


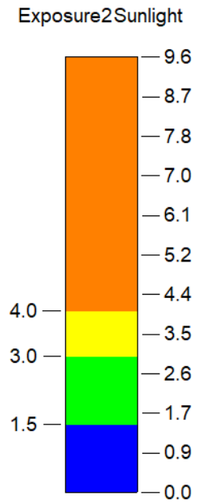
Block 5	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	0	6
Second Floor	6	0	6
Third Floor	6	0	6
Fourth Floor	6	0	6
	30	**0**	**30**
	100%	**0%**	

Block 5 - First Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



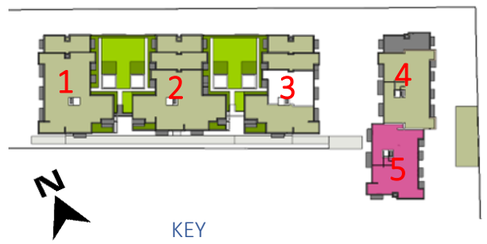


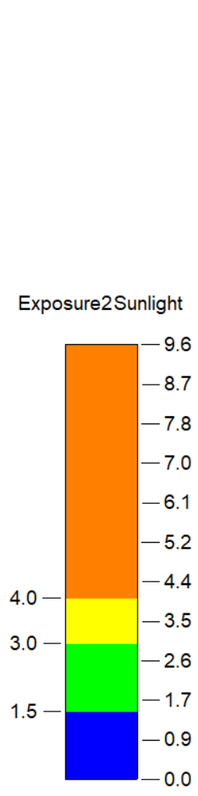


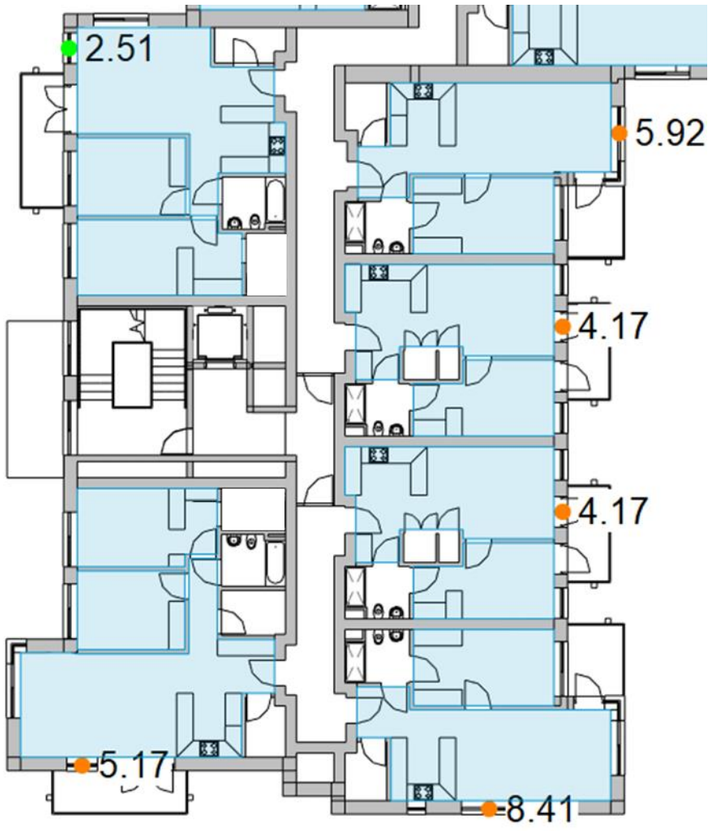
Block 5	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	0	6
Second Floor	6	0	6
Third Floor	6	0	6
Fourth Floor	6	0	6
	30	0	30
	100%	0%	

Block 5 - Second Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



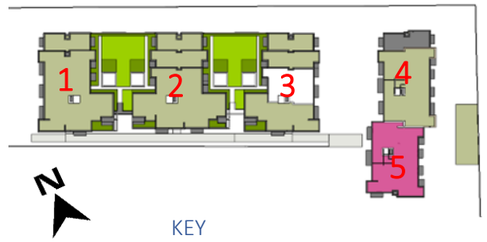


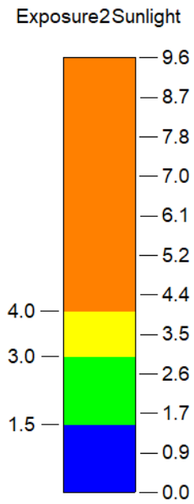


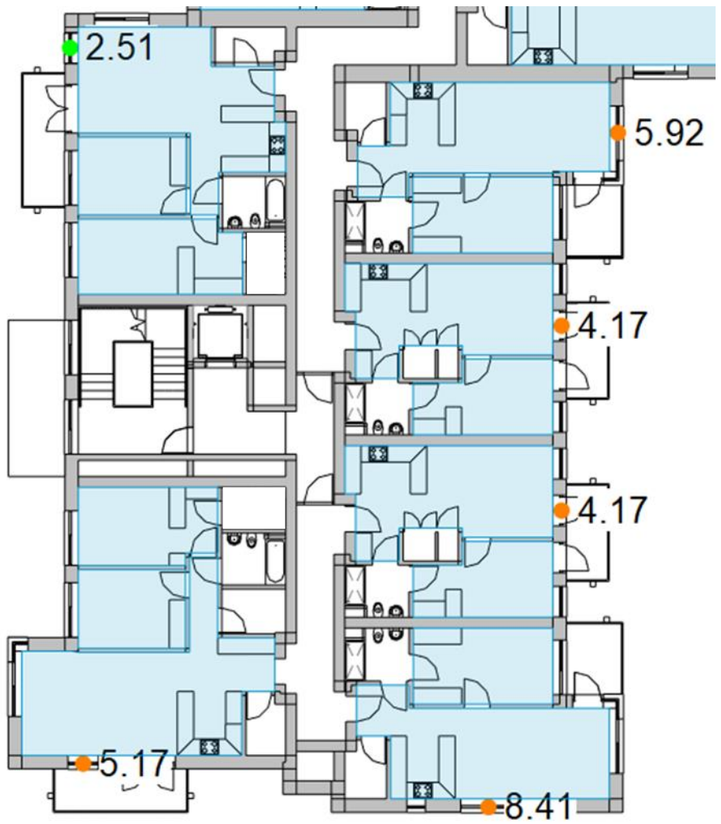
Block 5	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	0	6
Second Floor	6	0	6
Third Floor	6	0	6
Fourth Floor	6	0	6
	30	0	30
	100%	0%	

Block 5 - Third Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



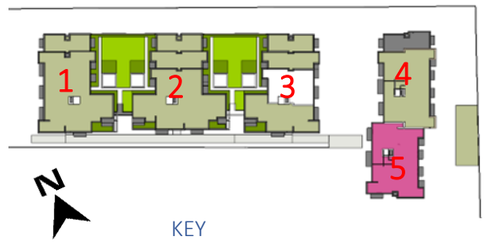


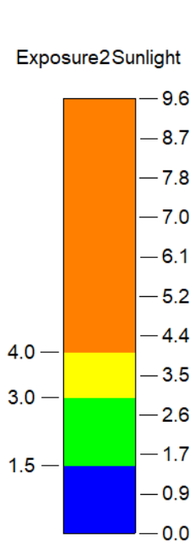


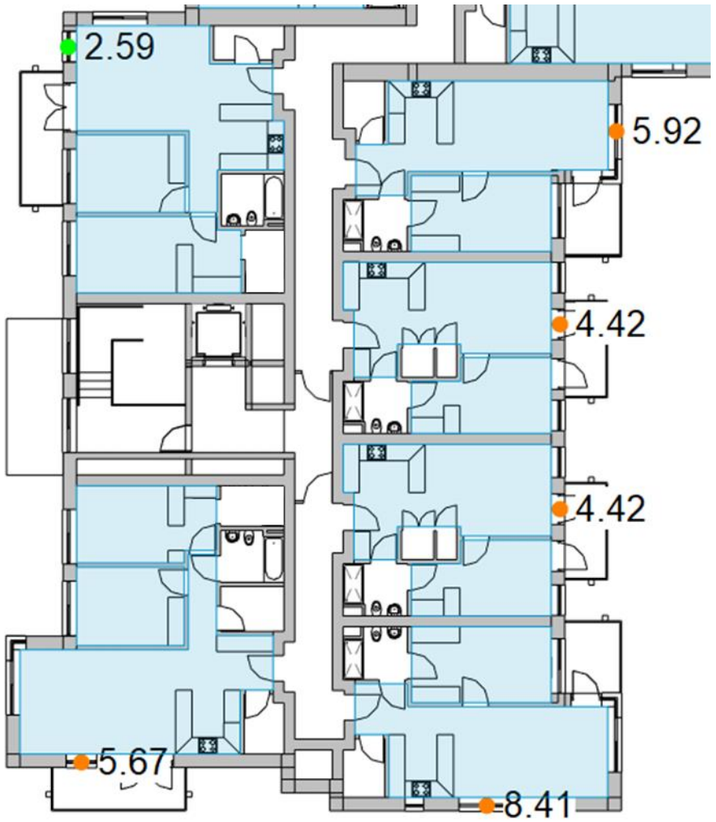
Block 5	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	0	6
Second Floor	6	0	6
Third Floor	6	0	6
Fourth Floor	6	0	6
	30	0	30
	100%	0%	

Block 5 - Fourth Floor

Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.







Block 5	Pass	Fail	Total
Ground Floor	6	0	6
First Floor	6	0	6
Second Floor	6	0	6
Third Floor	6	0	6
Fourth Floor	6	0	6
	30	0	30
	100%	0%	

Appendix A – Impact of Trees

The BRE Guide provides the following guidance in relation to the impact of trees:

> *"G1.1 Trees and hedges vary in their effects on skylight and sunlight. Most tree species will cast a partial shade[G¹,G²]; for deciduous trees this will vary with time of year. However very little light can penetrate dense belts of evergreen trees, and the shade they cause will be more like that of a building or wall.*
>
> *G1.2 It is generally more difficult to calculate the effects of trees on daylight because of their irregular shapes and because some light will generally penetrate through the tree crown. Where the effect of a new building on existing buildings nearby is being analysed, it is usual to ignore the effect of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."*

The guide goes on to further note (excerpted for relevance):

> ***"G2 Skylight in new dwellings obstructed by trees***
>
> *G2.1 Sometimes, however, trees should be taken into account, for example where a new dwelling is proposed near to large existing trees.* "
>
> ***"G3 Sunlight in new dwellings obstructed by trees***
>
> *G3.1 To assess sunlight provision to new dwellings, BS EN 17037 recommends the calculation of hours of sunlight received on a single day, assuming clear skies; 21 March is the suggested date. …. At this time of the year deciduous trees will not be in full leaf and therefore some sun will be expected to penetrate. However, it would be impossible to accurately simulate how the fragmented obstruction of a tree would obstruct direct sunlight to a point at a particular time."*
>
> ***"G4 Sunlight in gardens with trees***
>
> *G4.1 In assessing the impact of buildings on sunlight in gardens (see section 3.3), trees and shrubs are not normally included in the calculation unless a dense belt or group of evergreens is specifically planned as a windbreak or for privacy purposes. This is partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees)."*

Therefore, for the purpose of the analysis within this report, the impact of the relevant trees was only included in the assessment of the internal daylight assessment.

Figure A.1 below shows satellite images of the neighbouring dense trees and figure A.2 shows the representation allowed for in the assessment of the SDA results based on 3D survey information acquired from a third party.

Fig A.1 –Satellite Image of Large Existing Trees

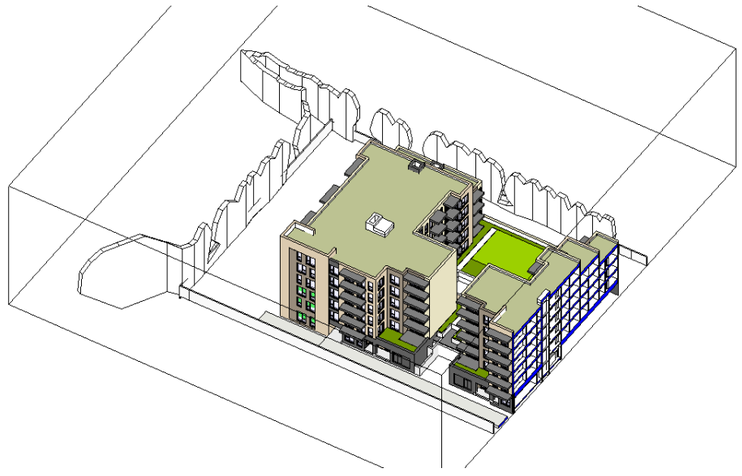


Fig A.2 –Modeled Representation of Large Existing Trees for SDA Assessment

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