Carmanhall Road SHD 2022

Former Avid Technology International Site

Carmanhall Road

Sandyford Industrial Estate

Dublin 18

Daylight & Sunlight Analysis

IN2 Project No. D2005

24/08/2022

24/08/2022

Rev03

Revision History

Date	Revision	Description
15/07/2022	00	Issued for Comment
29/07/2022	01	Project Description Updated
17/08/2022	02	Updated to include comments received from Client
24/08/2022	03	Finalised for formal Planning Issue

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1.0 Executive Summary

This report compiles the daylight and sunlight analysis as undertaken by IN2 Engineering Design Partnership for the Proposed development at Avid, Sandyford.

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

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)	Section 7.0 – Internal Daylight Analysis
Daylight	Existing Neighbouring Buildings	Vertical Sky Component	BRE 209 (2022)	Section 6.0 – Impact on Neighbouring Buildings
Sunlight	Proposed Development	Sunlight Exposure	BRE 209 (2022)	Section 8.0 – Exposure to Sunlight
Sunlight	Existing Neighbouring Buildings	Annual Probable Sunlight Hours	BRE 209 (2022)	Section 6.0 – Impact on Neighbouring Buildings
Sunlight	Proposed Development Amenity Spaces	Sunlight Hours	BRE 209 (2022)	Section 5.0 – Site Sunlighting and Shading
Sunlight	Existing Neighbouring Amenity Spaces (Gardens)	Sunlight Hours	BRE 209 (2022)	Section 6.0 – Site Sunlighting and Shading

1.0 Executive Summary (Cont'd)

Section 5.0 illustrates the results from the amenity sunlight analysis as undertaken based on the BRE best practice for both proposed and existing garden/amenities areas. The proposed amenity space was found to receive excellent overall sunlight availability. The results demonstrate each of the amenity spaces easily achieve compliance with the BRE guidance of over 50% of amenity space across the site receiving two hours or more of sunlight on 21st March.

The methodology for the impact of the proposed development on neighbouring buildings is detailed in Section 6.0. The proposed development is sited in the Sandyford Business District and therefore it can be noted that there are no dwellings within the impact zone of the scheme. Dwellings are defined under the BRE guide as having an expectation of sunlight and daylight, as there are none, it was considered in our professional judgement that the analysis was not applicable as the offices to the north and south would not have an expectation of daylight or sunlight.

The internal daylight analysis, as detailed in section 7.0, has been undertaken for all Kitchen/Living/Dining (KLD) and bedroom spaces for Spatial Daylight Autonomy (SDA) – a climate-based means of assessing natural light performance accounting for both direct (sunlit) and diffuse light. The new BRE BR 209, 2022 edition (see section 3.0) prescribes analysis utilising Median Daylight Factor Spatial Daylight Autonomy (see section 4.0 for definitions). The analysis determined a very high compliance rate of **96%** of rooms achieved prescribed SDA targets. Section 7.0 includes full results demonstrating how this overall compliance was determined.

The 'Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities 2020 (see section 3.0 Standards and Guidelines) advise that "*Where an applicant cannot fully meet all of the requirements of the daylight provisions above(...BR 209…), 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 spaces and provides compensatory solutions.

Section 8.0 includes the results for exposure to sunlight. Exposure to sunlight in the new metric, as defined in BR 209 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."* The proposed development achieves a high compliance rate with 98% of units meeting or exceeding the minimum recommendations.

Shadow diagrams are provided in Appendix A.

In summary, this report confirms that best practice Sunlight and Daylight availability have been ensured for the proposed Carmanhall Road SHD development, with minimal impact on the existing neighbouring environment.

2.0 Development Overview

Atlas GP Limited, intend to apply to An Bord Pleanála for planning permission for a strategic housing development at this site of c.0.99 ha at the 'Former Avid Technology site', at the junction of Blackthorn Road and Carmanhall Road Sandyford, Dublin 18.

The proposed development consists of 334 Build to Rent residential apartment units within 4 no. apartment blocks and as follows:

- 79 No. Studio
- 175 No. 1 bed
- 80 No. 2 bed

- All residential units provided with private balconies/terraces to the north/south/east and west elevations
- Crèche 272 sq.m.
- Residential amenity spaces 893 sq.m. (including resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge and games room)
- Height ranging from 5 to 16 storeys (over basement)
- Landscaped communal space in the central courtyard
- Provision of a new vehicular entrance from Ravens Rock Road and egress to Carmanhall Road
- Provision of pedestrian and cycle connections
- 125 No. Car Parking, 6 No. Motorcycle Parking and 447cycle spaces at ground floor/under croft and basement car park levels
- Plant and telecoms mitigation infrastructure at roof level

The development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works and all ancillary site development works above and below ground.

3.0 Standards and Guidelines

The following 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) 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").**
c) British Standard BS EN 17037:2018 – Daylight in Buildings (the "**2018 British EN Standard**").
d) Irish Standard IS EN 17037:2018 (the "**2018 Irish EN Standard**").

EN 17037:2018, which was approved by the 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

Accordingly, it was considered appropriate to apply the BRE Guide 2022 (3rd Edition) as the basis for Daylight and Sunlight Assessments included within this report.

The BRE Guide

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."*

4.0 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

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.

5.0 Site Sunlighting and Shading

5.1 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 Fig. 5.1), 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).

It may be noted that the Equinox as utilised for the purpose of amenity sunlight assessment within BR 209 relates to the mid-position of the sun's position throughout the year. The shadow diagrams illustrating the extent of sunlit area to the amenity space at the Equinox therefore essentially present the average condition through the year- with summer seeing a larger area receiving direct sunlight and conversely, winter receiving less, when sun angles are lower. Therefore, overshadowing assessments during winter months are not generally useful in establishing the impacts of a proposed development, as considerable shading will occur from existing buildings/ structures and vegetation, whereas the Equinox as utilised within the methodology ensures a mean annual approximation of the sunlight.

Appendix A includes shadow cast images for information for the summer solstice, winter solstice and the equinox. However, 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

An example analysis of Amenity Spaces is indicated in Figure 5.1. In this sample development, the main amenity space is located to the North of a building block which provides some degree of overshadowing (dark green contours).

Analysis was undertaken utilising 3D modelling information as prepared in Revit format. Lighting Simulations were then undertaken by IN2 Engineering utilising Radiance software.

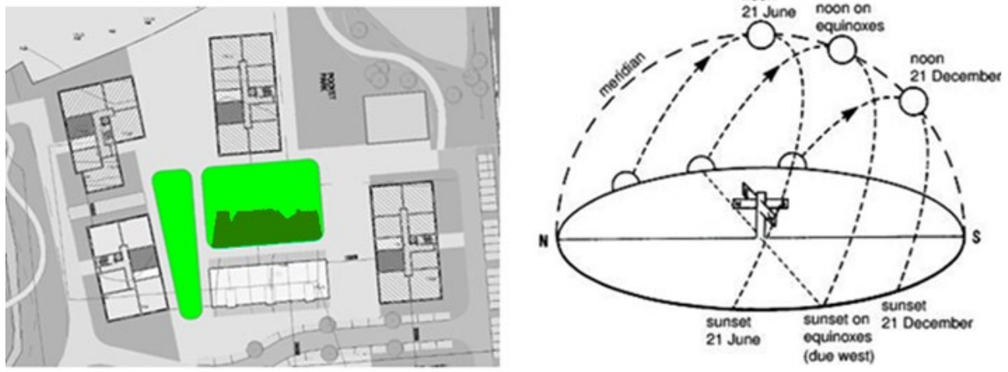


Fig 5.1 – Example Amenity Spaces

5.2 Residential Amenity Spaces

Annual sunlight availability was analysed for proposed residential amenity spaces across the development, calculating the extent of each area that can receive at least 2 hours of potential sunlight during the equinox day.

Results for the proposed development are detailed in Figure 5.2, demonstrating the amenity space achieved compliance with the BRE guidance of over 50% of amenity receiving two hours or more of sunlight on 21st March.

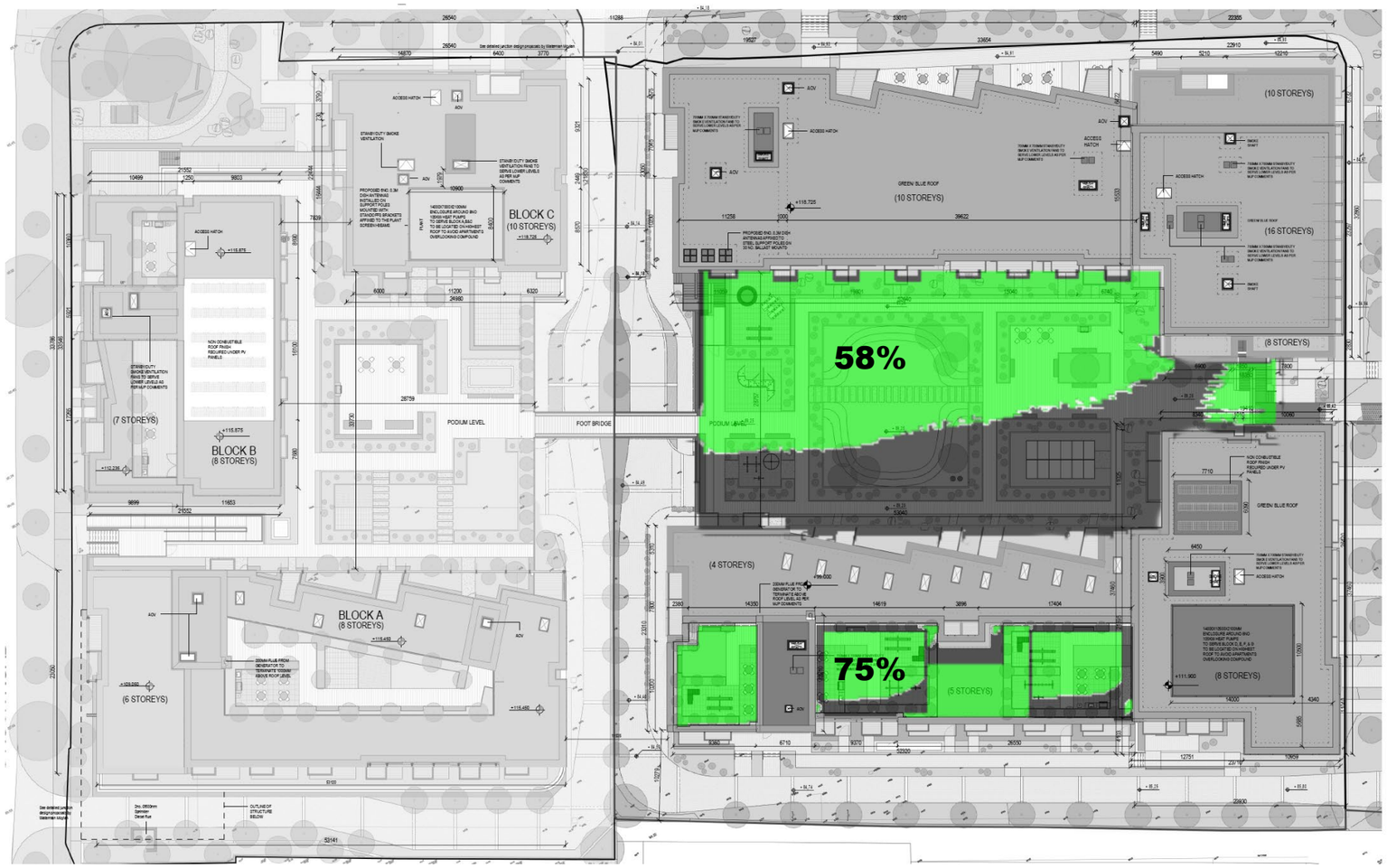


Fig 5.2 –Sunlight Availity to Amenity Spaces for Proposed Development

6.0 Impact on Neighbouring Buildings

6.1 Guidance

The quantitative assessment methodology for the assessment on the impact on existing buildings as detailed in the BRE publication "Site Layout Planning for Daylight and Sunlight – A guide to good Practice (Third Edition)" is:

BRE Guidelines state:

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."*

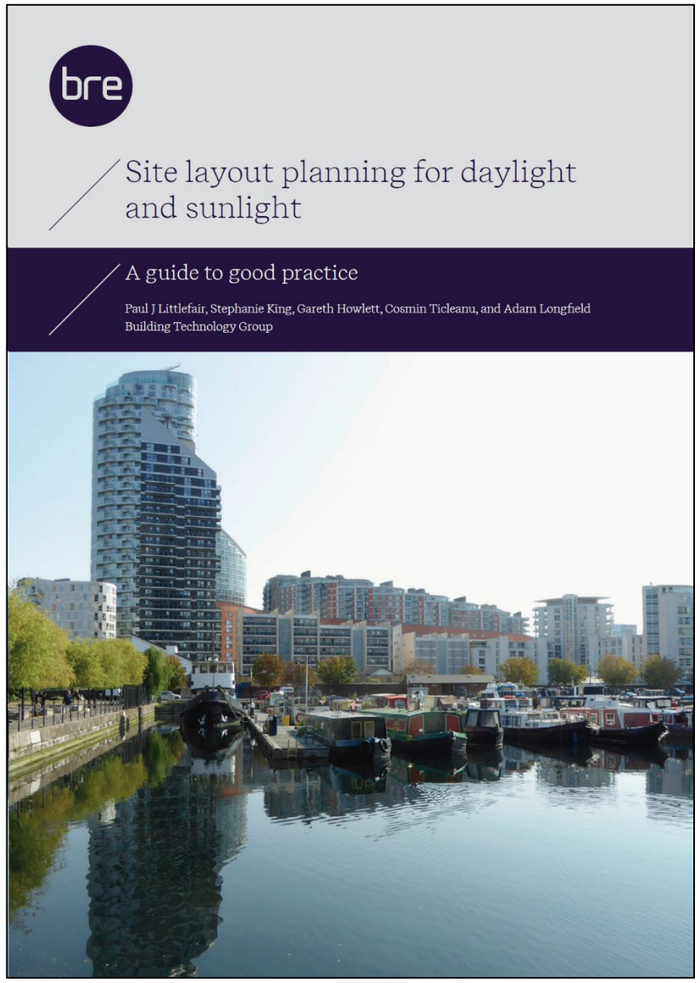


Fig 6.1.1 – BRE publication "Site Layout Planning for Daylight and Sunlight – A guide to good practice (Third Edition)

6.2 Analysis

The proposed development site and its surroundings is highlighted in Fig 6.2.1 below.

The BRE Guide recommends that

> *"The guidelines given here are intended for use for rooms in adjoining dwellings where daylight is required, including living rooms, kitchens, and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas, and garages need not be analysed. The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops, and some offices."*

As all existing buildings surrounding the proposed development are commercial buildings, which have no expectation or requirement for sunlight or daylight it is our professional judgement that further assessment is not required.

Additionally, there are no neighbouring spaces that may be deemed as Amenity areas (gardens etc) for which assessment in accordance with the BRE methodology would be required.

Nevertheless, illustrative shading diagrams have been undertaken and are included within Appendix A. It can be seen from the shading images prepared for the Equinox (March 21st) that even the areas directly North of the development (street and area in front of the Nova Atria) would still receive at least 2 hours of sunlight (08:00 and 09:00 hours).

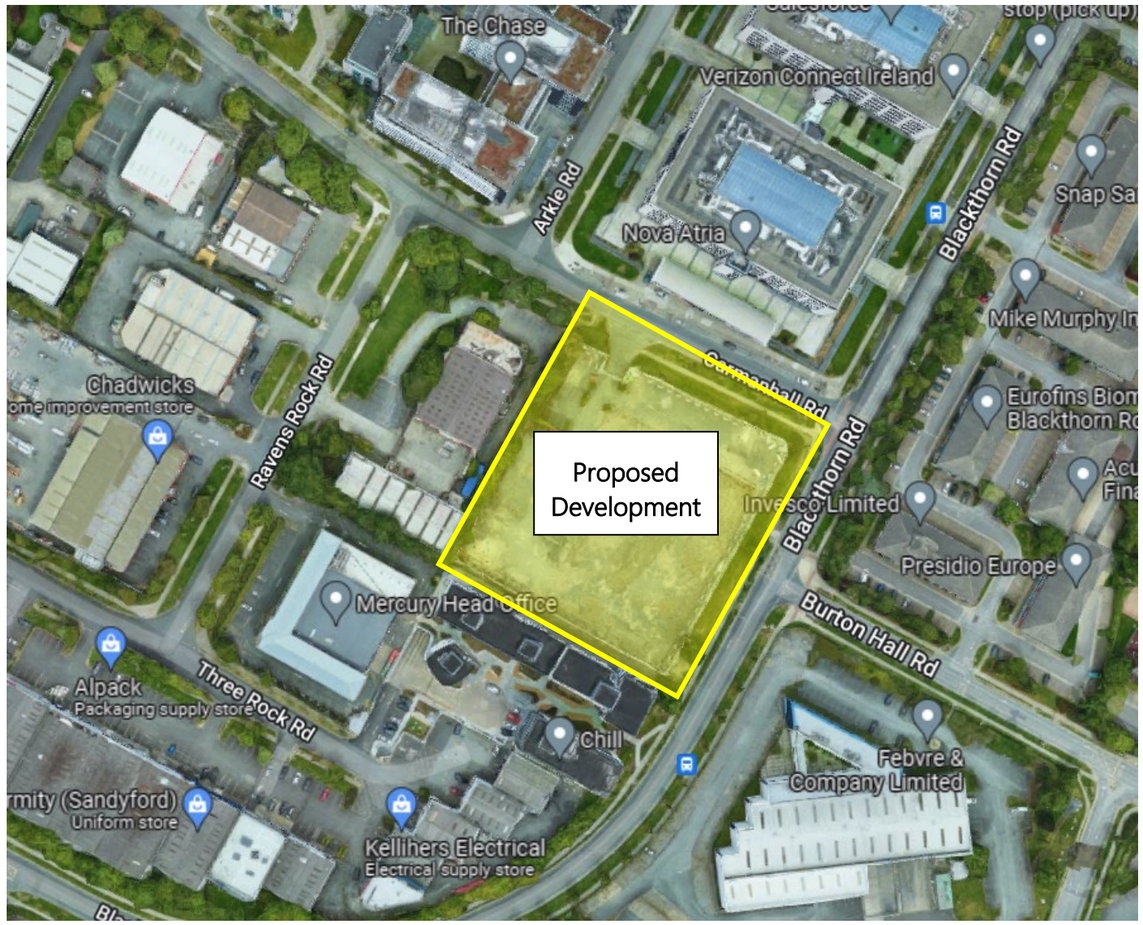


Fig 6.2.1 – Proposed Site and Surroundings

7.0 Internal Daylight Analysis

7.1 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 to enable a detailed calculation within each room, the medium of which was then determined the space compliance.

Fig 7.1.1 – Example Daylight Analysis Results

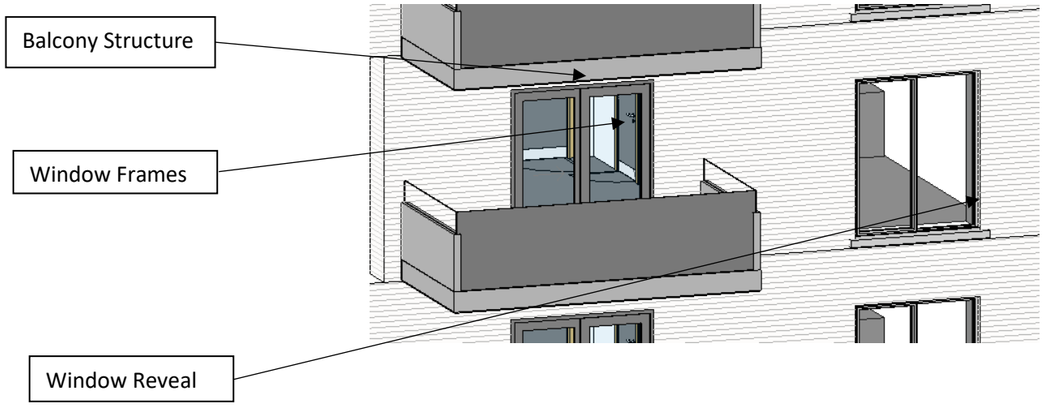


Fig 7.1.2 – Building Details included within Daylight Analysis (Sample)

7.1 Methodology (Cont'd)

The rooms have been assessed to the minimum areas as prescribed in the 2020 Apartment Guidelines, Fig 7.1.3 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. 7.1.3.

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 in accordance with BR.209 Appendix C (i.e., adjacent to doors illustrated) as per Fig 7.1.3.

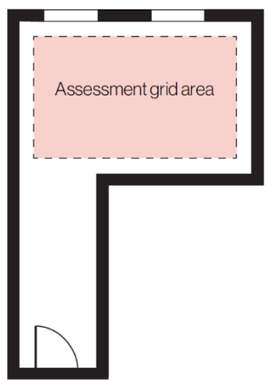


Fig 7.1.3 – BR 209 Figure C3 – Assessment Area excluding Corridor

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.*

Minimum bedroom floor areas/widths***

Type	Minimum width	Minimum floor area
Studio	4m**	30 sq m**
Single bedroom	2.1 m	7.1 sq m
Double bedroom	2.8 m	11.4 sq m
Twin bedroom	2.8 m	13 sq m

** Note: Minimum floor areas exclude built-in storage presses that are contributing to storage space requirements*
***Note: Combined living/dining/bedspace*

Minimum aggregate bedroom floor areas

One bedroom	11.4 sq m
Two bedrooms (3 person)	13 + 7.1 sq m = 20.1 sq m
Two bedrooms (4 person)	11.4 + 13 sq m = 24.4 sq m
Three bedrooms	11.4 + 13 + 7.1 sq m = 31.5 sq m

Fig 7.1.4 – Apartment Guidelines Extract

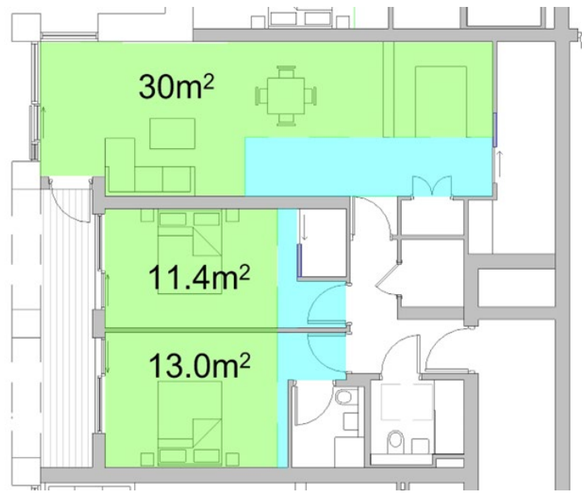


Fig 7.1.5 – Space Delineation

7.2 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 [sic]. 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

Any space which does not achieve the 50% SDA for shared Kitchen/Living/Dining (KLD) or for bedrooms, includes compensatory measures 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 reduction and for each unit are illustrated below and summarised as follows: -

1. Daylight*

   Although the room in question does not achieve daylight targets, the other spaces within the unit receive excellent daylight.

2. Sunlight

   The rooms with below target Spatial Daylight Autonomy have also been assessed for exposure to sunlight as per the BRE Guide, refer to section 8.0 of this report. The results determined that relevant windows would receive greater than the minimum direct sunlight (1.5 hours) with some windows achieving the medium level of recommendations at >3 hours.

3. 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.

4. Dual Aspect

   Room is within unit that has the added benefit of dual aspect ensuring multiple options for aspect and sunlight / daylight availability.

Each non-compliant apartment and its specific compensatory measures as applicable are identified in Section 7.4 overleaf.

As a compensatory measure has been defined for each non-compliant space it is our judgment that the scheme complies with the 2020 Apartment Guidelines in this regard insuring that high quality housing will be provided on this site.

7.3 Results Summary – SDA

The analysis determined that 96% of KLD and bedrooms would achieve or exceed the BRE guidance targets in terms of SDA compliance.

The assessment has been carried out for sample space throughout the development with values inferred across the remainder of the scheme.

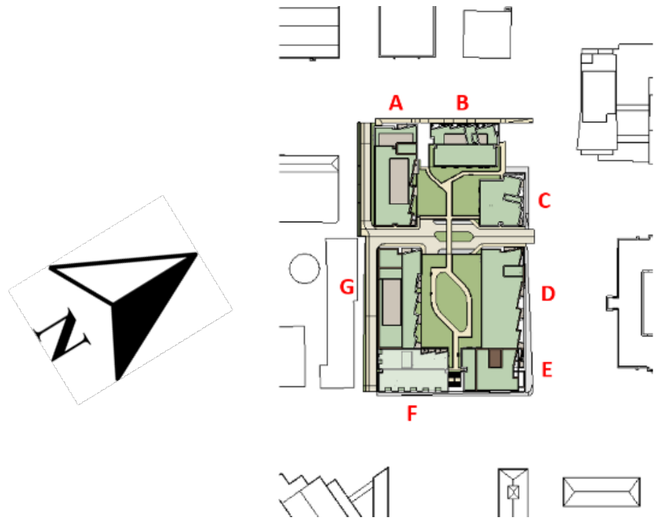
The table below give a breakdown of compliance rates for each block as well as overall development.

Block D	Pass	Fail	Total
Ground Floor	21	0	21
First Floor	26	0	26
Second Floor	26	0	26
Third Floor	26	0	26
Fourth Floor	26	0	26
Fifth Floor	26	0	26
Sixth Floor	26	0	26
Seventh Floor	26	0	26
Eighth Floor	26	0	26
Ninth Floor	26	0	26
Total	**255**	**0**	**255**
	100%	**0%**	

Block E	Pass	Fail	Total
Ground Floor	14	1	15
First Floor	14	1	15
Second Floor	14	1	15
Third Floor	14	1	15
Fourth Floor	14	1	15
Fifth Floor	14	1	15
Sixth Floor	14	1	15
Seventh Floor	14	0	14
Eighth Floor	14	0	14
Ninth Floor	11	0	11
Tenth Floor	11	0	11
Eleventh Floor	11	0	11
Twelth Floor	11	0	11
Thirthteenth Floor	11	0	11
Fourthteenth Floor	11	0	11
Total	**192**	**7**	**199**
	96%	**4%**	

Block F	Pass	Fail	Total
Lower Ground Floor	11	1	12
Ground Floor	16	1	17
First Floor	16	1	17
Second Floor	16	1	17
Third Floor	17	0	17
Fourth Floor	17	0	17
Fifth Floor	17	0	17
Sixth Floor	17	0	17
Total	**127**	**4**	**131**
	97%	**3%**	

Block G	Pass	Fail	Total
Lower Ground Floor	6	6	12
Ground Floor	17	9	26
First Floor	26	1	27
Second Floor	27	0	27
Third Floor	13	0	13
Total	**89**	**16**	**105**
	85%	**15%**	



KEY

	Pass	Fail	Total
Block D	**255**	**0**	**255**
Block E	**192**	**7**	**199**
Block F	**127**	**4**	**131**
Block G	**89**	**16**	**105**
Total	**663**	**27**	**690**
	96%	**4%**	

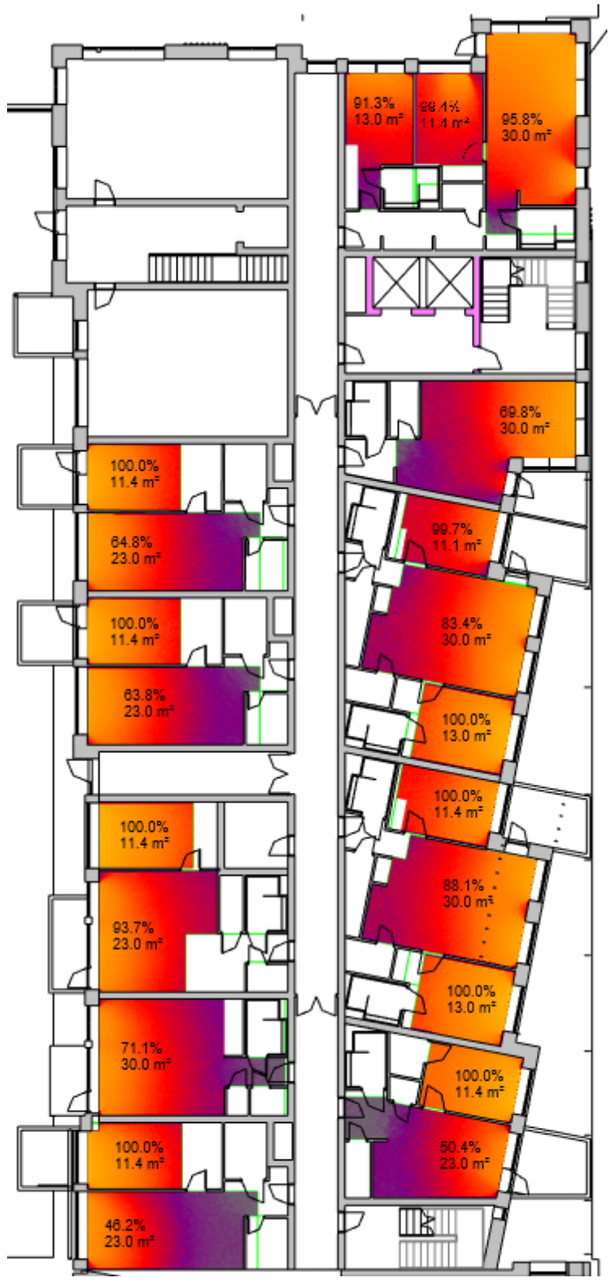
7.4 Results – Block D

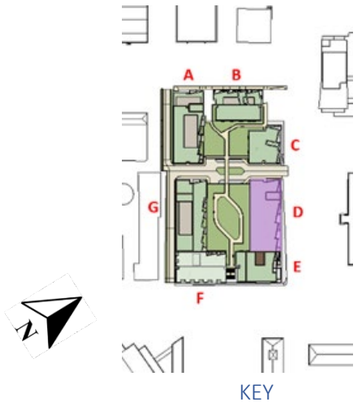
Block D – Ground Floor

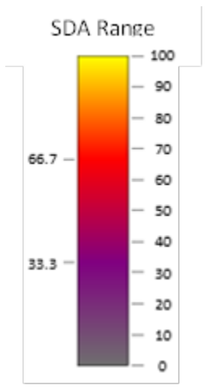
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

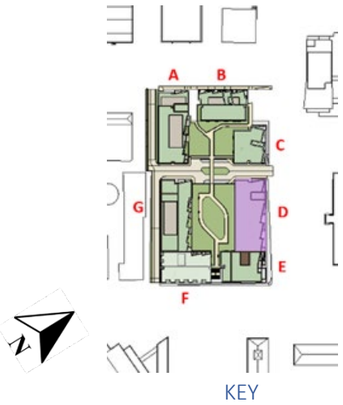
7.5 Results – Block D

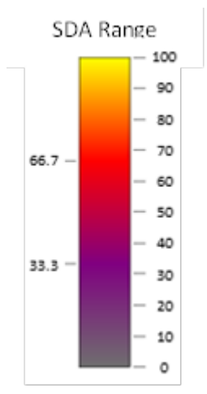
Block D – First Floor

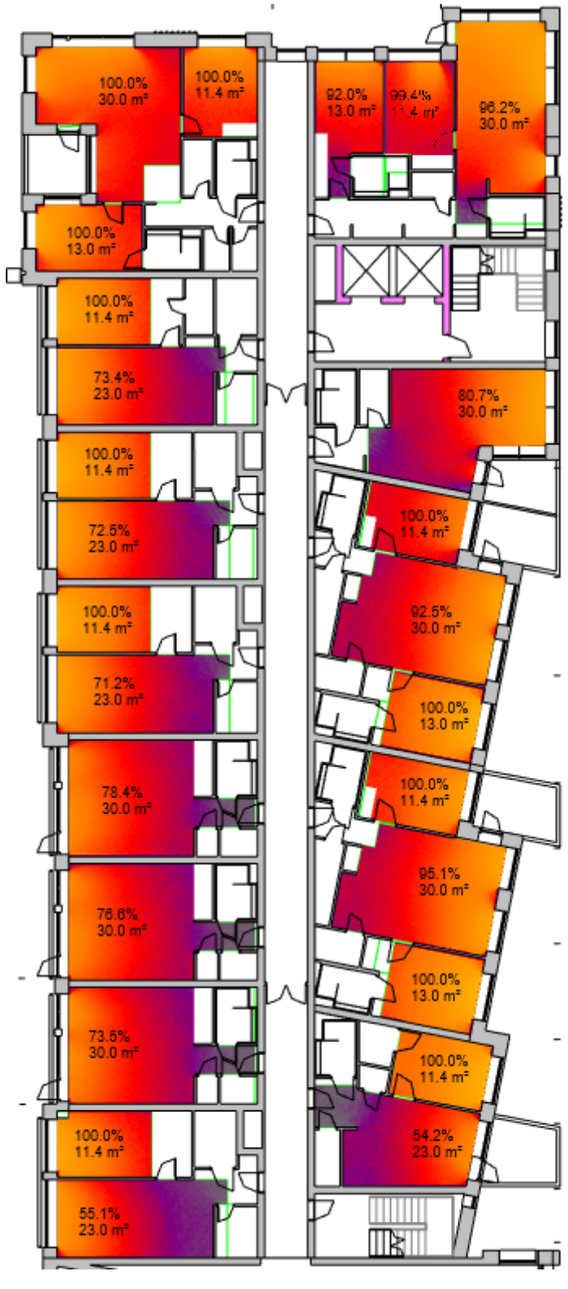
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

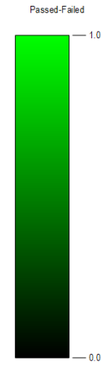
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.









SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

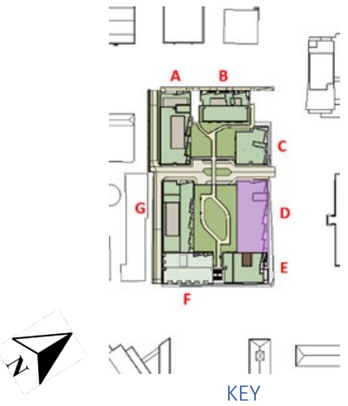
7.6 Results – Block D

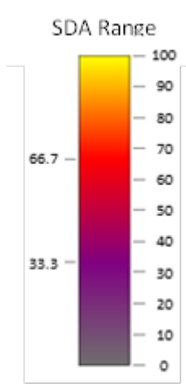
Block D – Second Floor

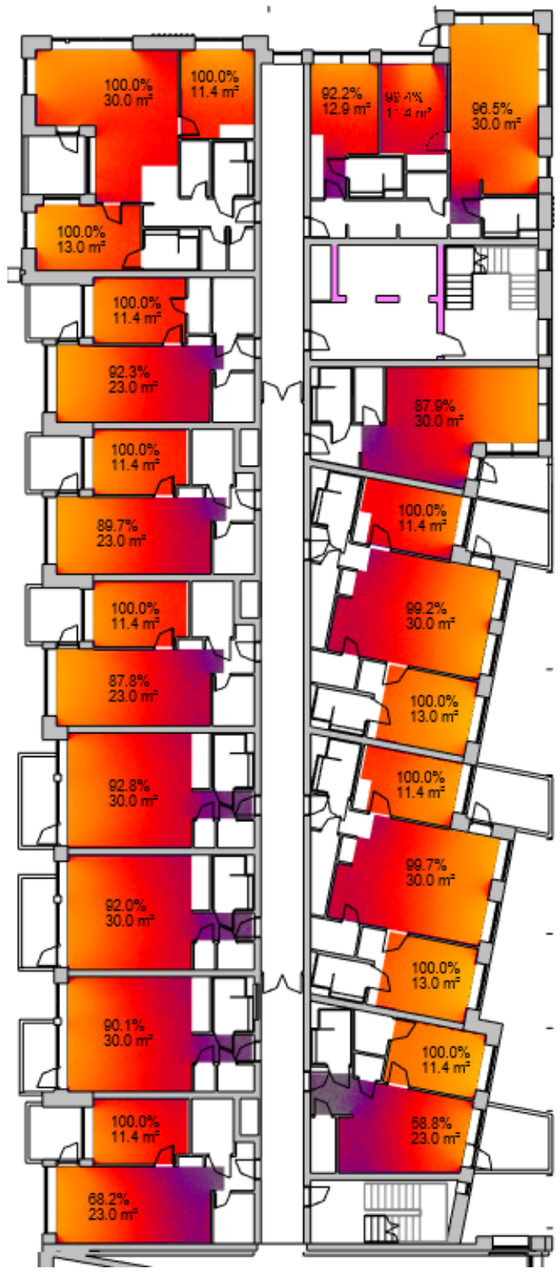
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

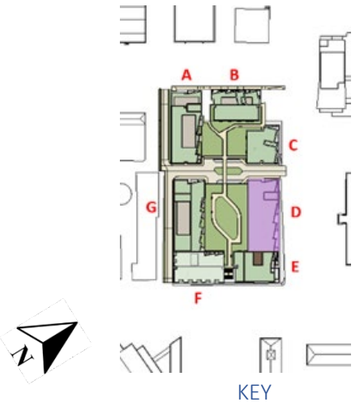
7.7 Results – Block D

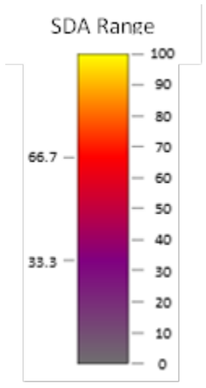
Block D – Third Floor

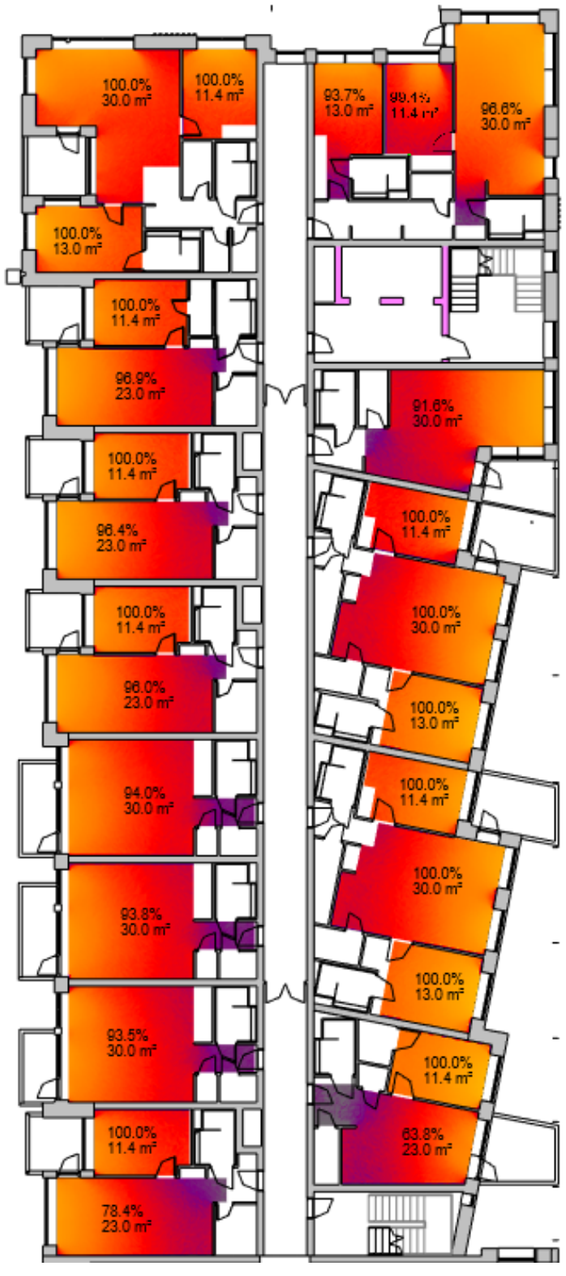
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

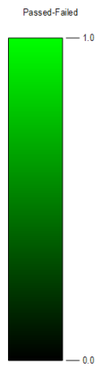
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.









SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

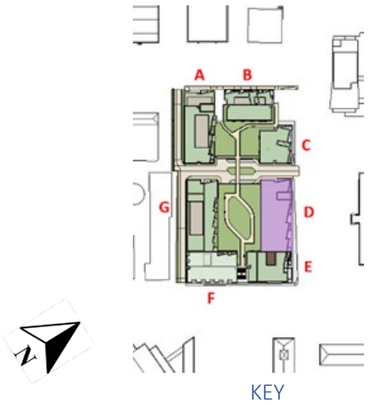
7.8 Results – Block D

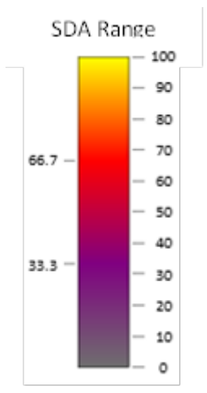
Block D – Fourth Floor

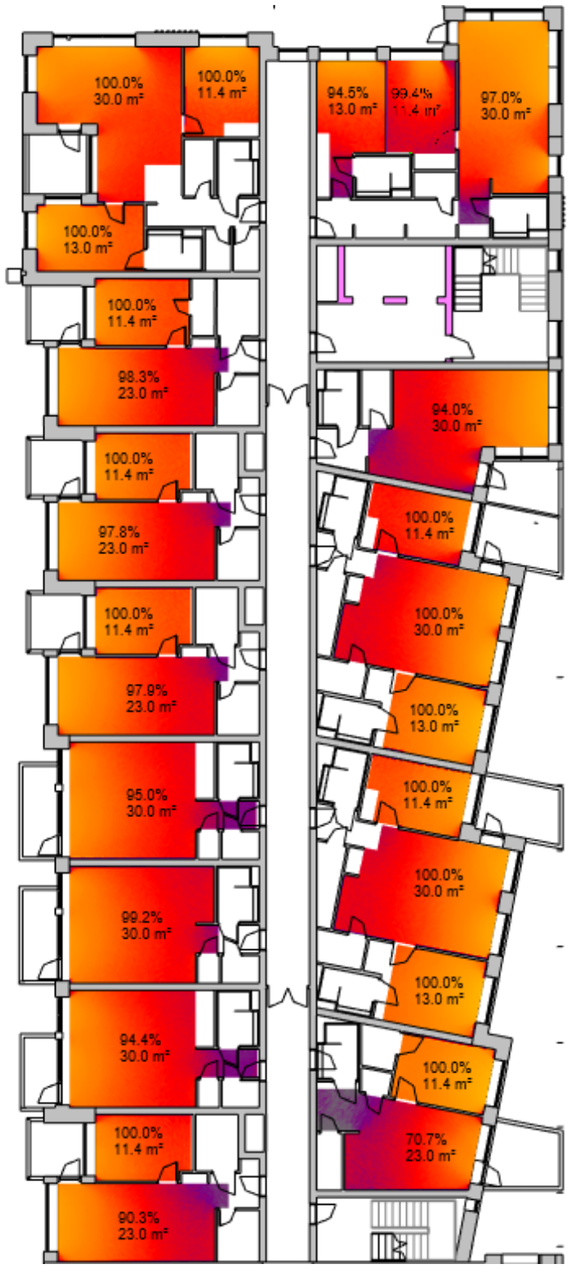
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

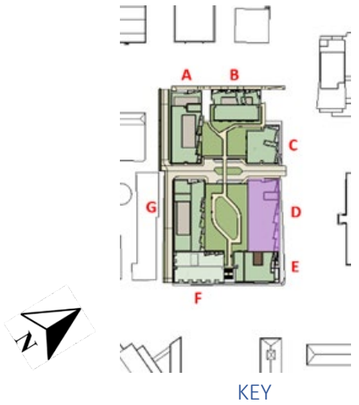
7.9 Results – Block D

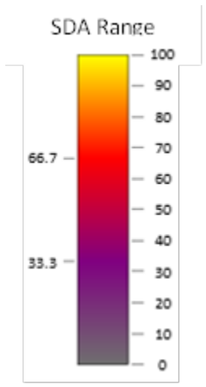
Block D – Fifth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

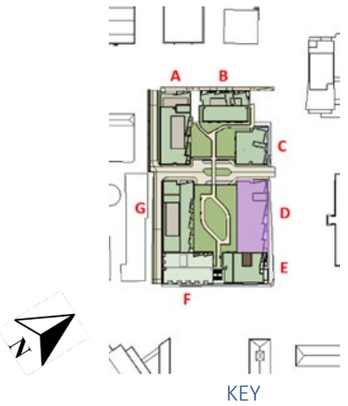
7.10 Results – Block D

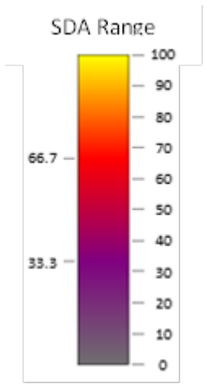
Block D – Sixth Floor

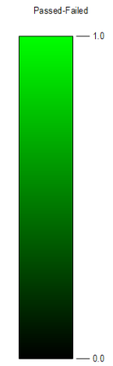
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

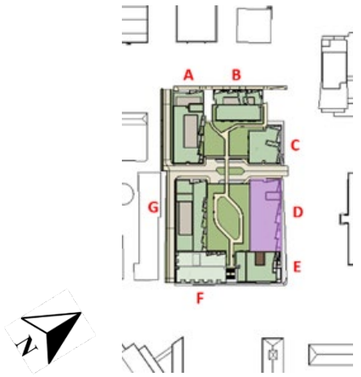
7.11 Results – Block D

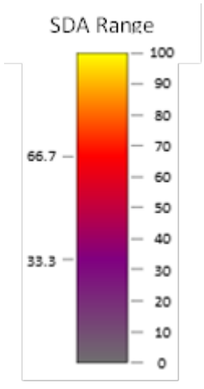
Block D – Seventh Floor

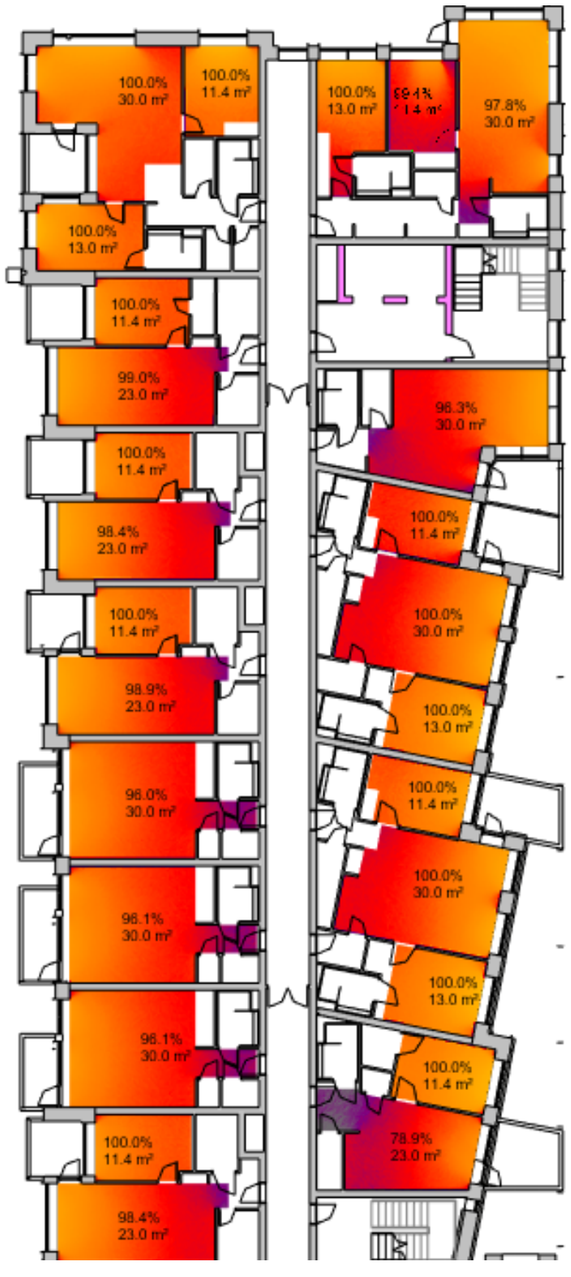
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

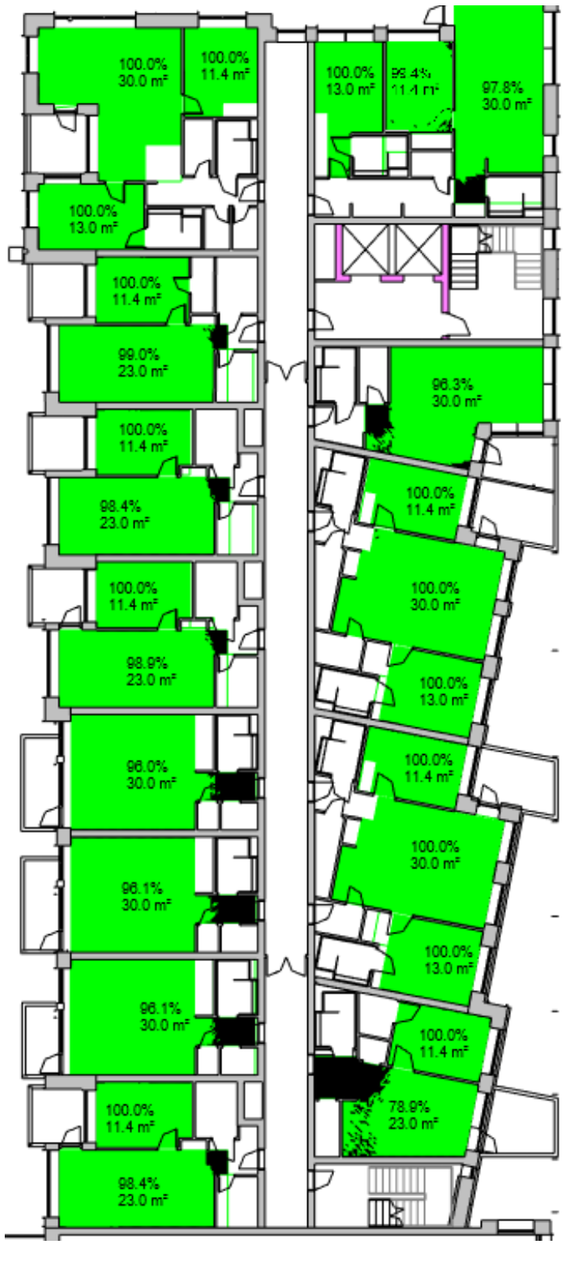
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.









SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

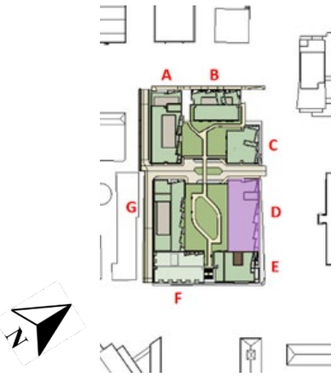
7.12 Results – Block D

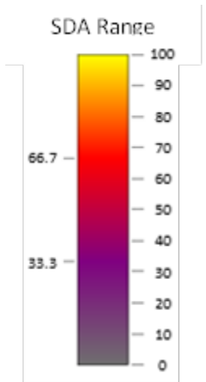
Block D – Eighth Floor

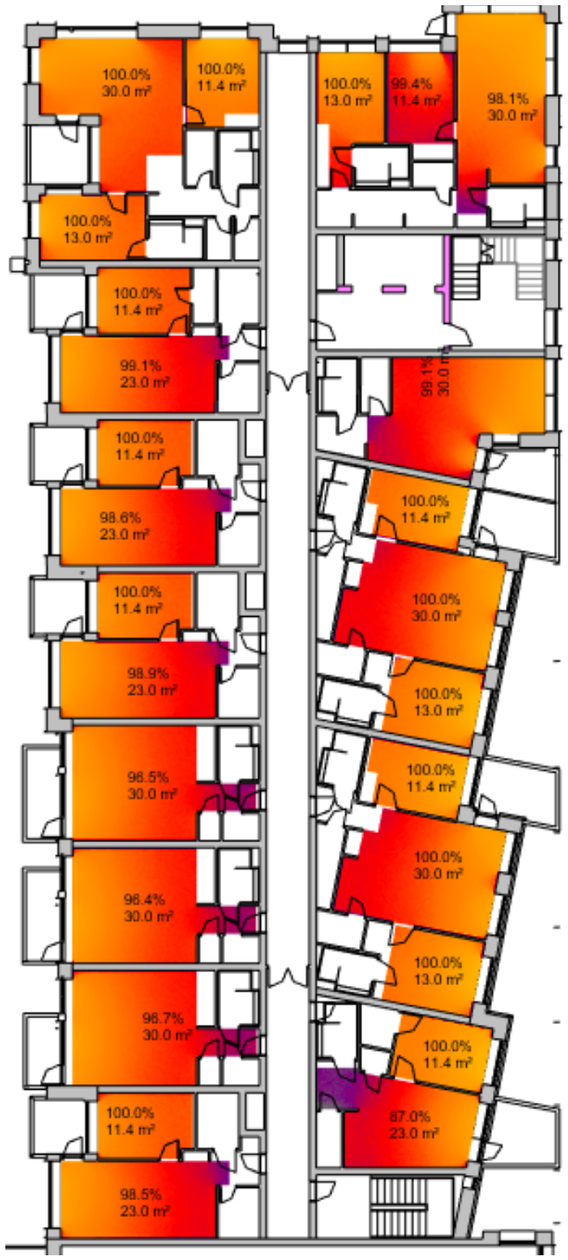
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

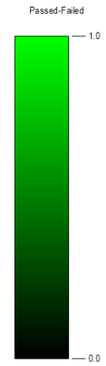
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.









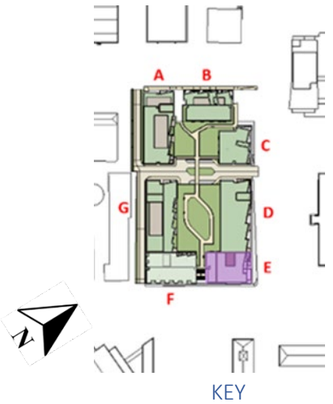
SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

7.13 Results – Block E

Block E – Ground Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.



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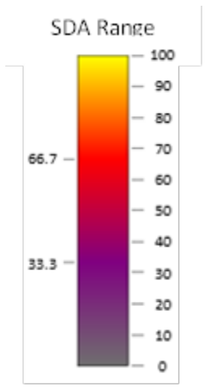
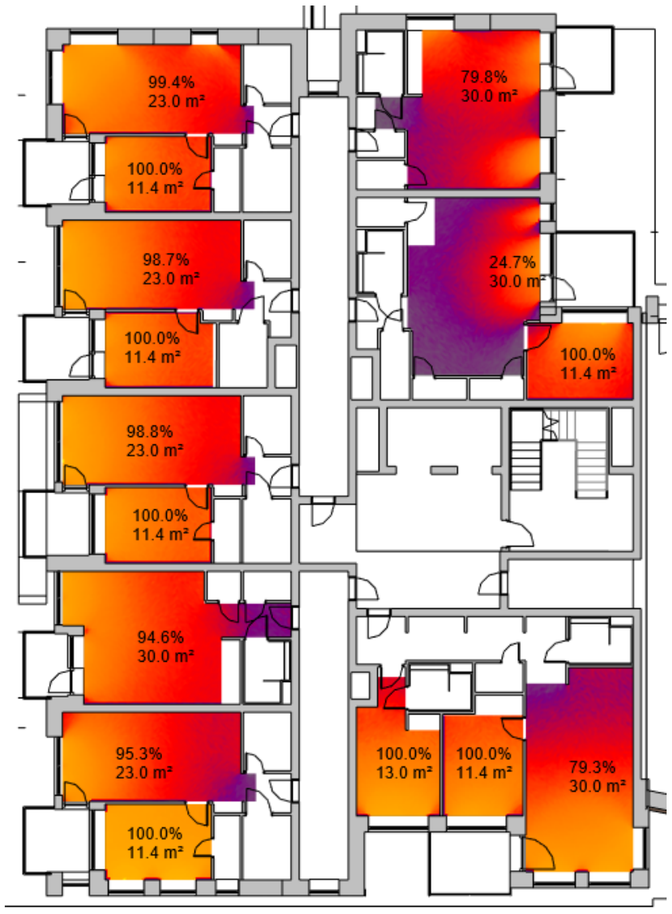




CM: 1, 2, 3, 4

SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

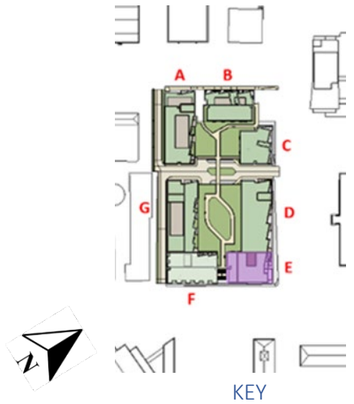
4: Dual Aspect

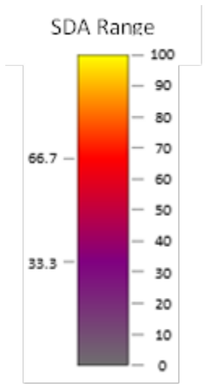
7.14 Results – Block E

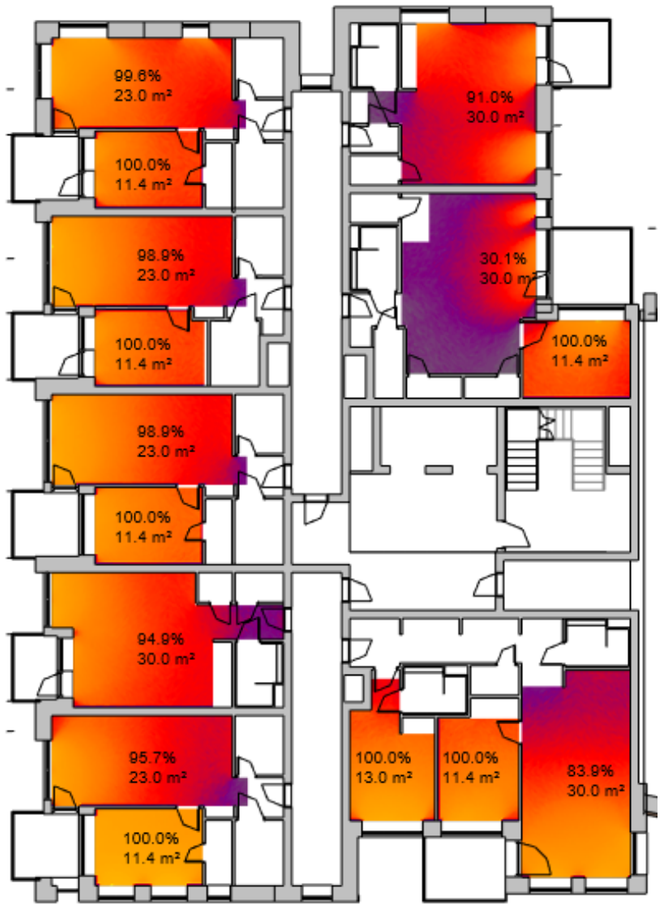
Block E – First Floor

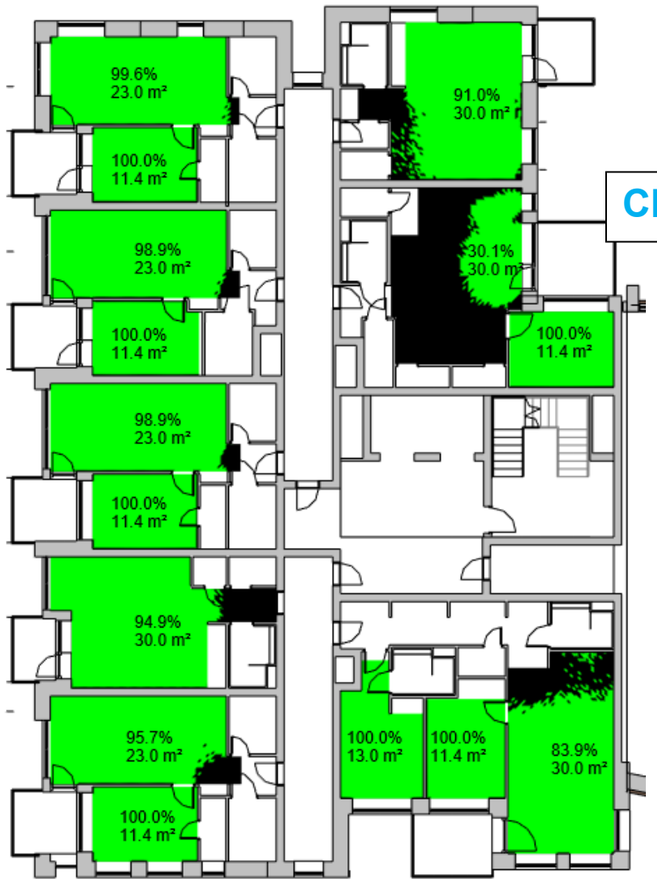
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.









CM: 1, 2, 3, 4

SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

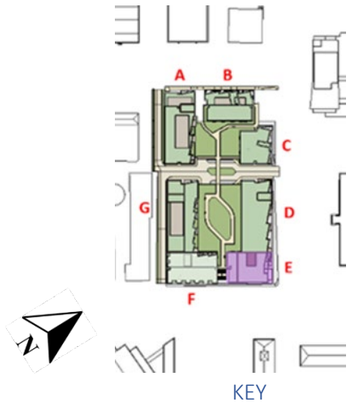
4: Dual Aspect

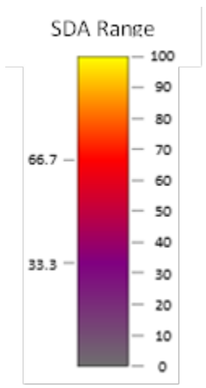
7.15 Results – Block E

Block E – Second Floor

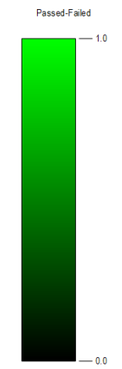
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.





CM: 1, 2, 3, 4



SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

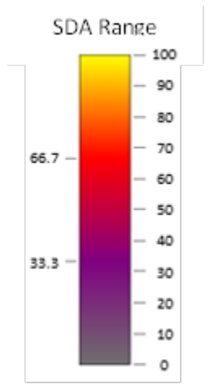
4: Dual Aspect

7.16 Results – Block E

Block E – Third Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.



CM: 1, 2, 3, 4

SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

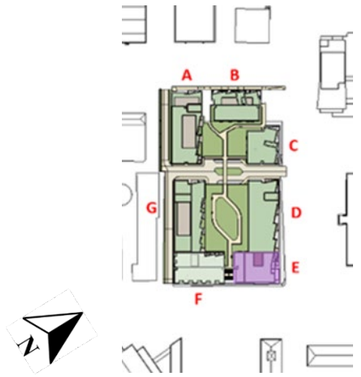
4: Dual Aspect

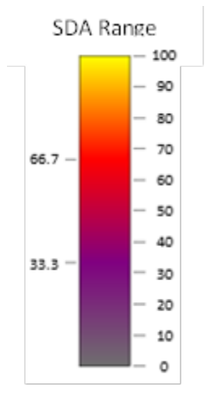
7.17 Results – Block E

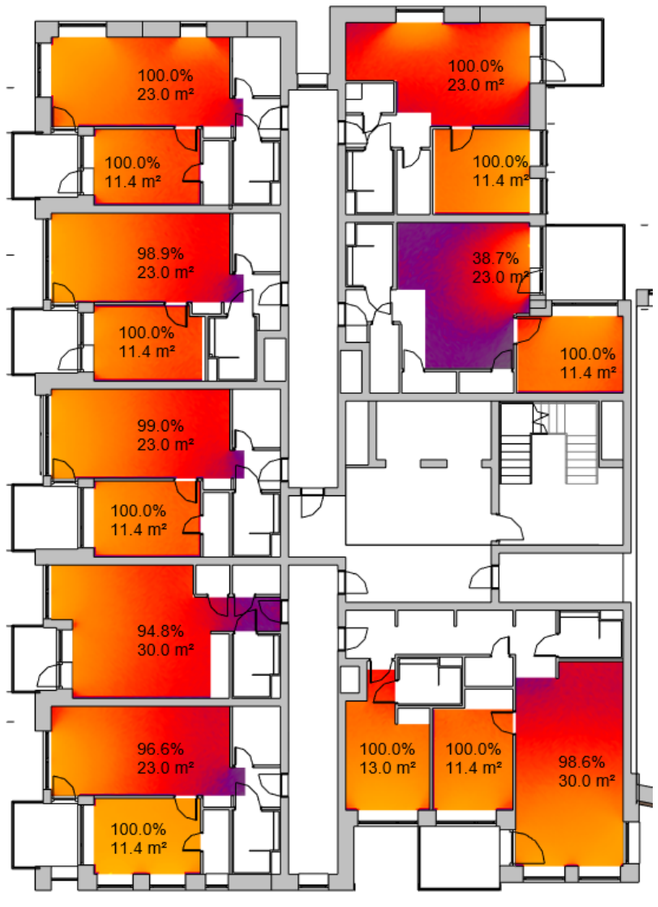
Block E – Fourth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.







CM: 1, 2, 3, 4

SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

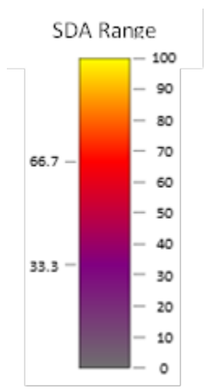
4: Dual Aspect

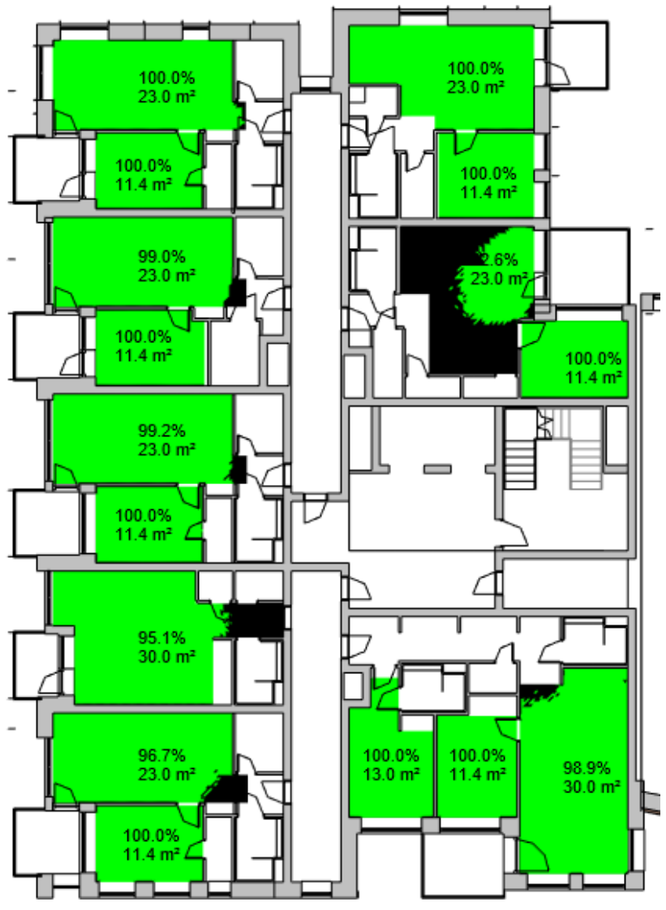
7.18 Results – Block E

Block E – Fifth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

CM: 1, 2, 3, 4

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

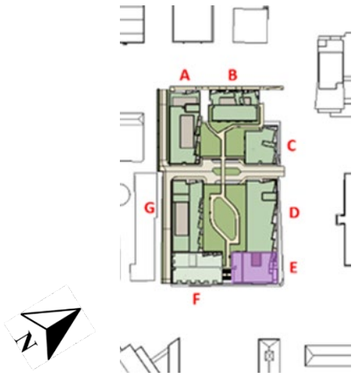
4: Dual Aspect

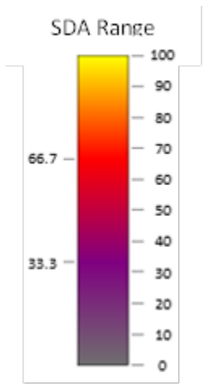
7.19 Results – Block E

Block E – Sixth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.





CM: 1, 2, 3, 4

SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

4: Dual Aspect

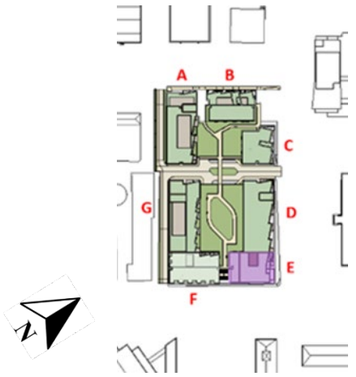
7.20 Results – Block E

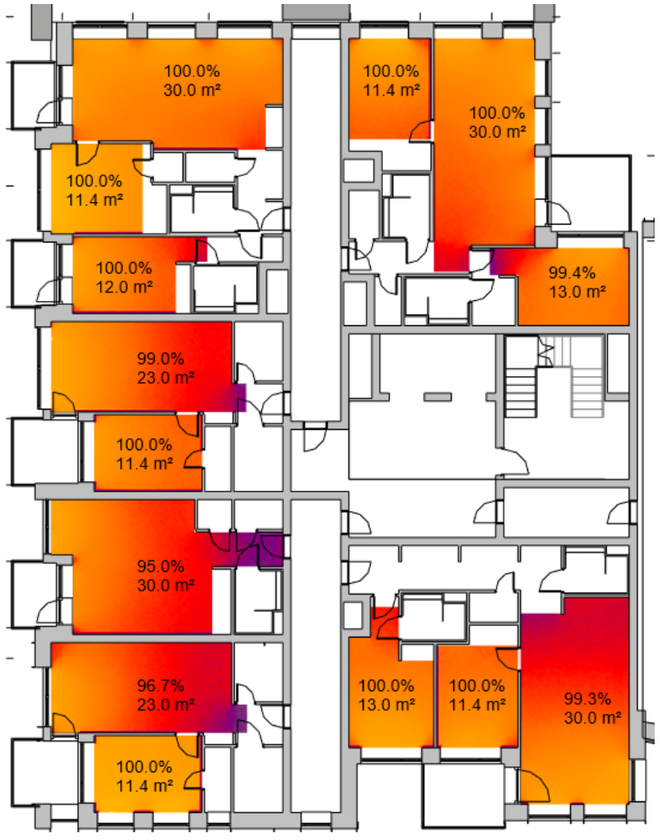
Block E – Seventh Floor

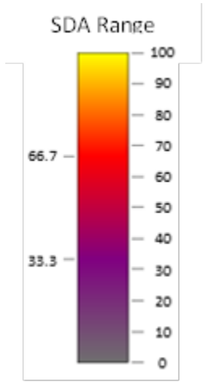
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

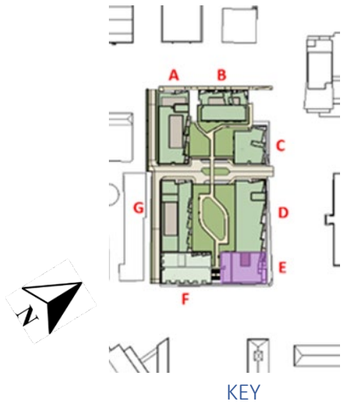
7.21 Results – Block E

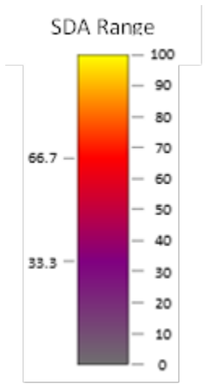
Block E – Eighth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

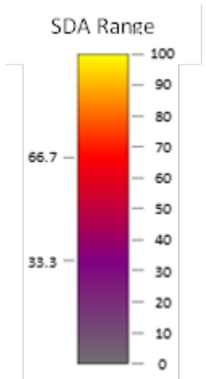
7.22 Results – Block E

Block E – Ninth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.



SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

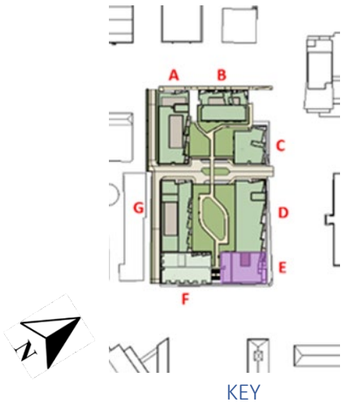
7.23 Results – Block E

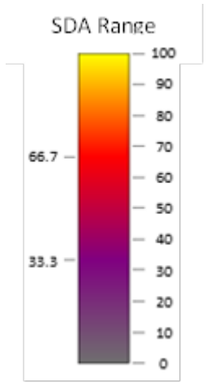
Block E – Tenth Floor

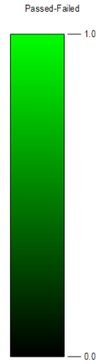
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

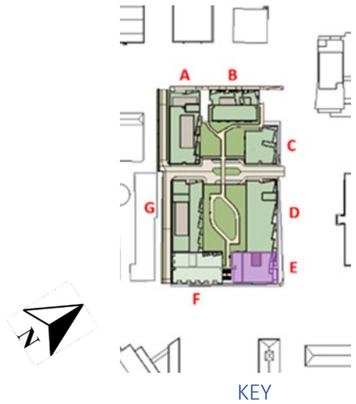
7.24 Results – Block E

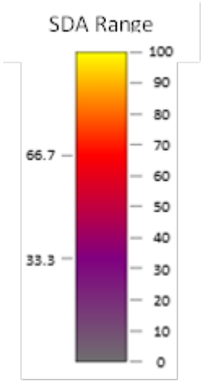
Block E – Eleventh Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

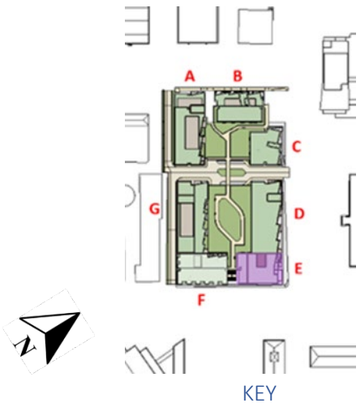
7.25 Results – Block E

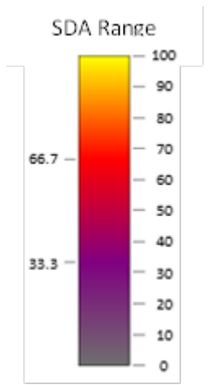
Block E – Twelfth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

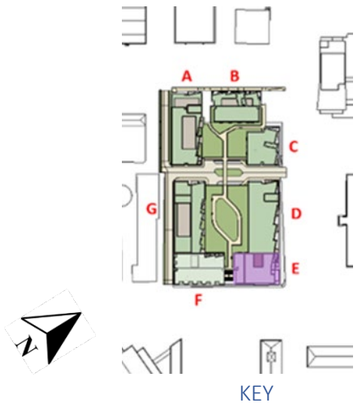
7.26 Results – Block E

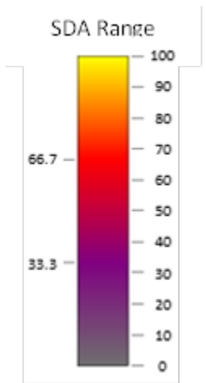
Block E – Thirteenth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

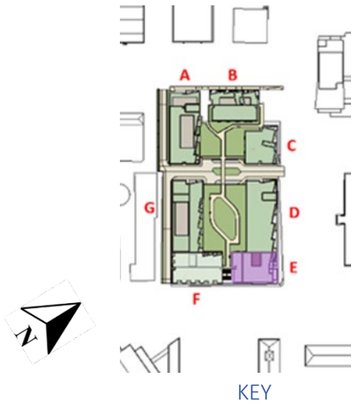
7.27Results – Block E

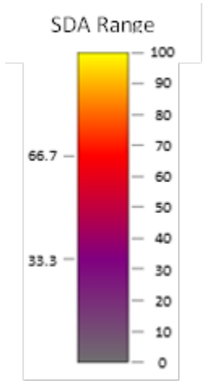
Block E – Fourteenth Floor

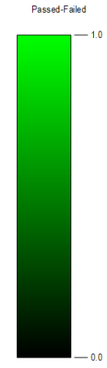
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







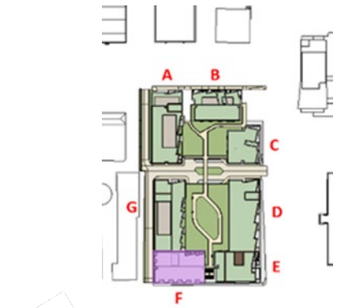
SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

7.28 Results – Block F

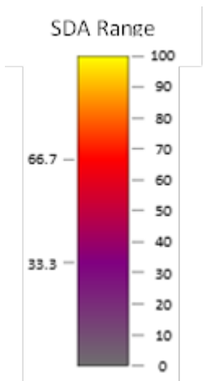
Block F – Lower Ground Floor

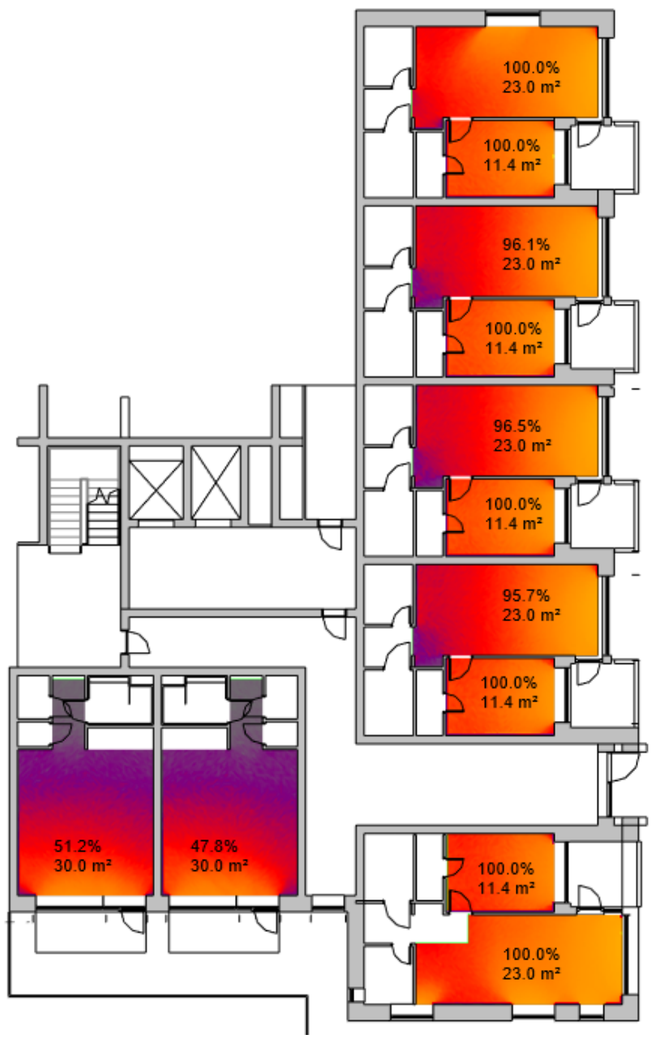
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

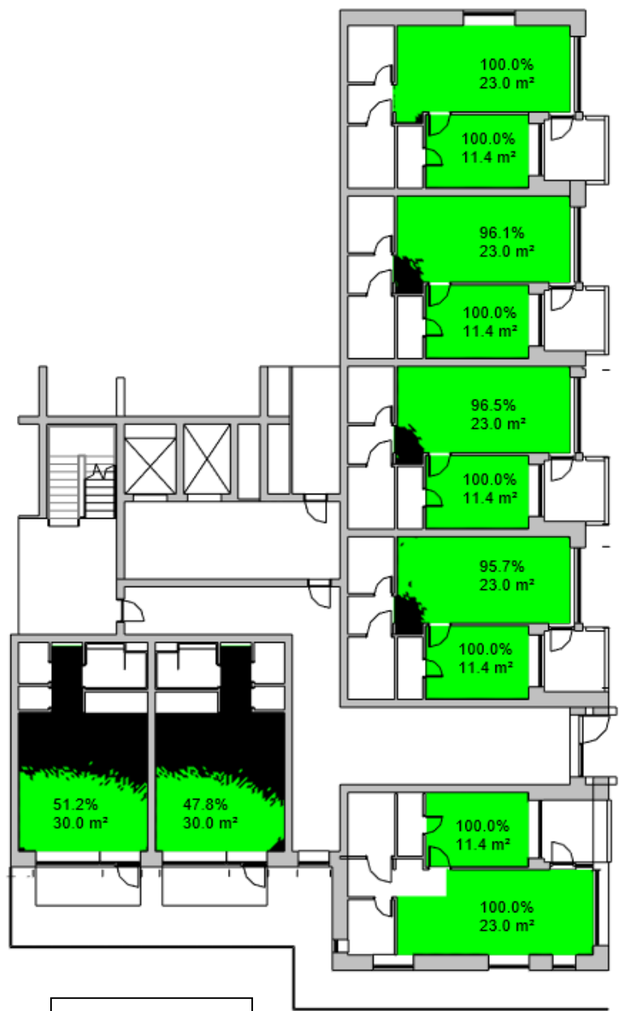


KEY

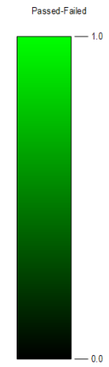




SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%



CM: 3



Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

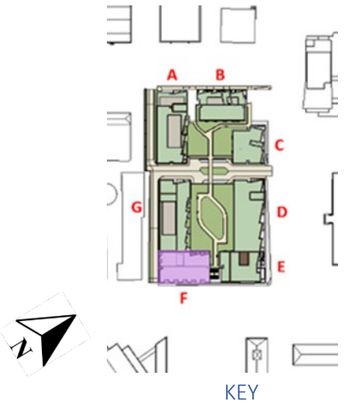
4: Dual Aspect

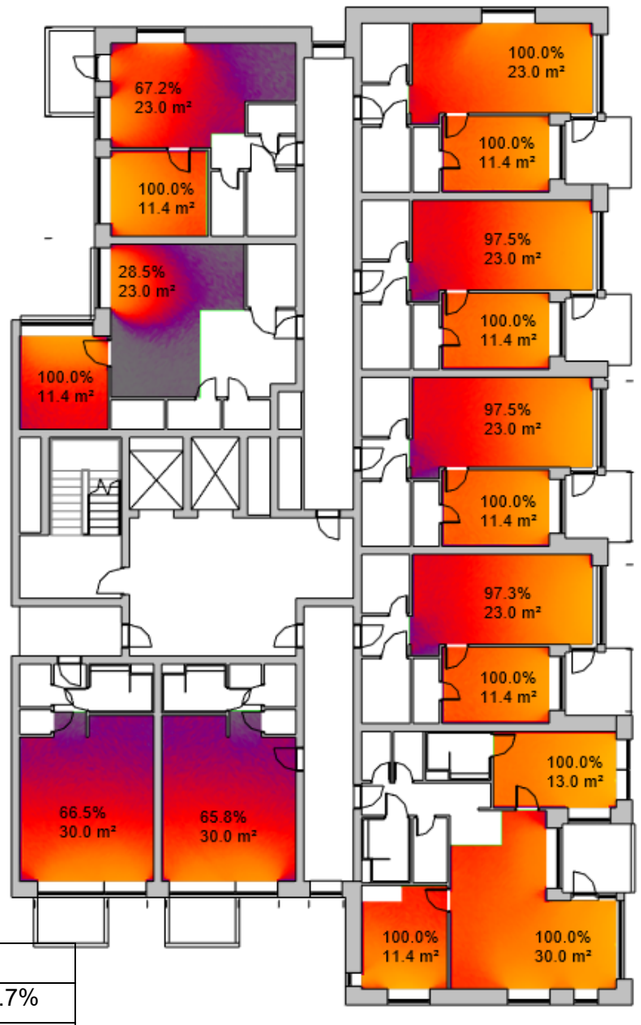
7.29 Results – Block F

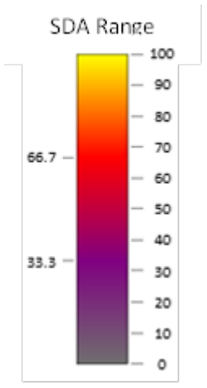
Block F – Ground Floor

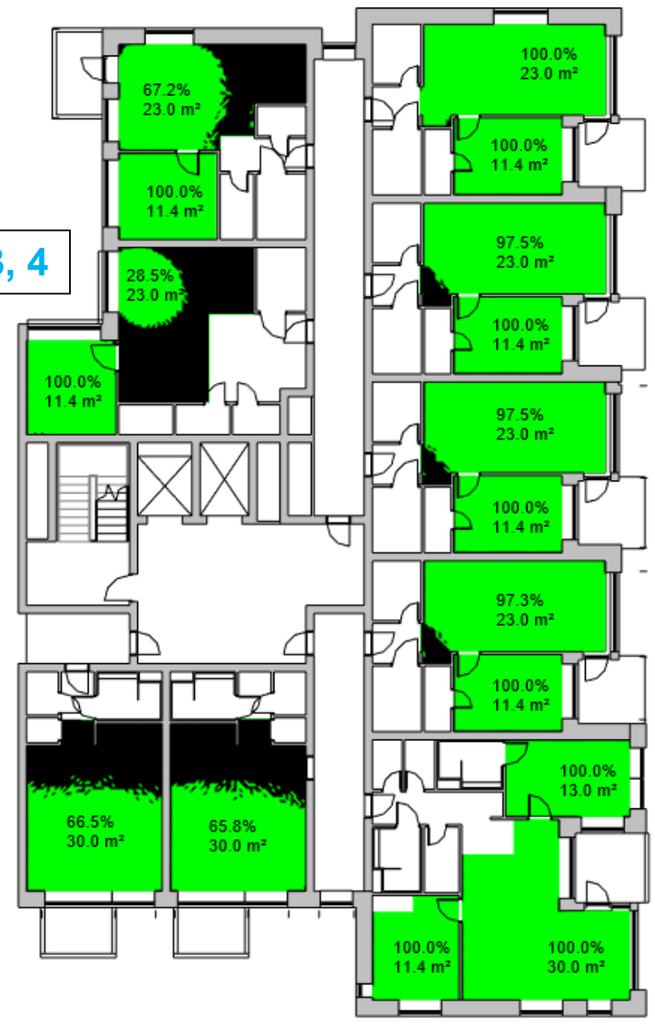
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

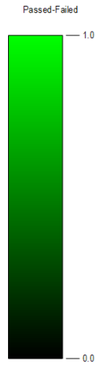
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.











SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

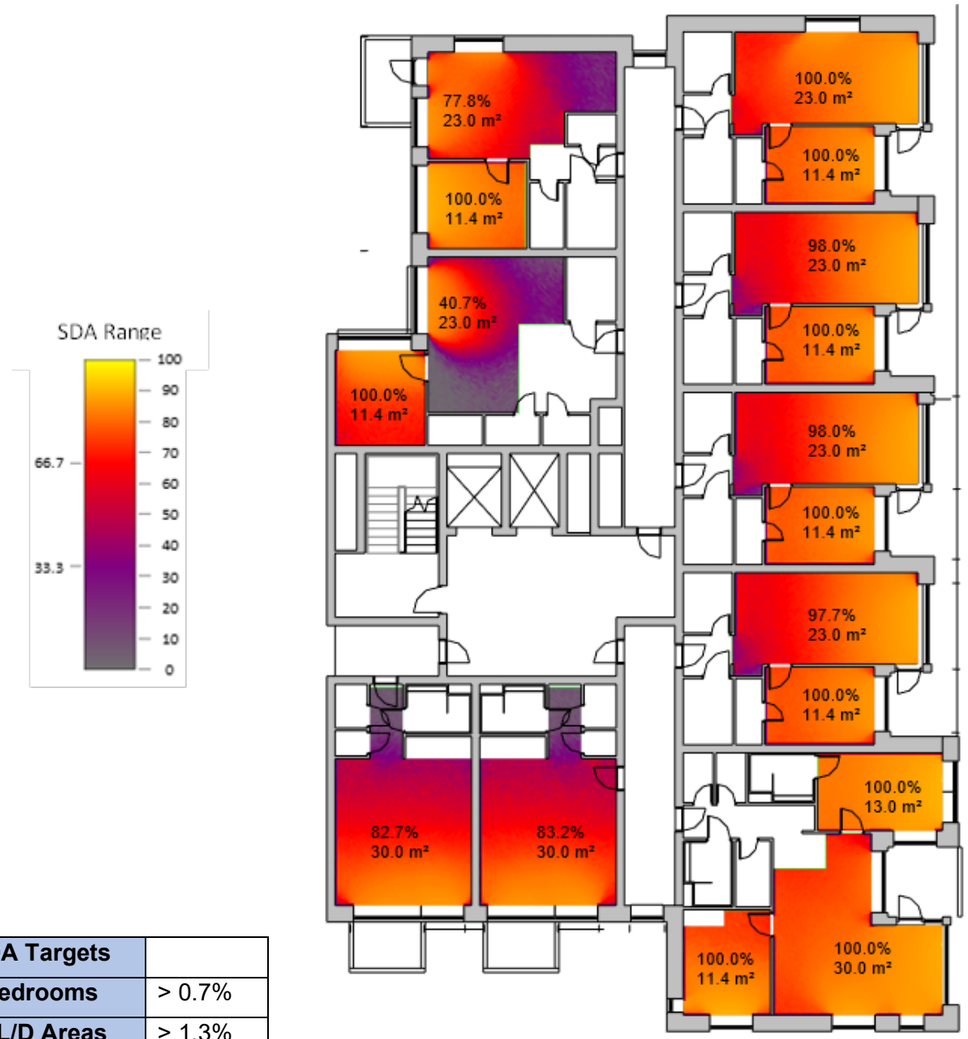
4: Dual Aspect

7.30 Results – Block F

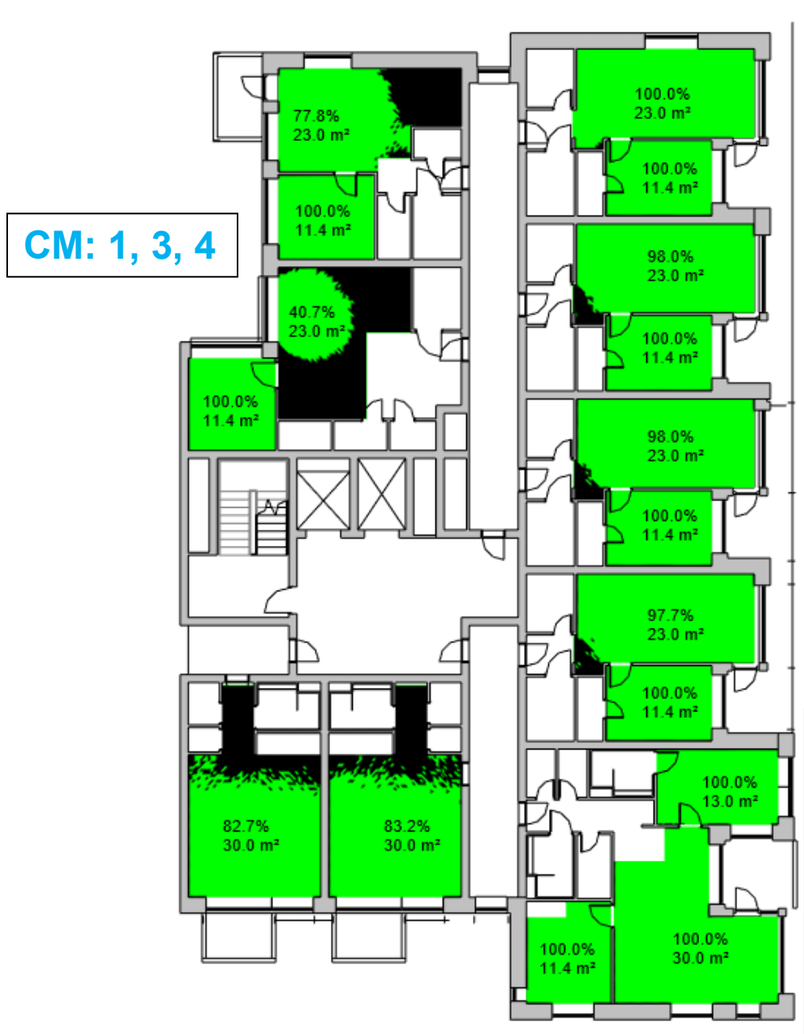
Block F – First Floor

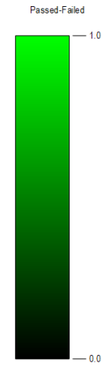
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.



SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%





Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

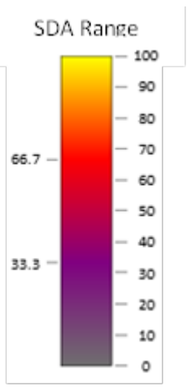
4: Dual Aspect

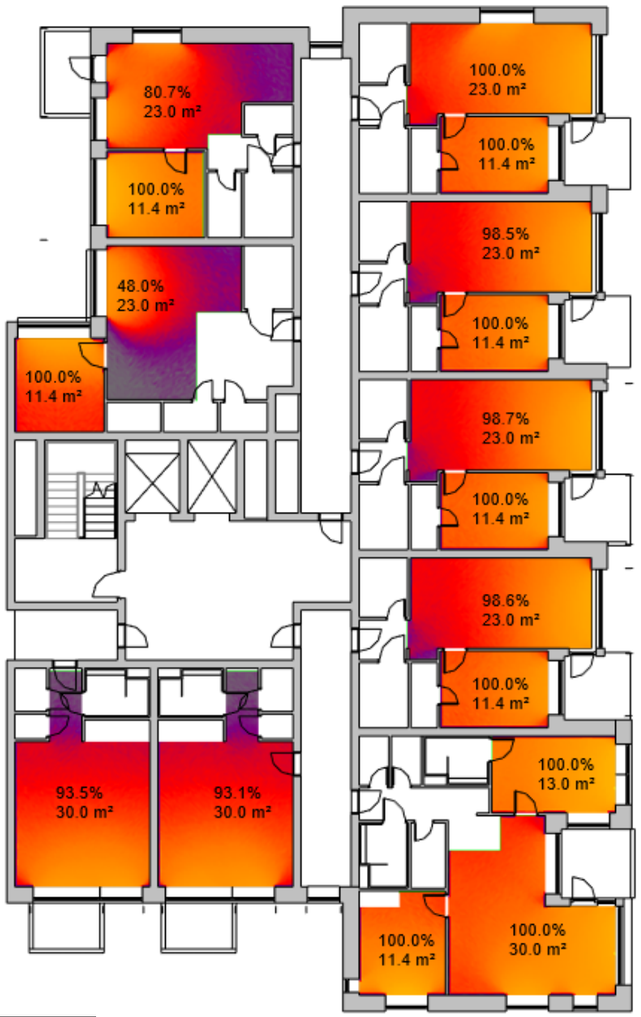
7.31 Results – Block F

Block F – Second Floor

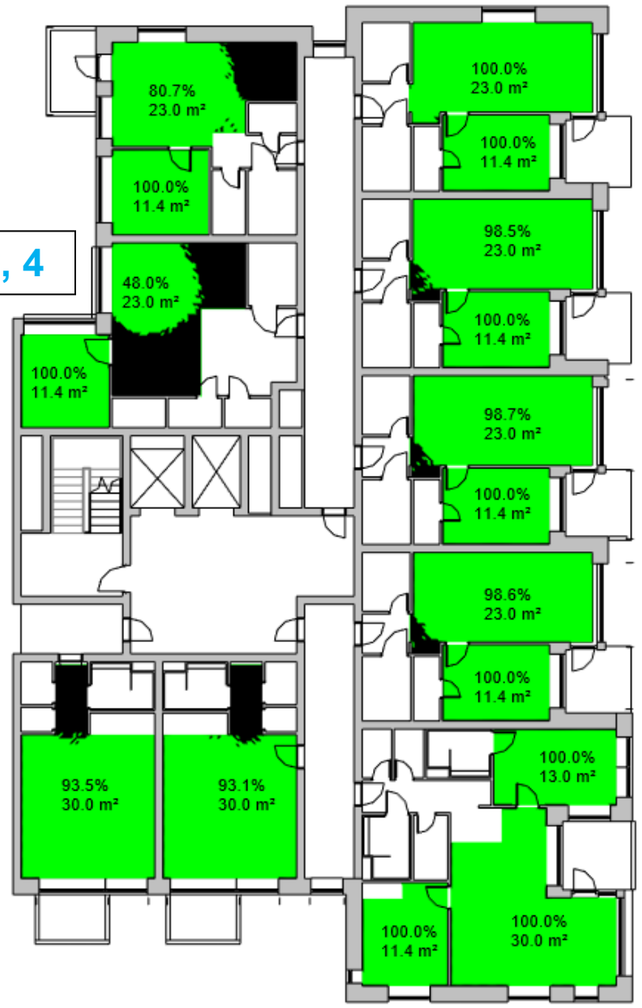
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

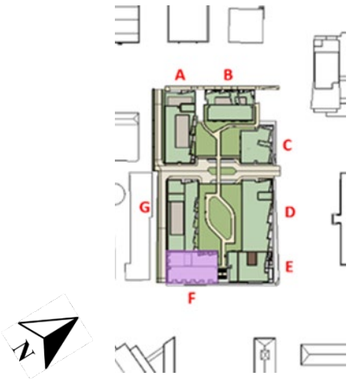
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

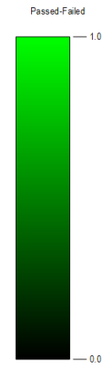




CM: 1, 3, 4







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

4: Dual Aspect

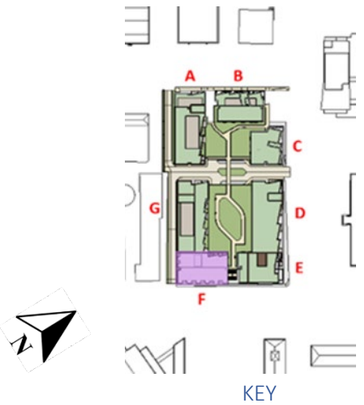
7.32 Results – Block F

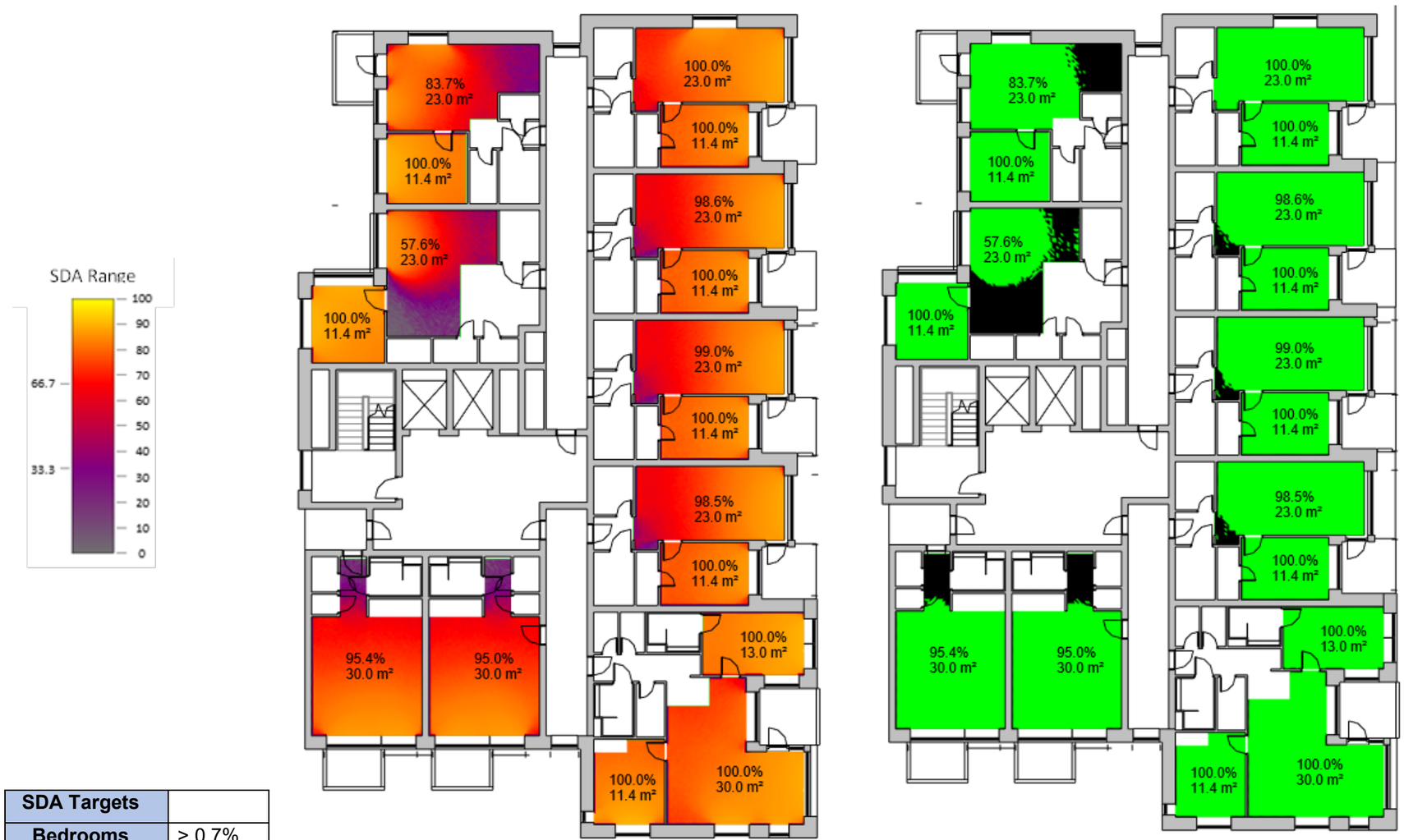
Block F – Third Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

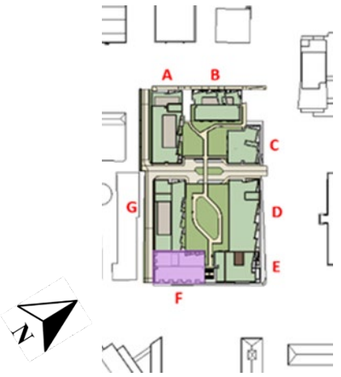
7.33 Results – Block F

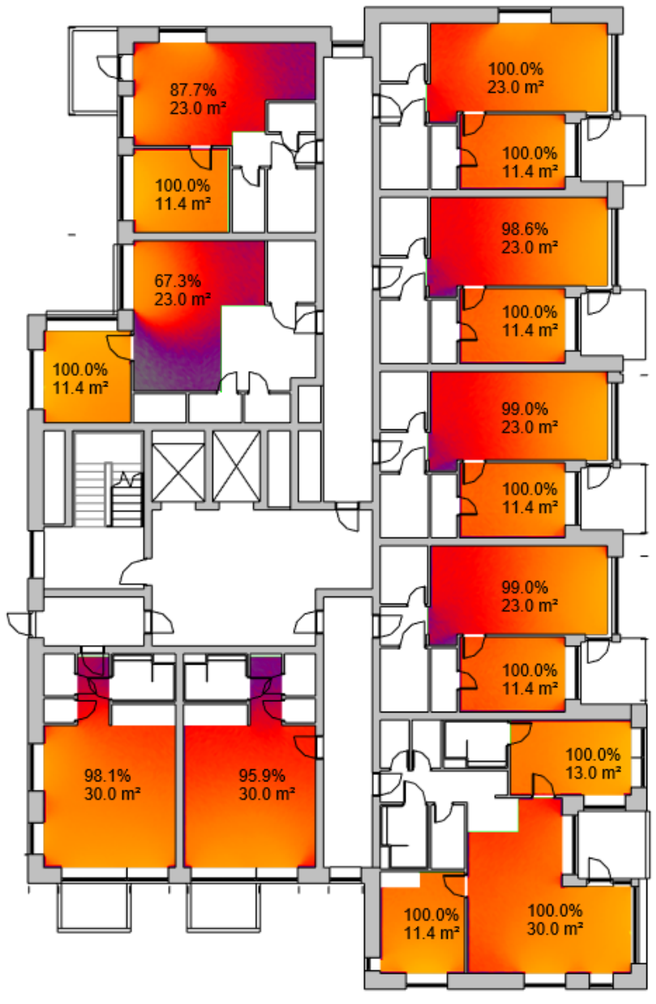
Block F – Fourth Floor

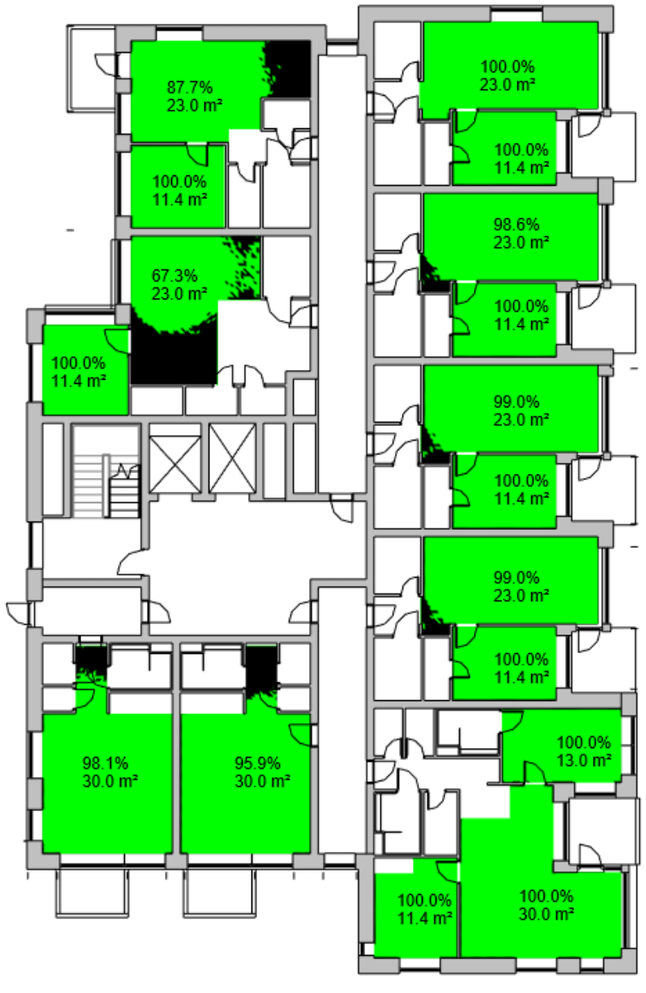
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

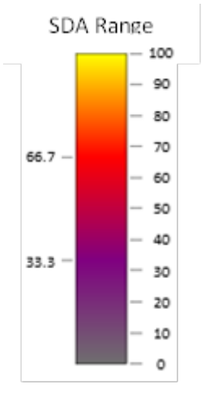
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.









SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

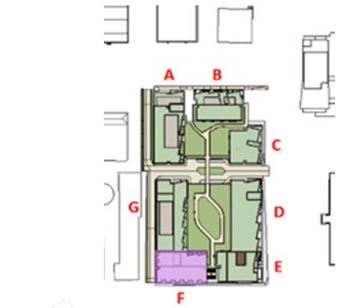
7.34 Results – Block F

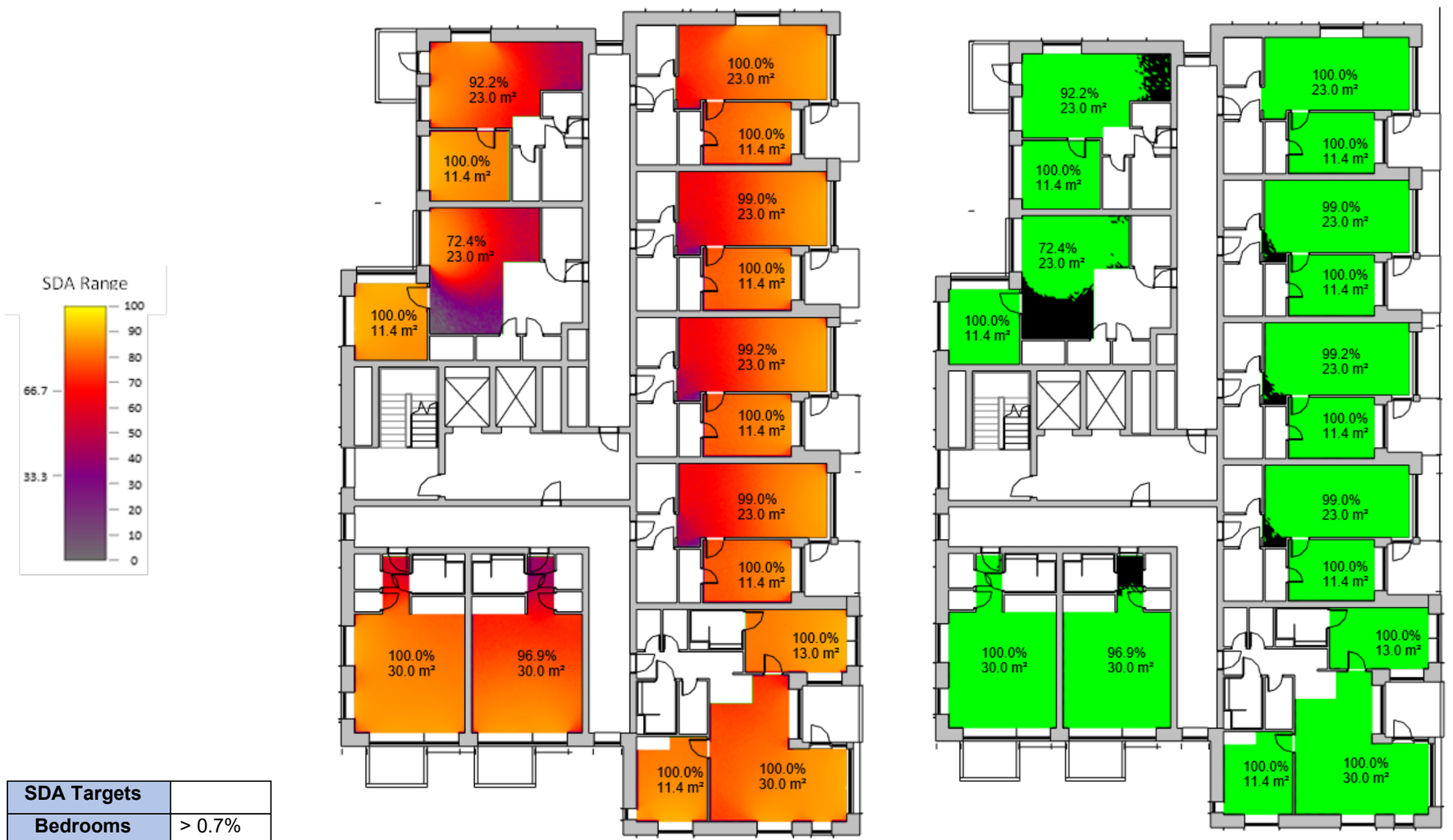
Block F – Fifth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

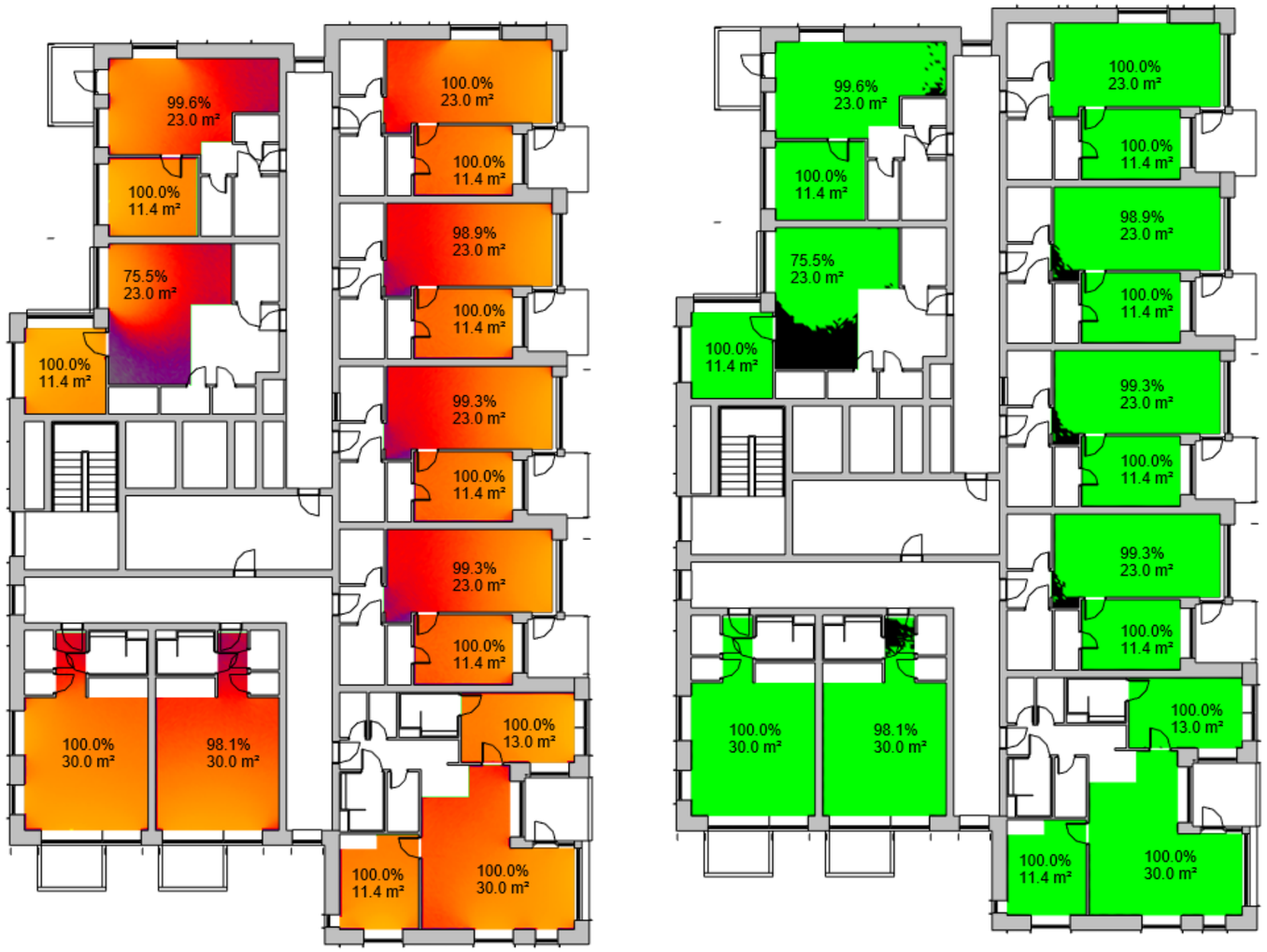
7.35 Results – Block F

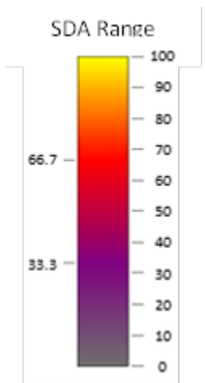
Block F – Sixth Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.





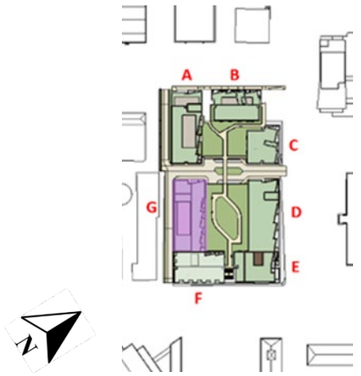
SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

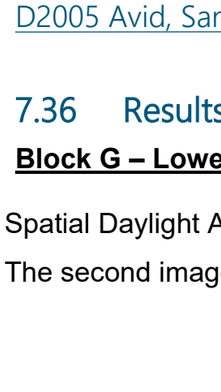
7.36 Results – Block G

Block G – Lower Ground Floor

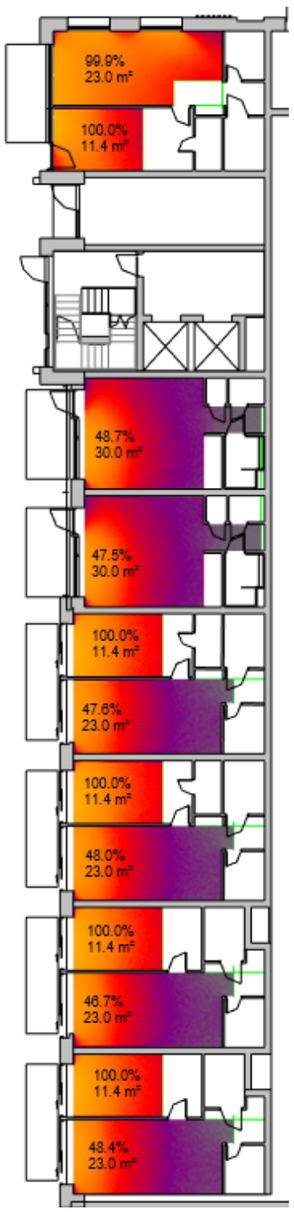
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%



CM: 2, 3

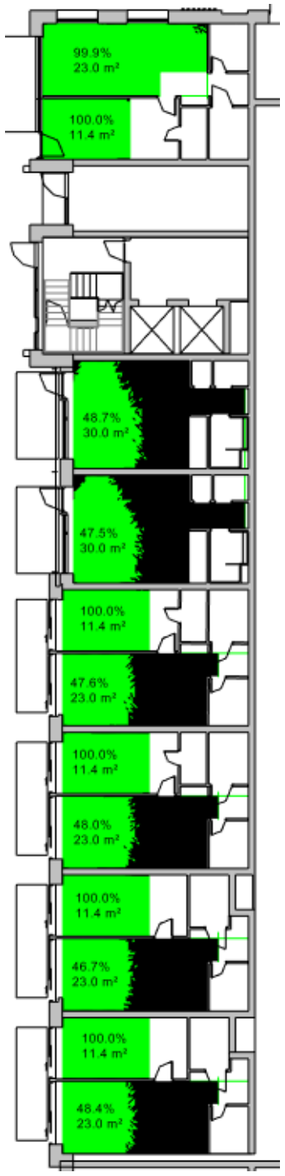
CM: 2, 3

CM: 1, 2, 3

CM: 1, 2, 3

CM: 1, 2, 3

CM: 1, 2, 3



Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

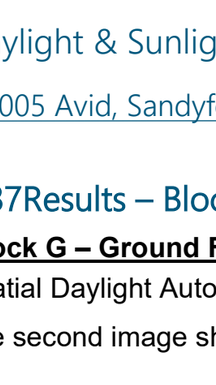
4: Dual Aspect

7.37Results – Block G

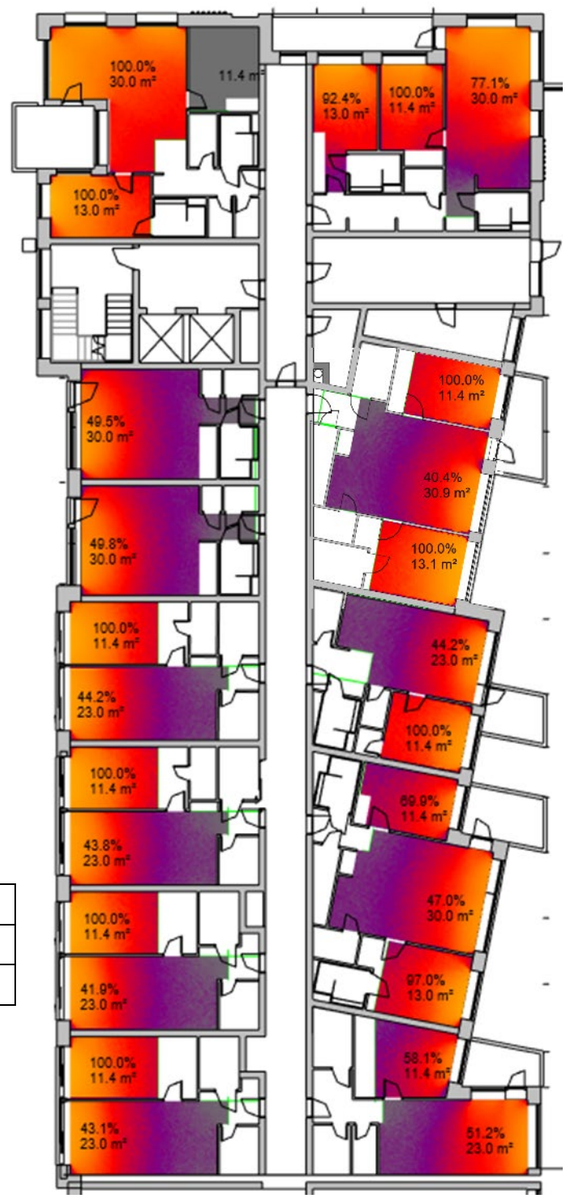
Block G – Ground Floor

Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.



SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%



CM: 2

CM: 2

CM: 1, 2

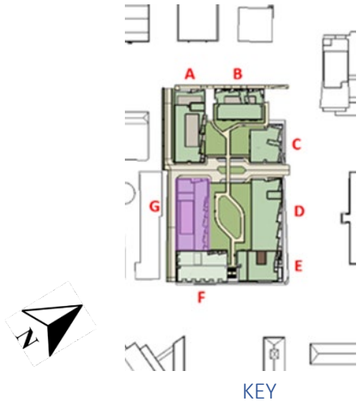
CM: 1, 2

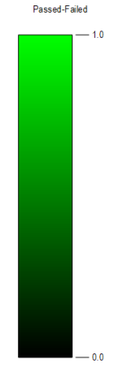
CM: 1, 2

CM: 1, 2, 3

CM: 1, 2, 3

CM: 2, 3





Compensatory Measures:

1: Daylight

2: Sunlight

3: Aspect

4: Dual Aspect

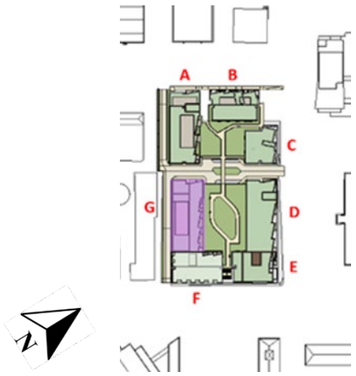
7.38 Results – Block G

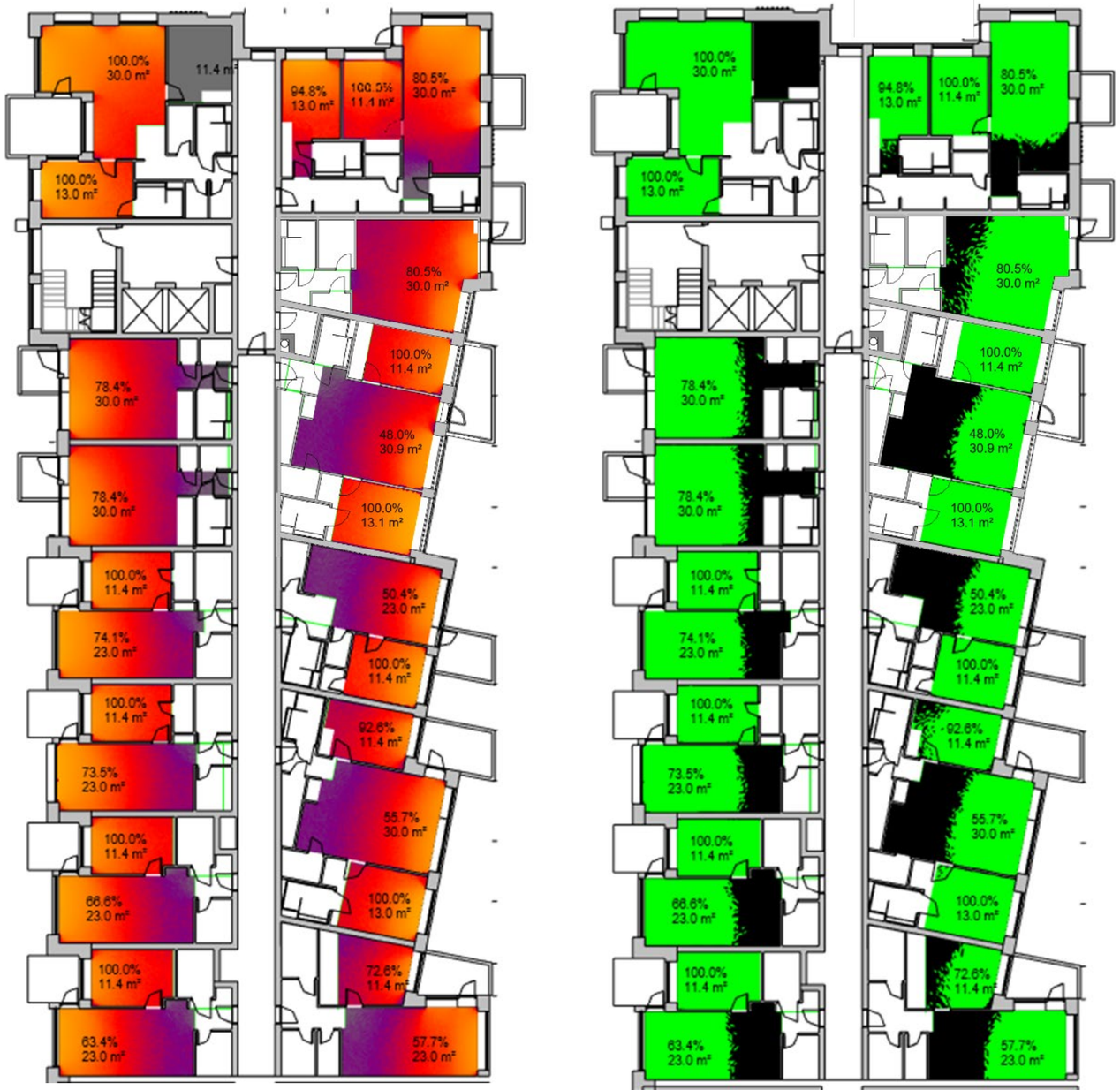
Block G – First Floor

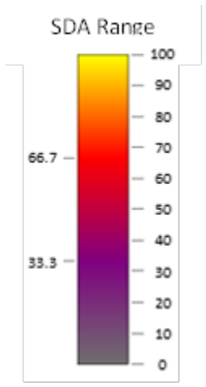
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

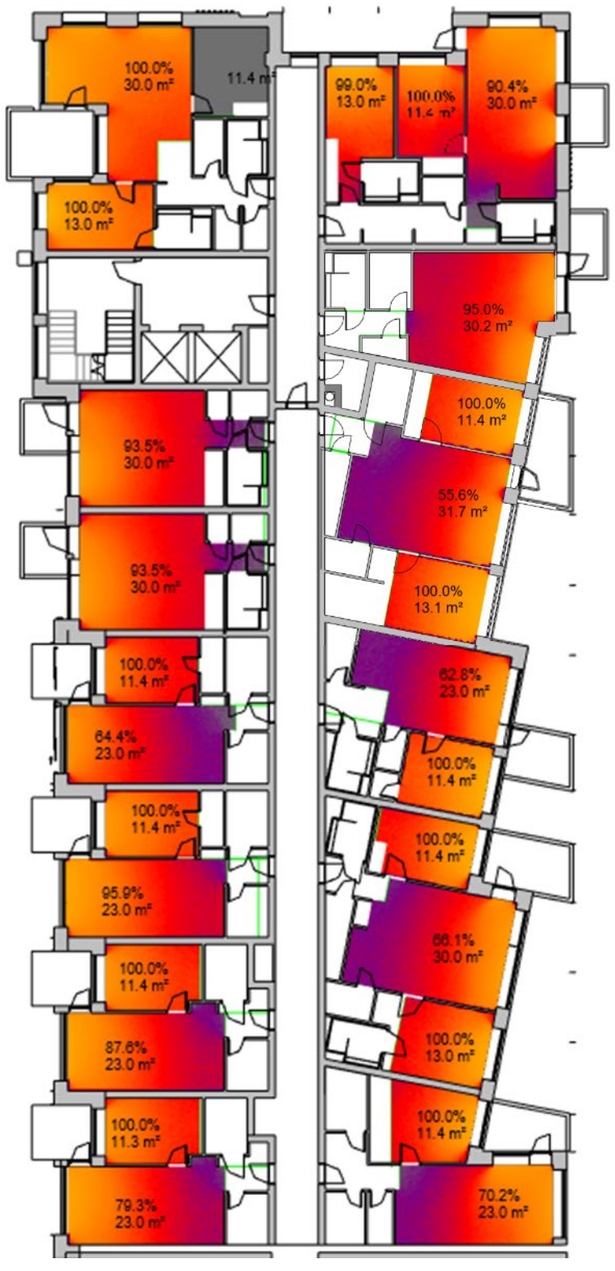
7.39 Results – Block G

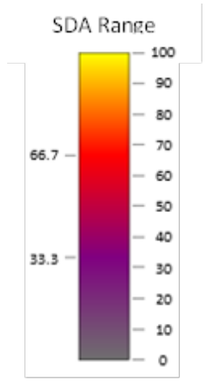
Block G – Second Floor

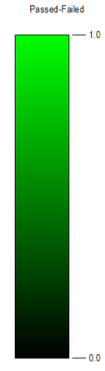
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.







SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

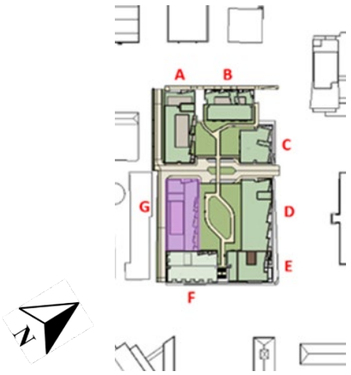
7.40 Results – Block G

Block G – Third Floor

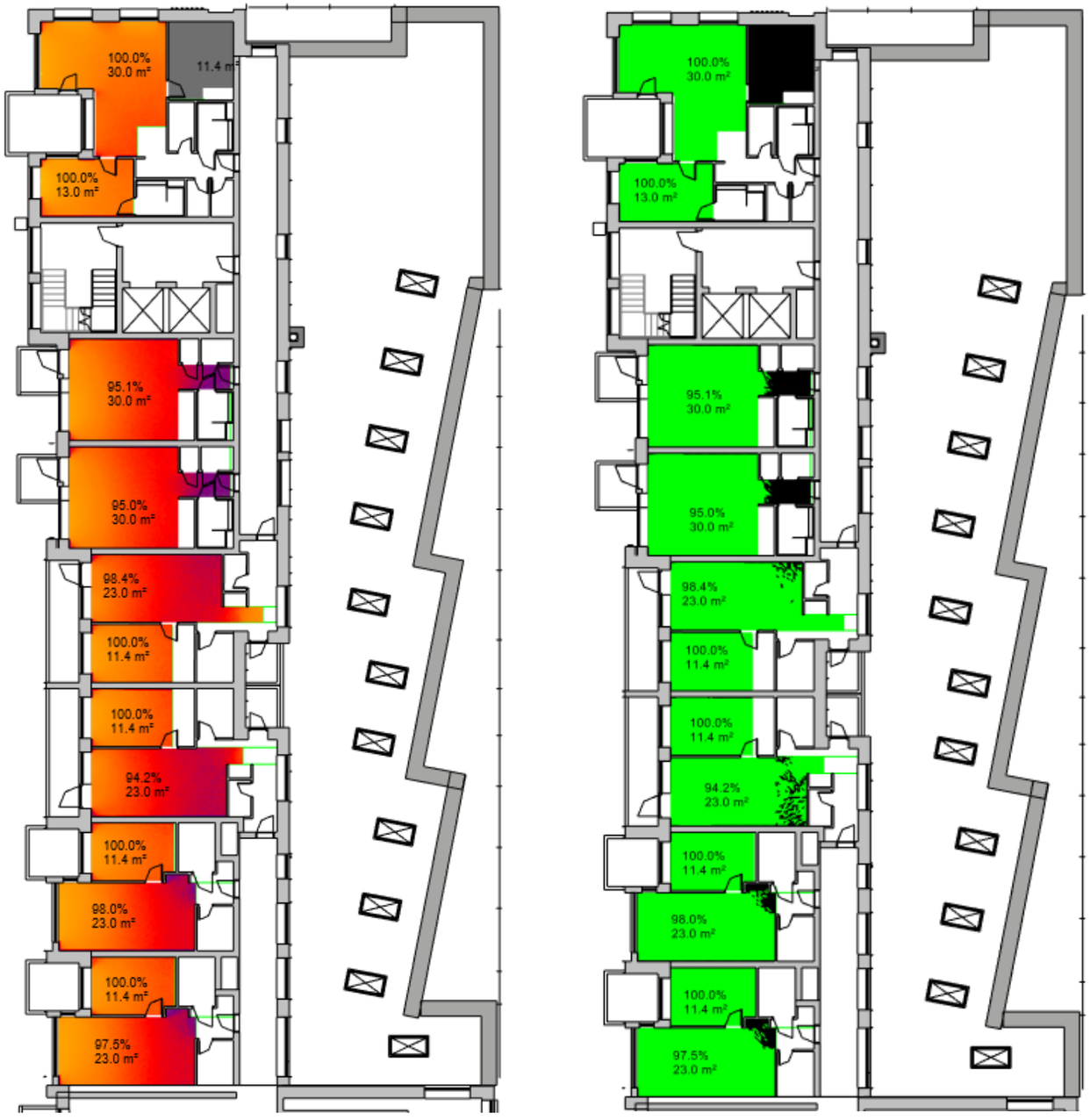
Spatial Daylight Autonomy (SDA) is illustrated below with a graduated compliance scale for 0% (grey) to 100% (yellow).

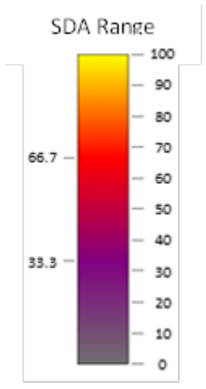
The second image shows compliance as pass (green) / fail (Black) for the targets of 200Lux in KLD and 100Lux in bedrooms.

This floor was determined to be fully compliant for SDA.



KEY





SDA Targets	
Bedrooms	> 0.7%
K/L/D Areas	> 1.3%

8.0 Exposure To Sunlight

The BRE Guide suggests 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. "*

The BRE Guide further notes:

> *"A south-facing window will, in general, receive most sunlight, while a north-facing one will only receive it on a handful of occasions (early morning and late evening in summer). East- and west-facing windows will receive sunlight only at certain times of the day. A dwelling with no main window wall within 90° of due south is likely to be perceived as insufficiently sunlit."*

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 has been undertaken for each unit in the proposed development to assess the exposure to sunlight that each unit can receive. The results below show the calculated values for each relevant window. As noted above, windows on different facades can be added where they occur at different times. Blue dots indicate an exposure to sunlight less than 1.5 hours, green, between 1.5 and 3.0 hours (minimum), yellow between 3.0 and 4.0 hours (medium level) with orange indicating windows which receive in excess of 4.0 hours (high level).

8.0 Results Summary

The results below show the calculated values for each relevant window. As noted above, windows on different facades can be added where they occur at different times. Blue dots indicate an exposure to sunlight less than 1.5 hours, green, between 1.5 and 3.0 hours (minimum), yellow between 3.0 and 4.0 hours (medium level) with orange indicating windows which receive in excess of 4.0 hours (high level).

The results tables show a high level of compliance for exposure to sunlight (1.5 hours or more), 98%, for the proposed scheme. Unlike daylight, the apartment guidelines do not require compensatory measures for sunlight, and instead the exposure to sunlight can be considered an enhanced performance that is in its self a compensatory measure.

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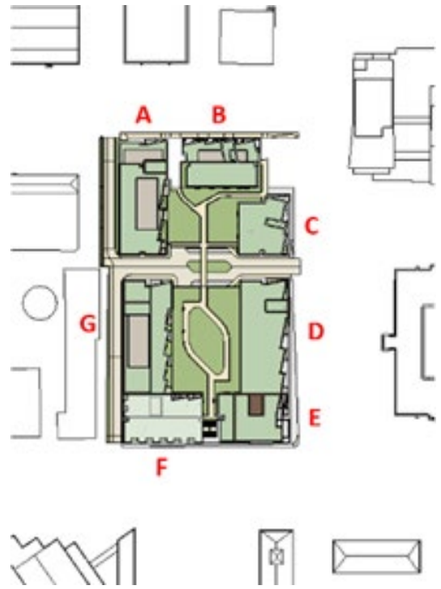
Block D	Pass	Fail	Total
Ground Floor	11	0	11
First Floor	13	0	13
Second Floor	13	0	13
Third Floor	13	0	13
Fourth Floor	13	0	13
	63	0	63
	100%	**0%**	

Block E	Pass	Fail	Total
Ground Floor	8	0	8
First Floor	8	0	8
Second Floor	8	0	8
Third Floor	8	0	8
Fourth Floor	8	0	8
Fifth Floor	8	0	8
Sixth Floor	8	0	8
Seventh Floor	6	0	6
Eighth Floor	6	0	6
Nineth Floor	5	0	5
Tenth Floor	5	0	5
Eleventh Floor	5	0	5
Twelveth Floor	5	0	5
Thirteenth Floor	5	0	5
Fourteenth Floor	5	0	5
	98	0	98
	100%	**0%**	

Block F	Pass	Fail	Total
Lower Ground Floor	6	1	7
Ground Floor	8	1	9
First Floor	8	1	9
Second Floor	8	1	9
Third Floor	9	0	9
Fourth Floor	9	0	9
Fifth Floor	9	0	9
Sixth Floor	9	0	9
	48	4	52
	92%	**8%**	

Block G	Pass	Fail	Total
Lower Ground Floor	7	0	7
Ground Floor	12	0	12
First Floor	13	0	13
Second Floor	13	0	13
Third Floor	7	0	7
	52	0	52
	100%	**0%**	



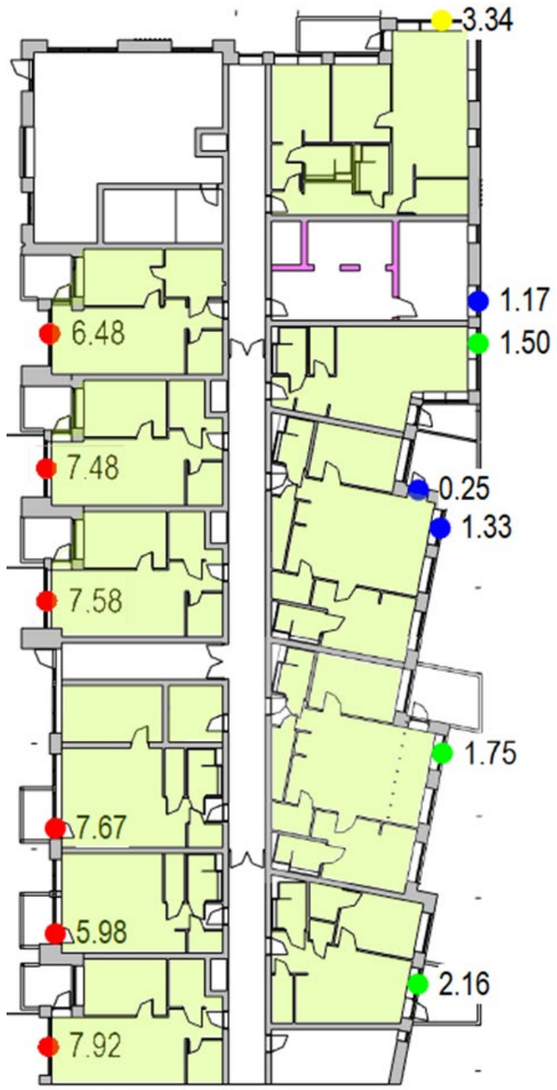
	Pass	Fail	Total
Block D	63	0	63
Block E	98	0	98
Block F	48	4	52
Block G	52	0	52
	261	4	265
	98%	2%	

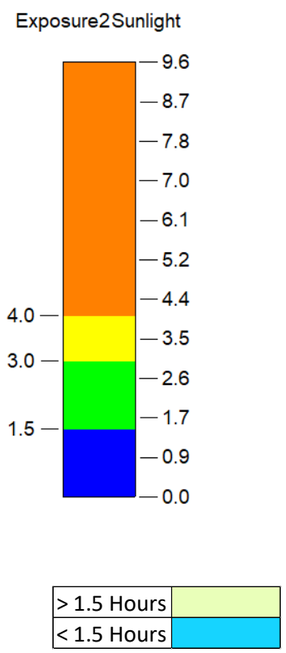
Fig 8.1.2 – Sunlight Exposure – Compliance table

Exposure to Sunlight

Block D - Ground Floor

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

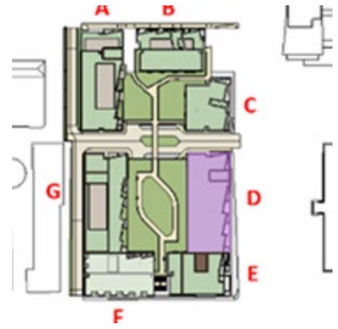


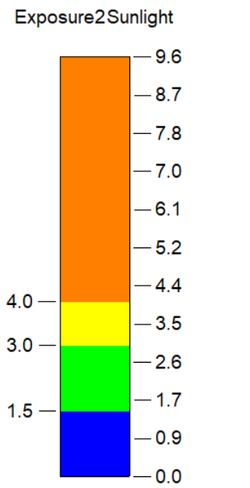


> 1.5 Hours	
< 1.5 Hours	

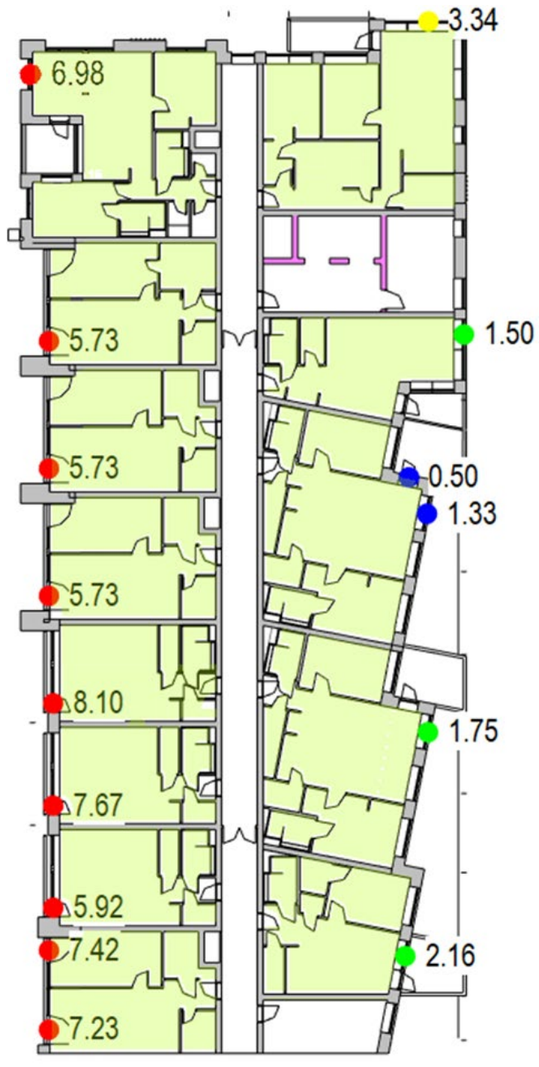
Block D - First Floor

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



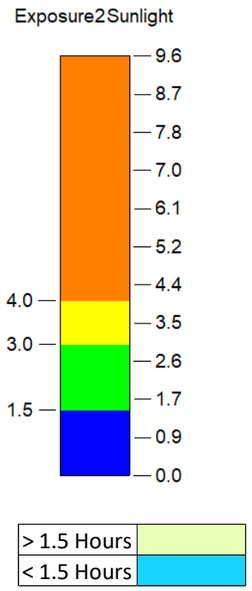


> 1.5 Hours	
< 1.5 Hours	

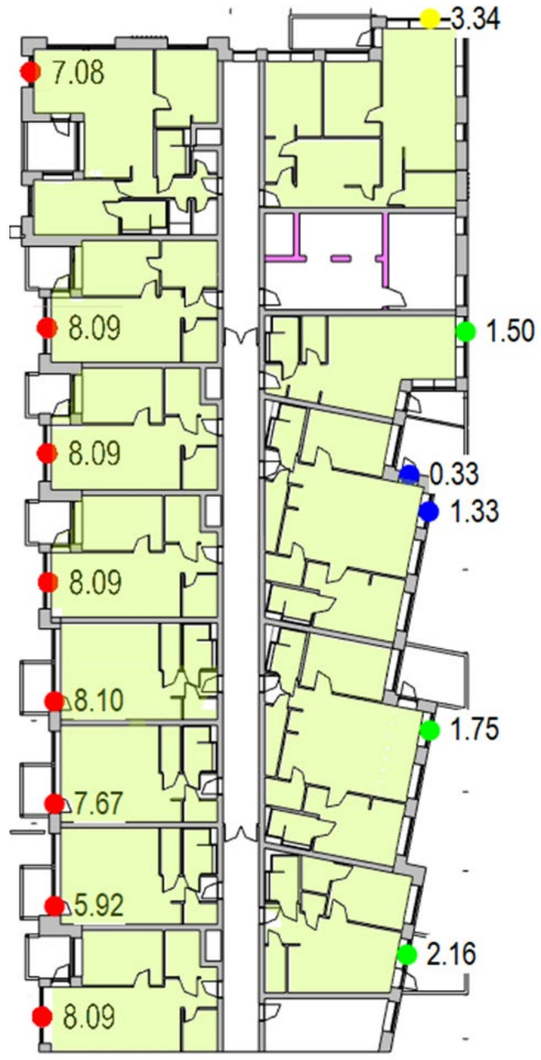


Block D - Second Floor

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

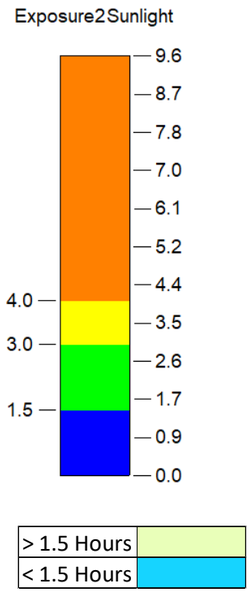


> 1.5 Hours	
< 1.5 Hours	

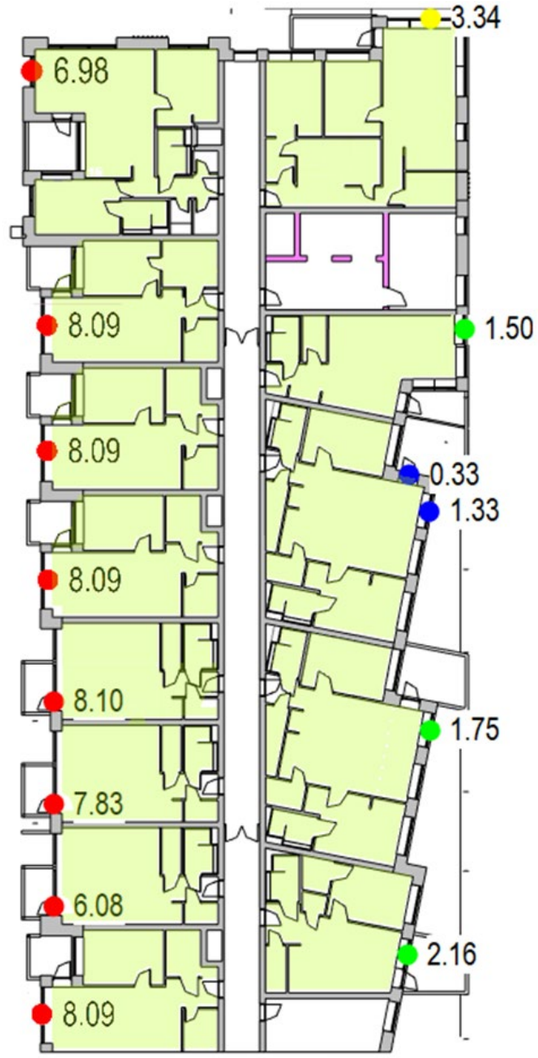


Block D - Third Floor

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

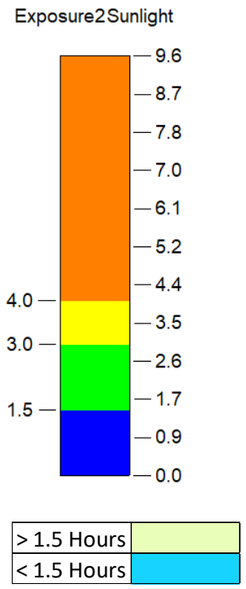


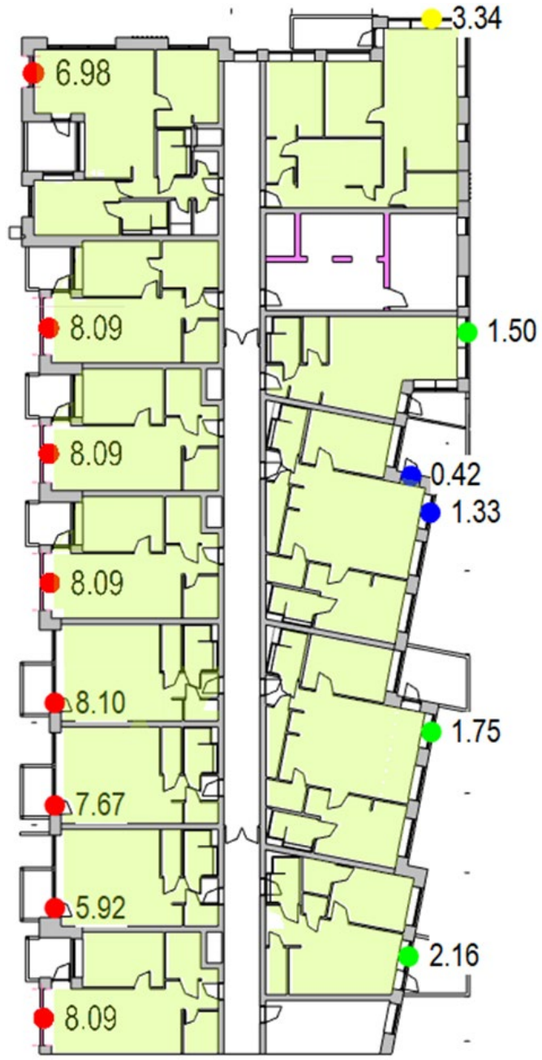
> 1.5 Hours	
< 1.5 Hours	



Block D - Fourth Floor

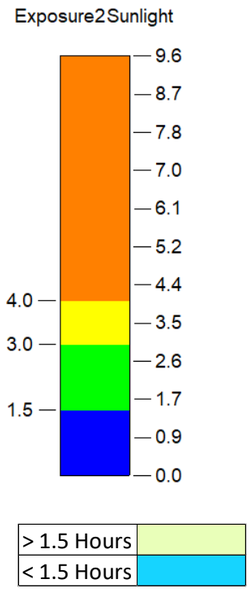
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



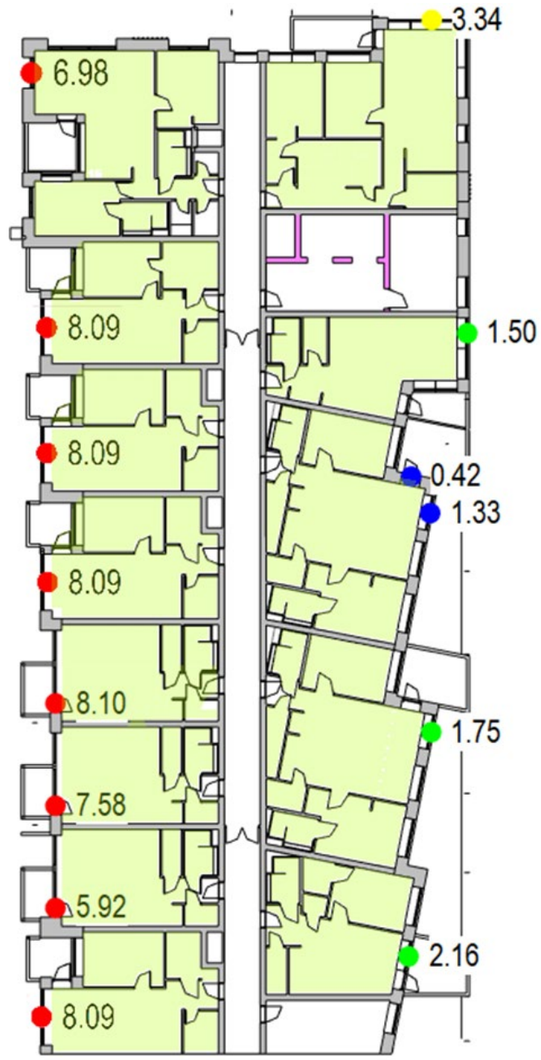


Block D - Fifth Floor

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

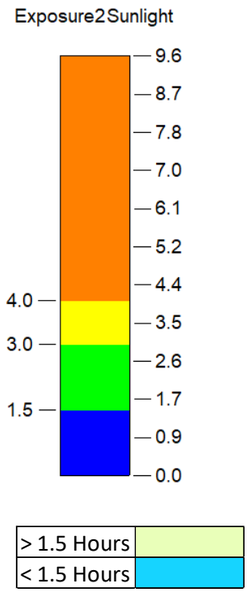


> 1.5 Hours	
< 1.5 Hours	

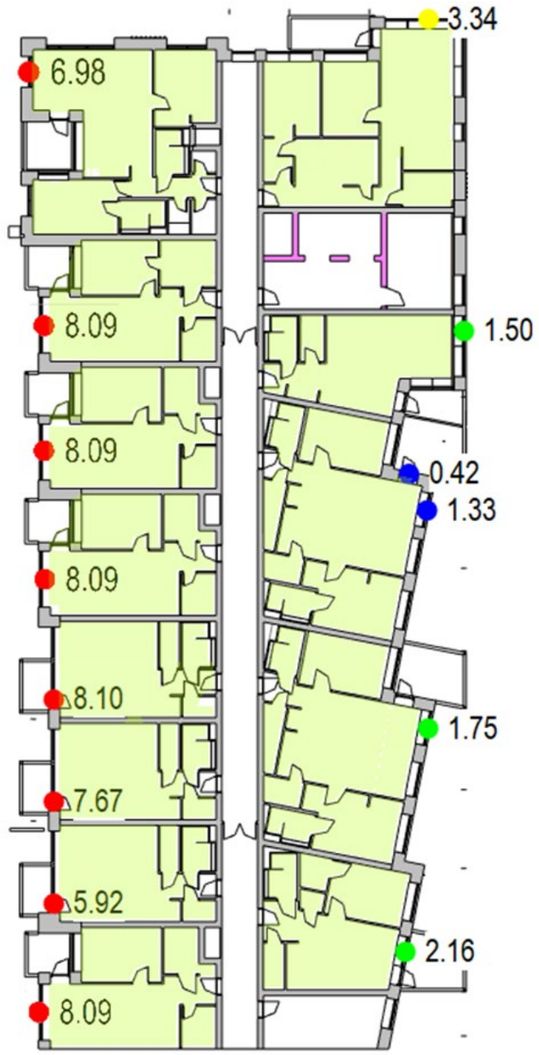


Block D - Sixth Floor

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

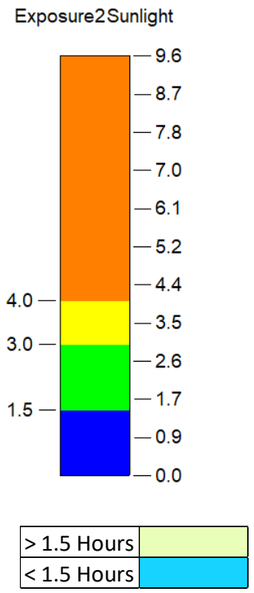


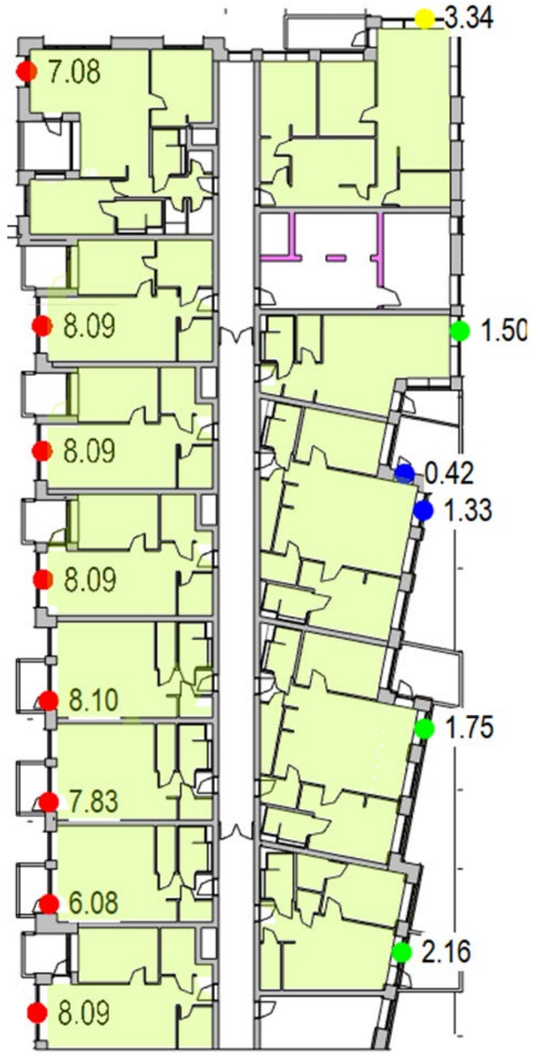
> 1.5 Hours	
< 1.5 Hours	



Block D - Seventh Floor

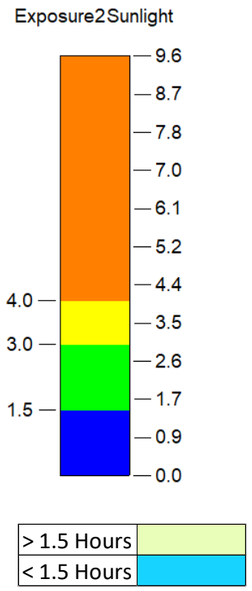
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



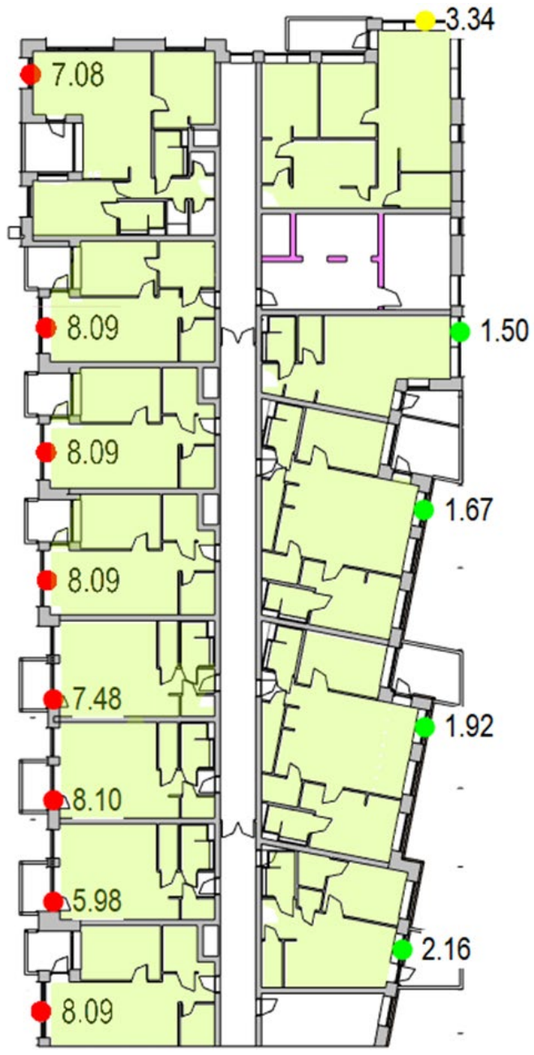


Block D - Eighth Floor

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

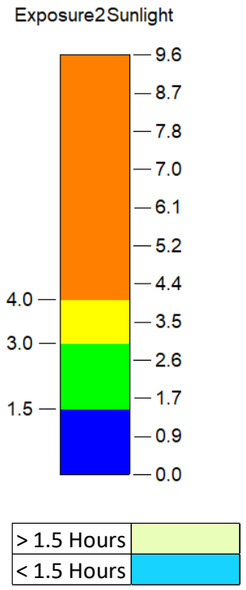


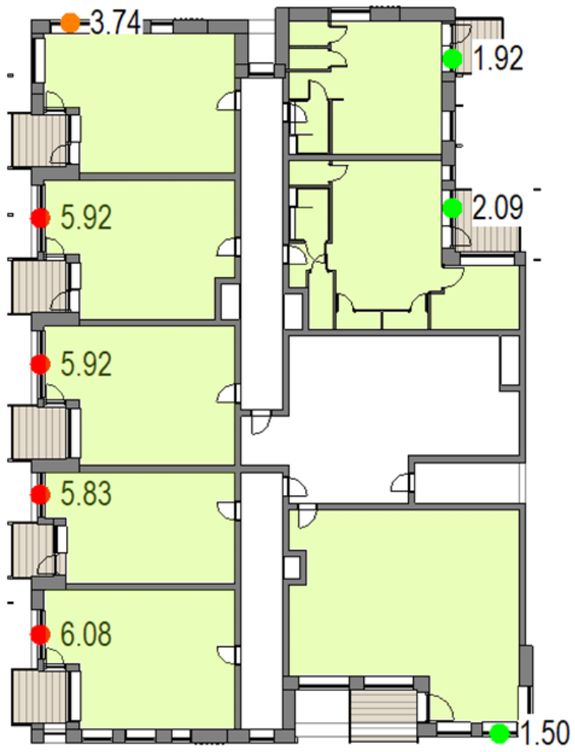
> 1.5 Hours	
< 1.5 Hours	



Block E – Ground Floor

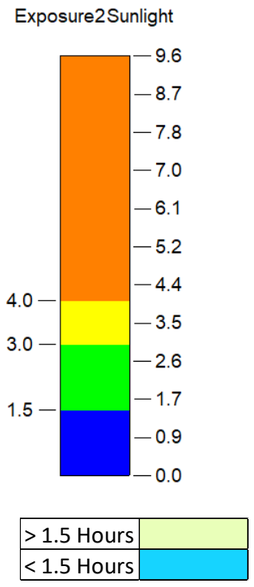
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



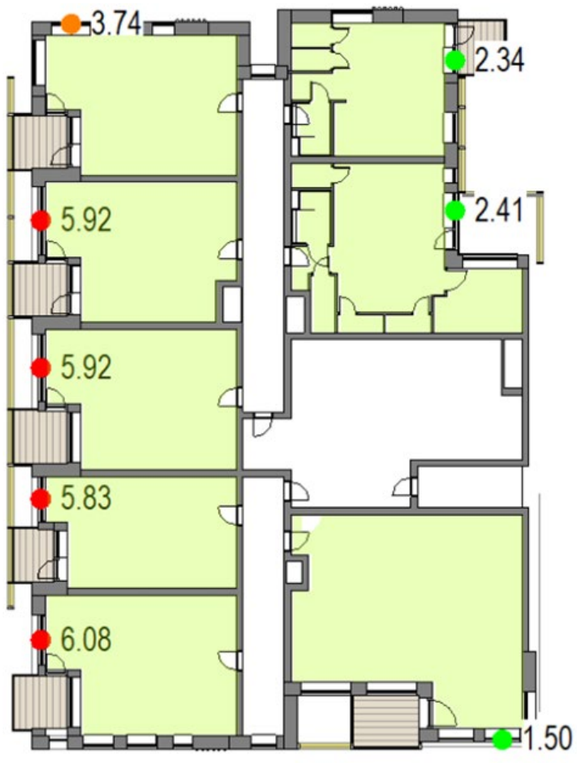


Block E - First Floor

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

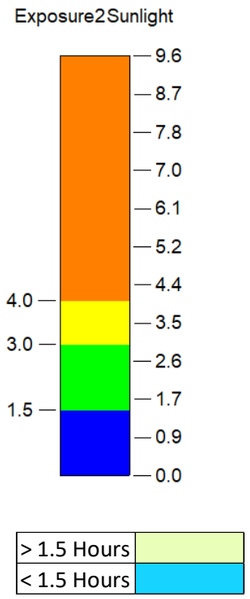


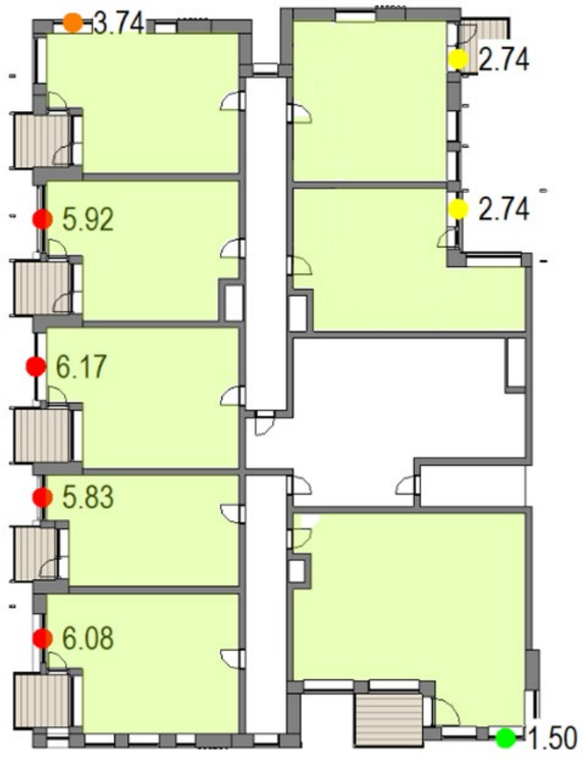
> 1.5 Hours	
< 1.5 Hours	



Block E - Second Floor

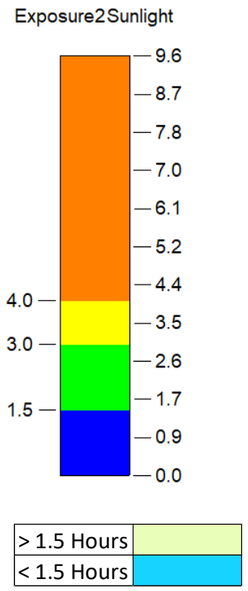
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

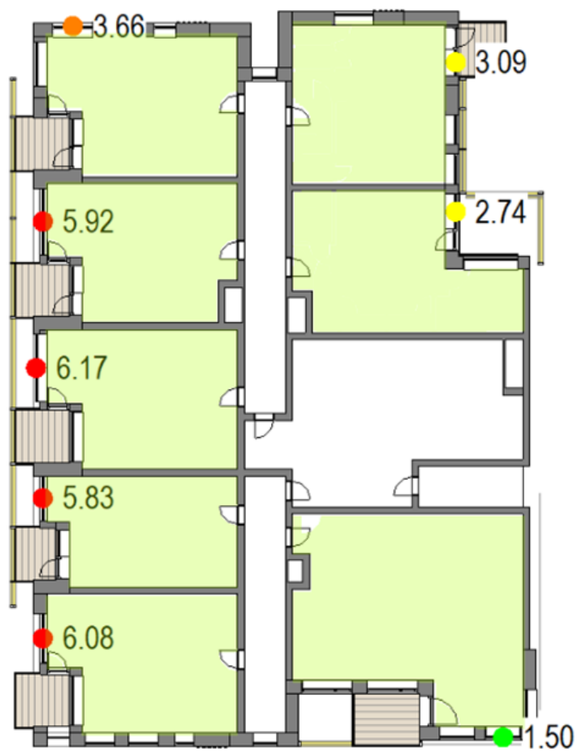




Block E – Third Floor

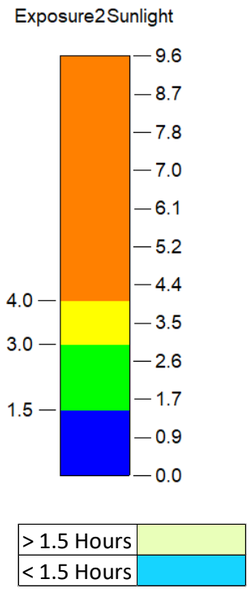
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

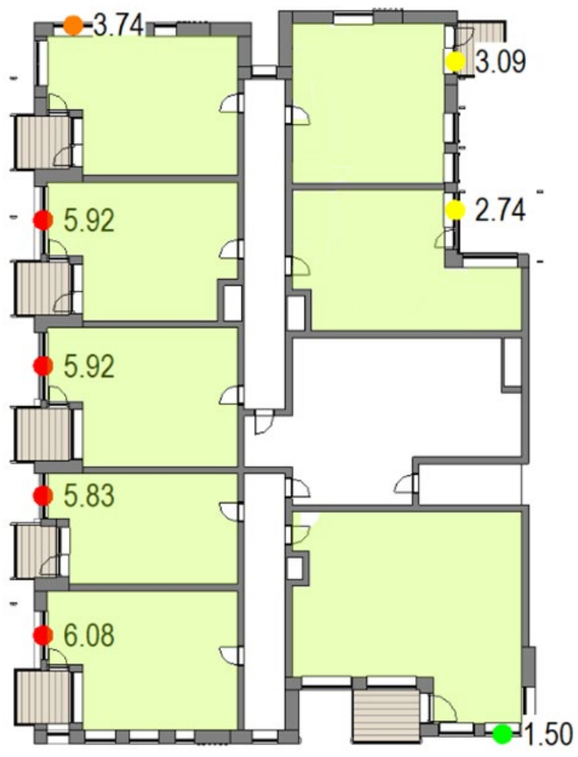




Block E – Fourth Floor

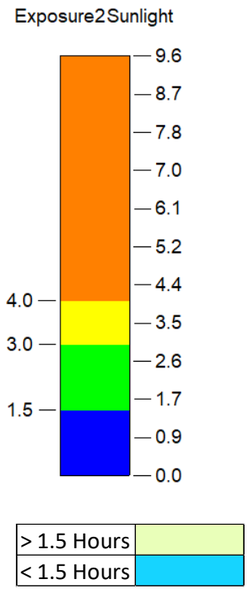
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

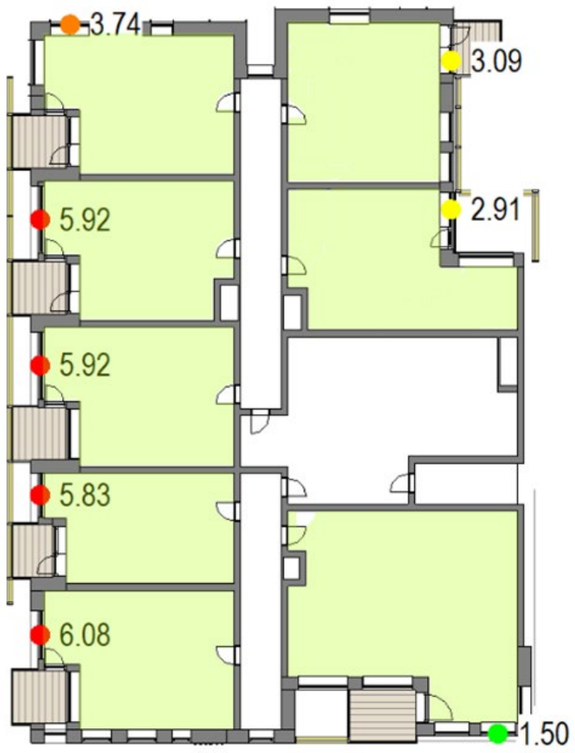




Block E – Fifth Floor

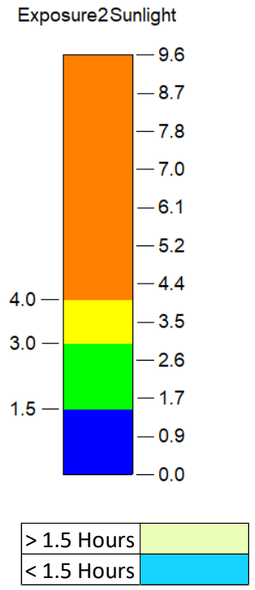
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

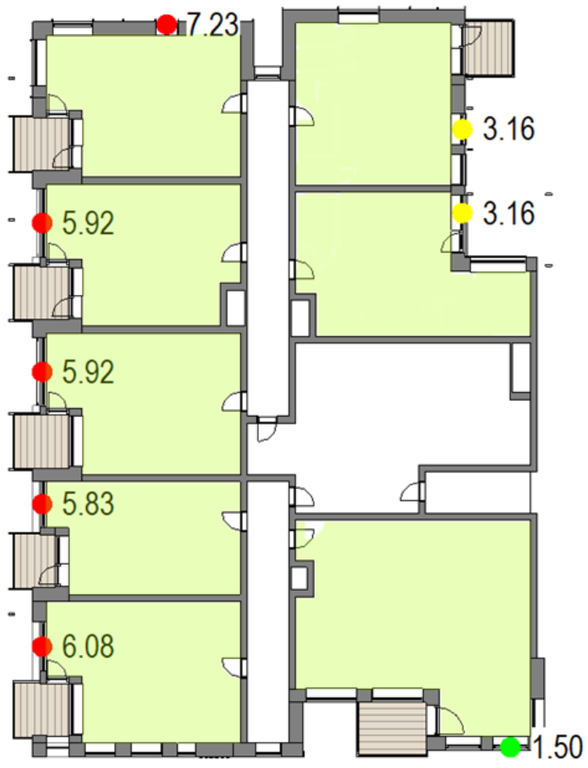




Block E – Sixth Floor

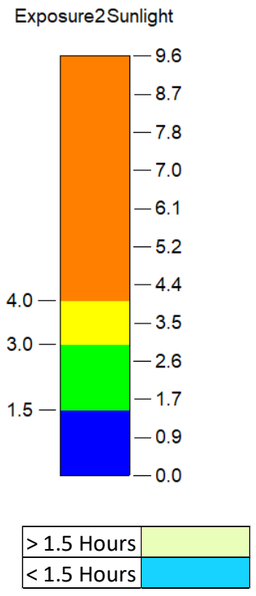
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

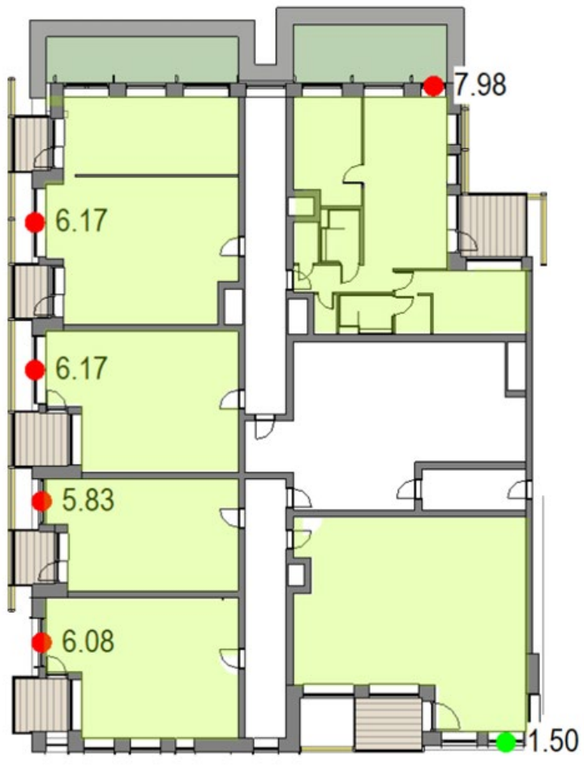




Block E – Seventh Floor

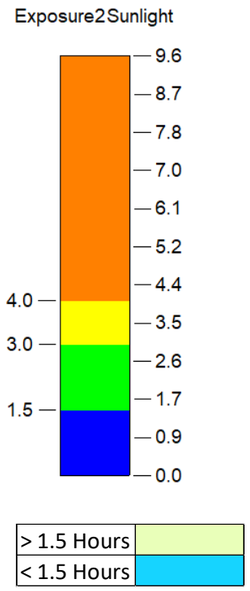
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

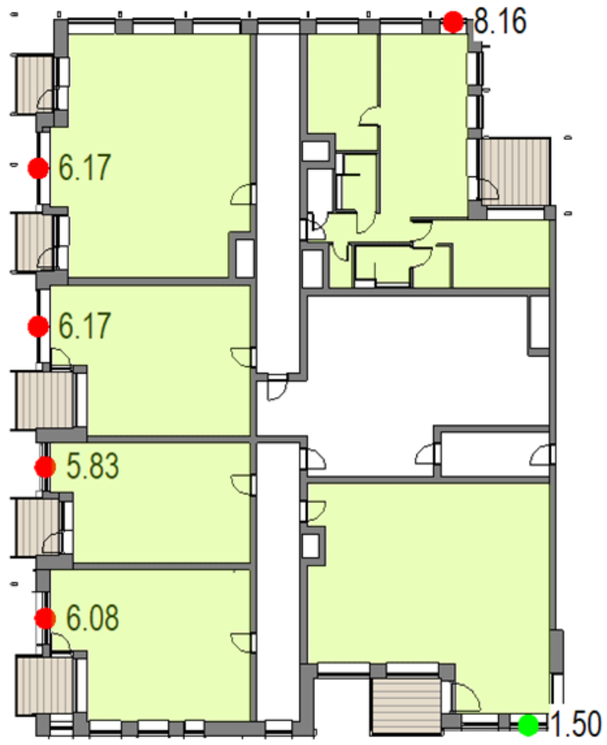




Block E – Eighth Floor

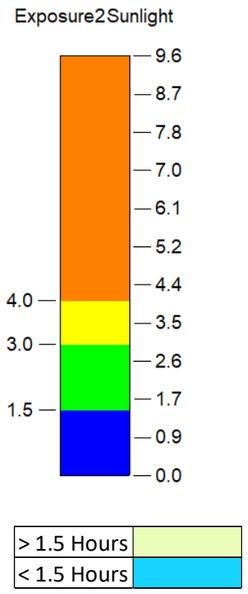
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

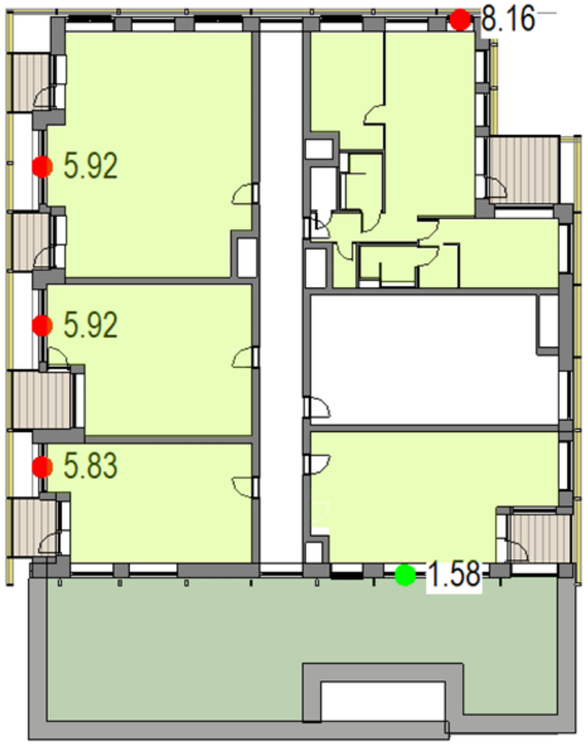




Block E – Ninth Floor

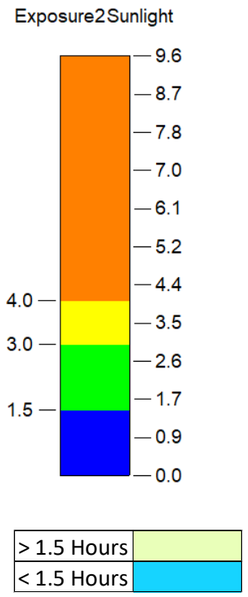
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.





Block E – Tenth Floor

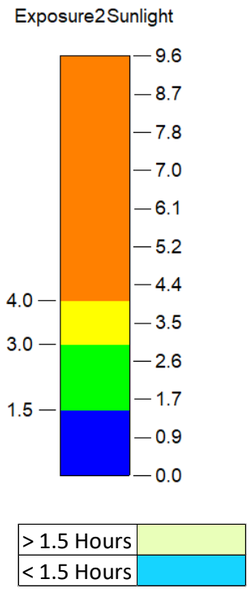
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

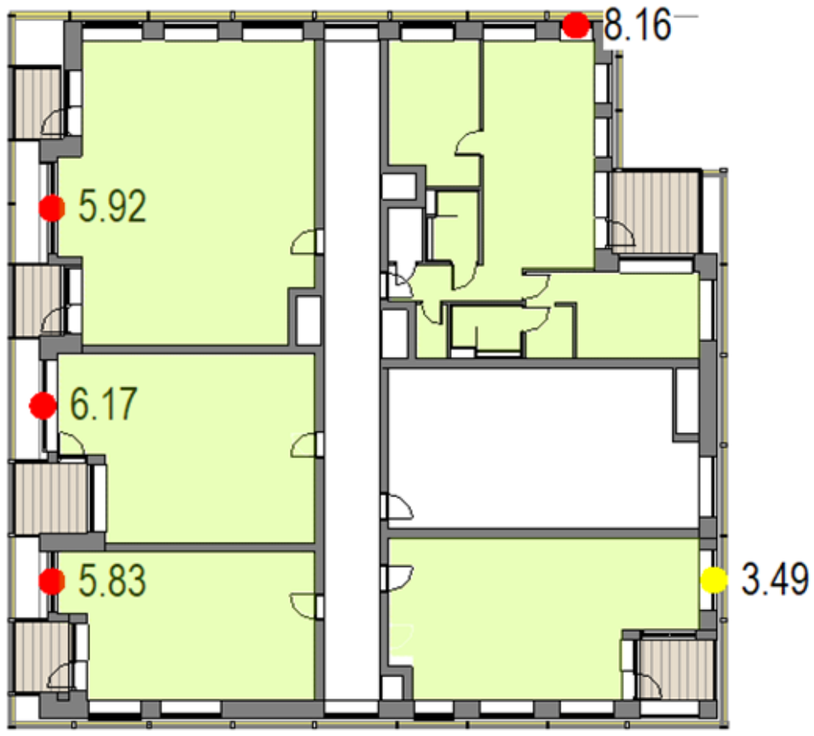


> 1.5 Hours	
< 1.5 Hours	

Block E – Eleventh Floor

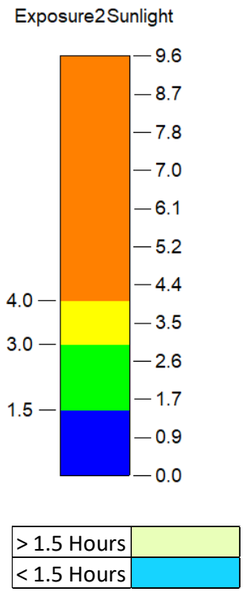
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.





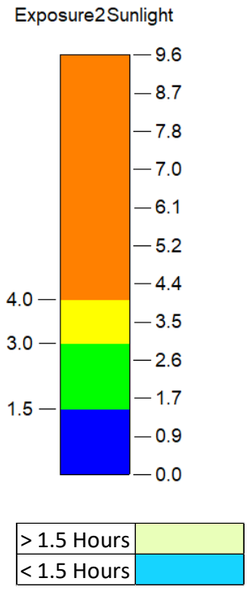
Block E – Twelfth Floor

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



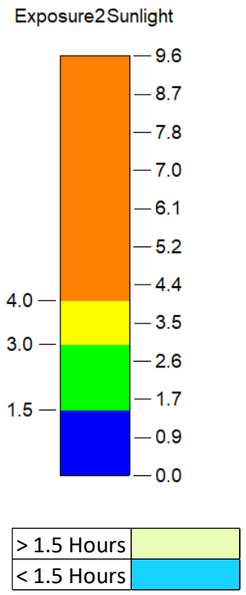
Block E – Thirteenth Floor

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



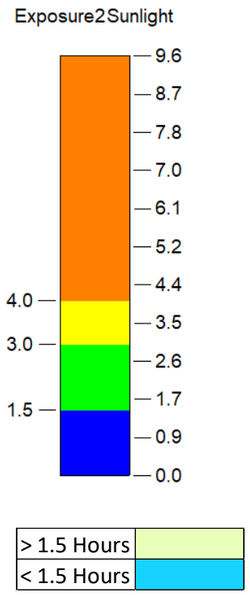
Block E – Fourteenth Floor

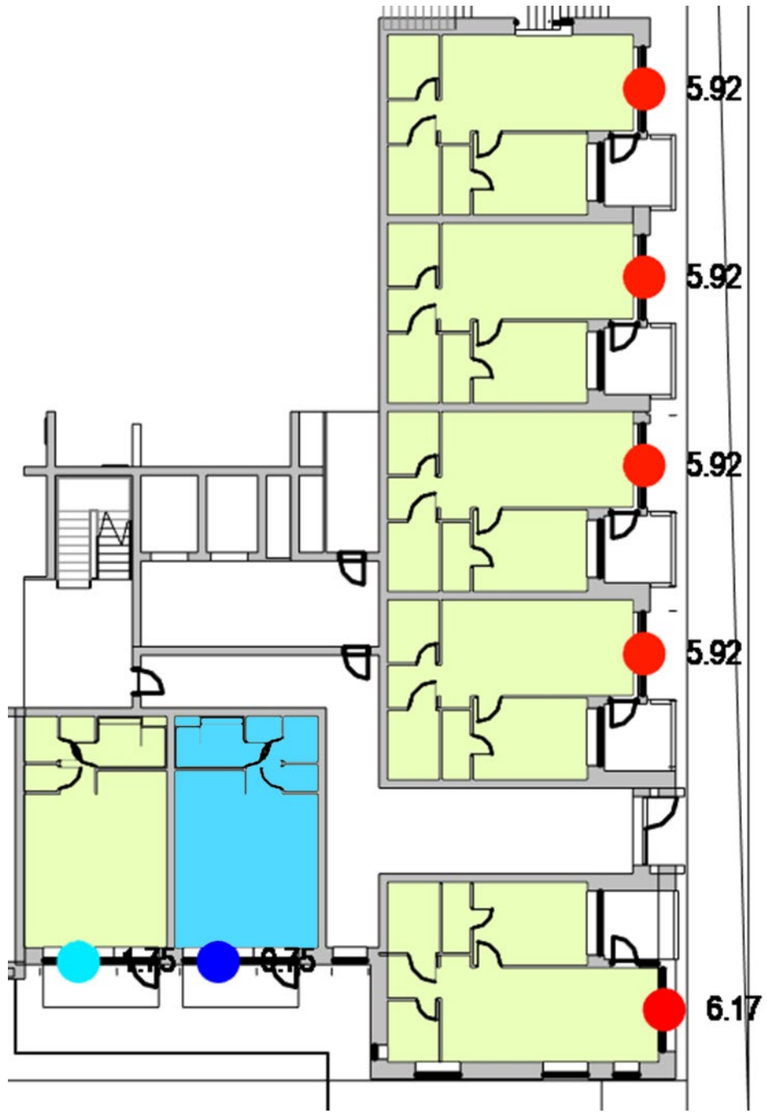
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



Block F – Lower Ground Floor

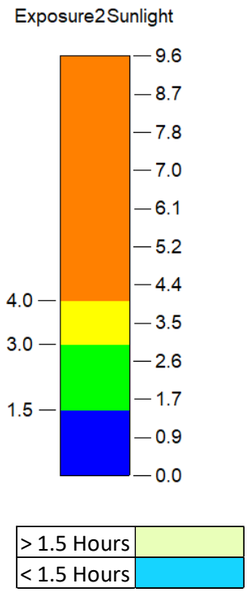
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

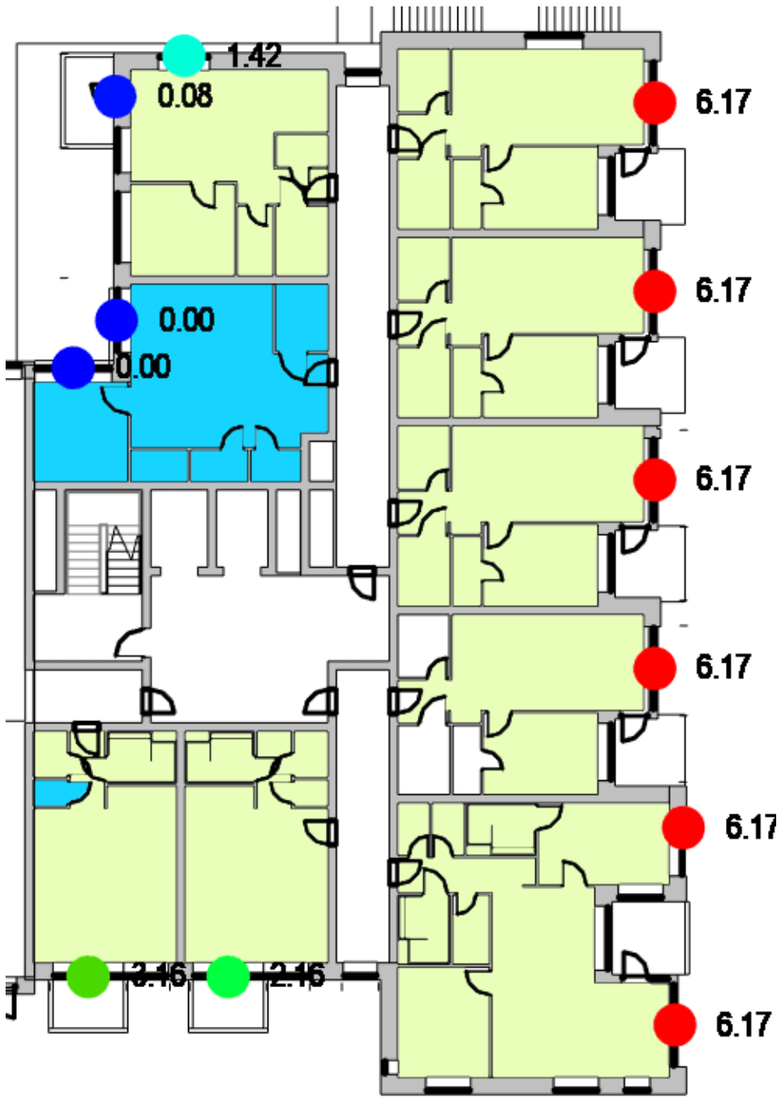




Block F – Ground Floor

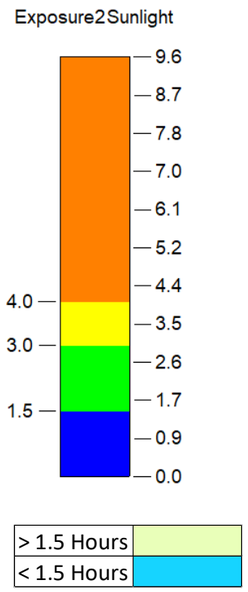
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

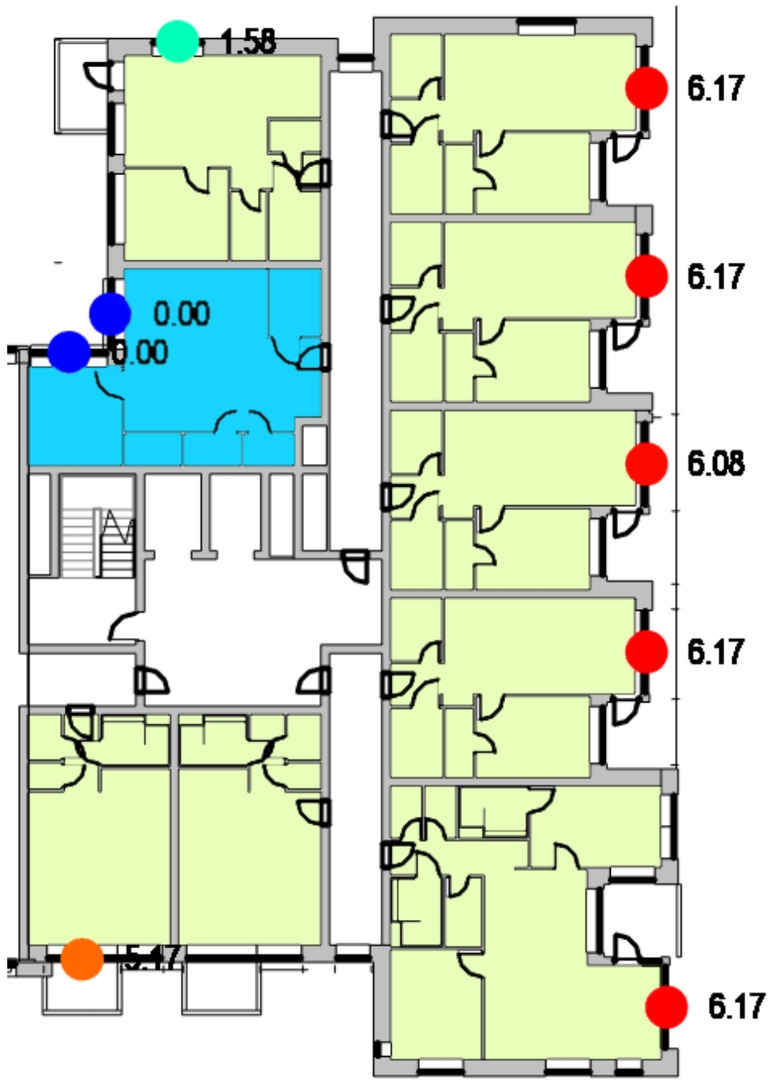




Block F – First Floor

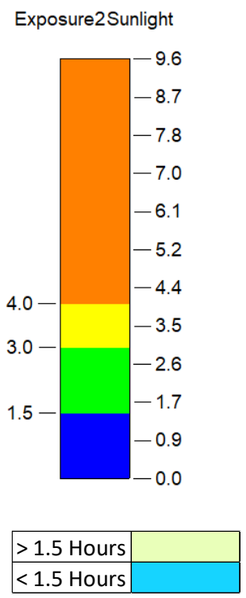
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.



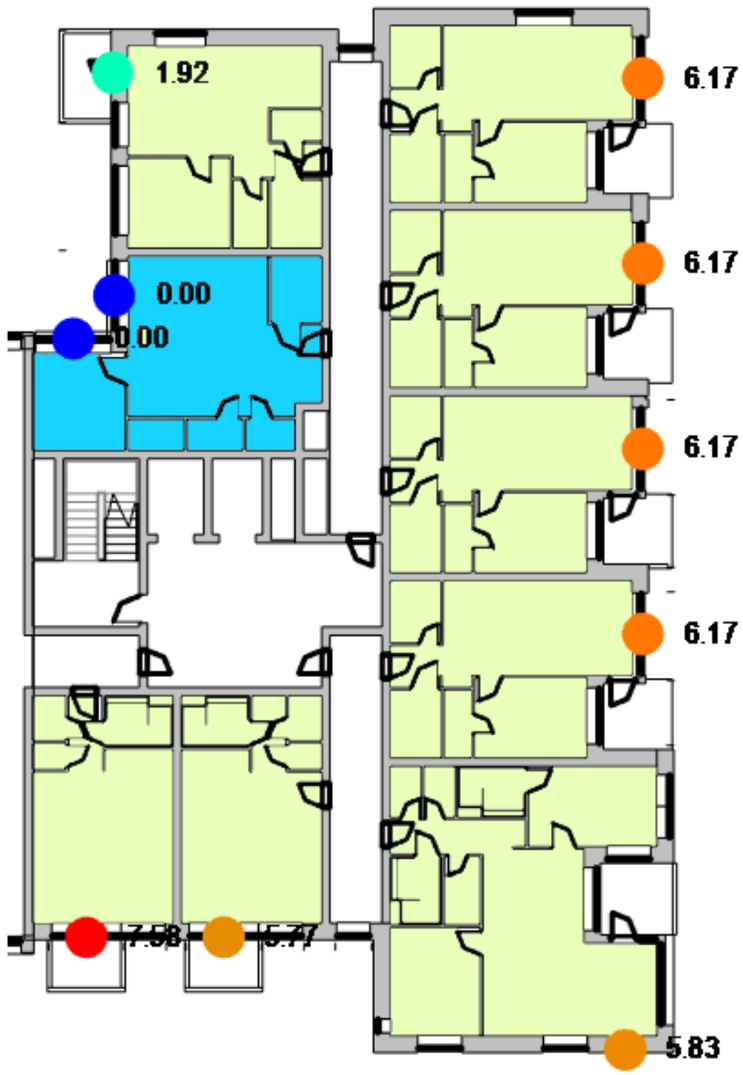


Block F – Second Floor

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

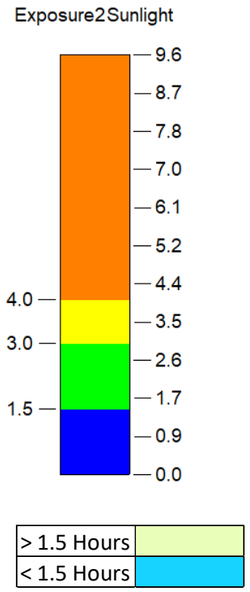


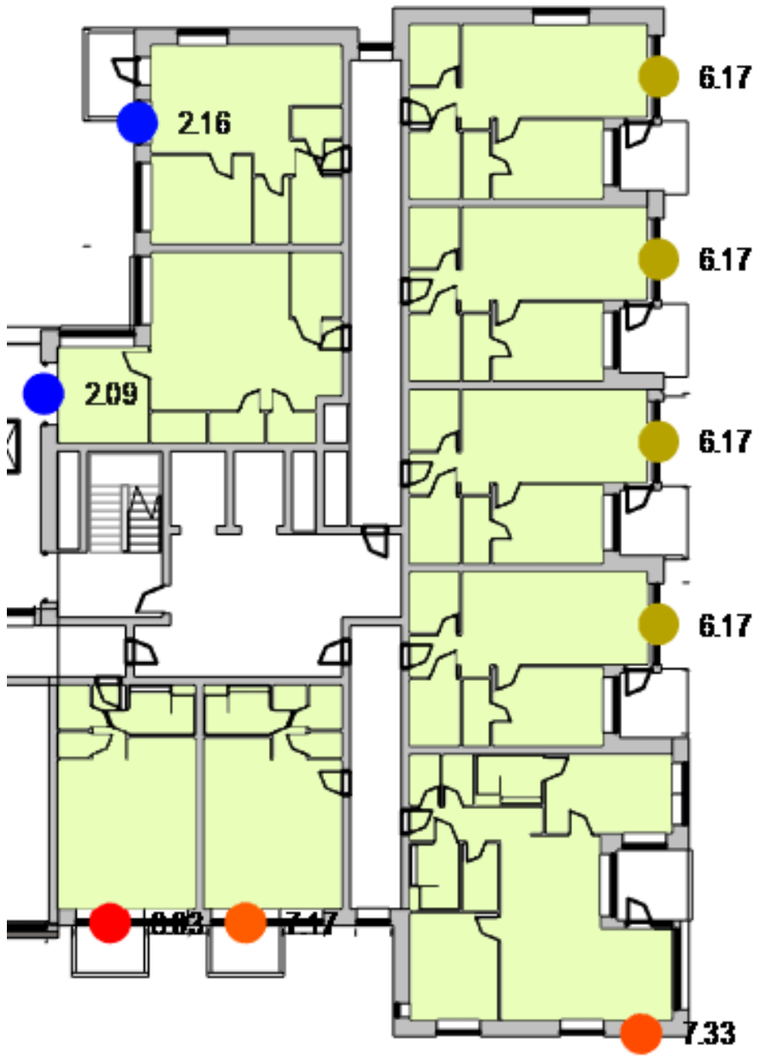
> 1.5 Hours	
< 1.5 Hours	



Block F –Third Floor

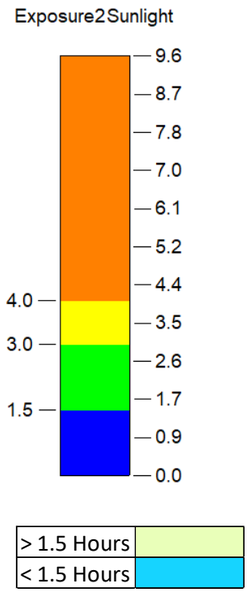
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

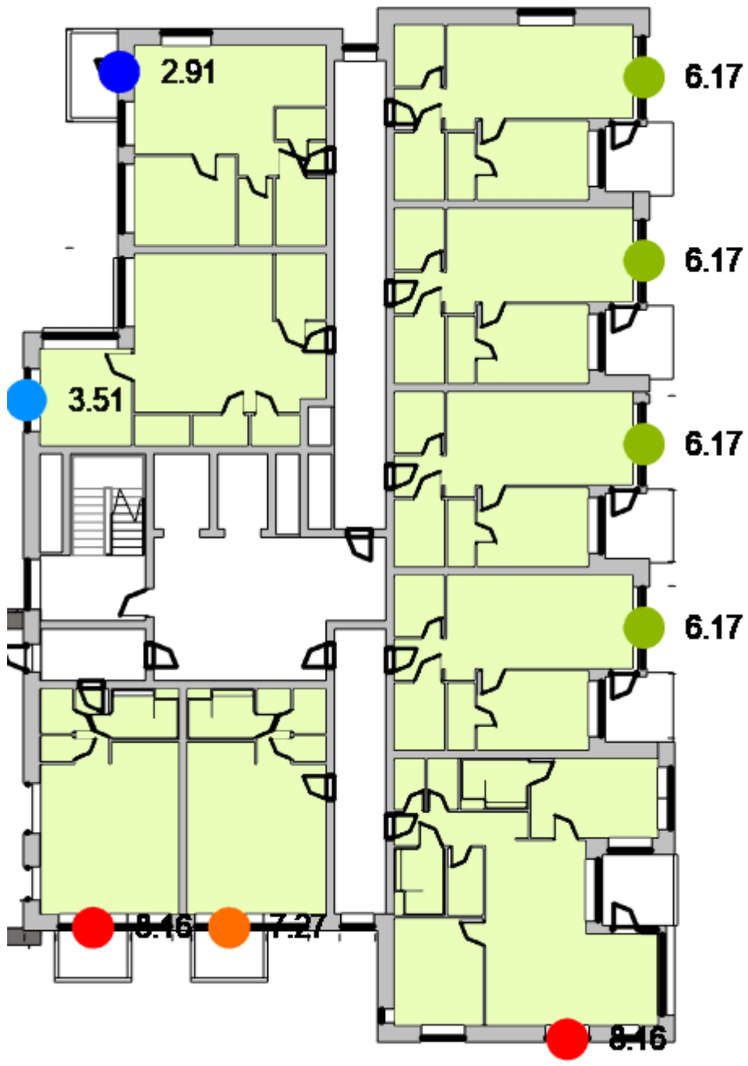




Block F – Fourth Floor

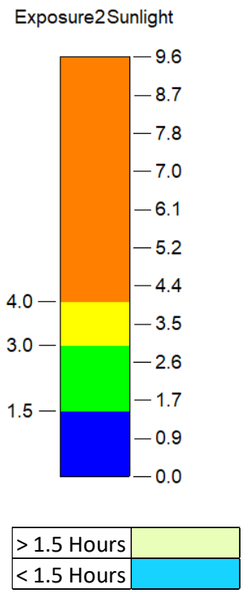
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

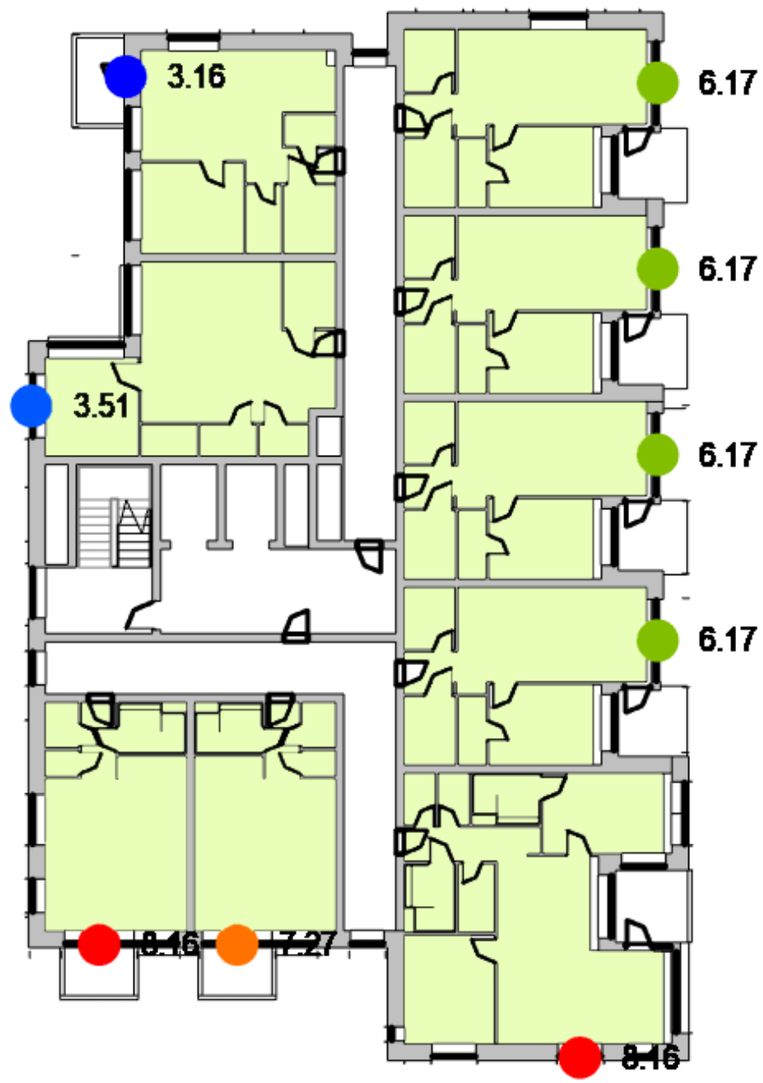




Block F – Fifth Floor

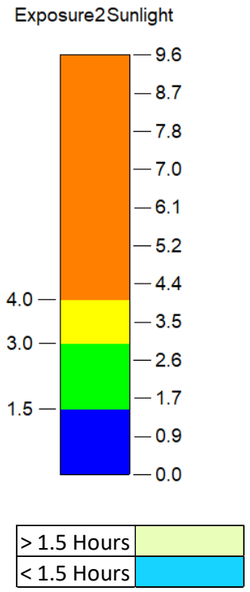
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

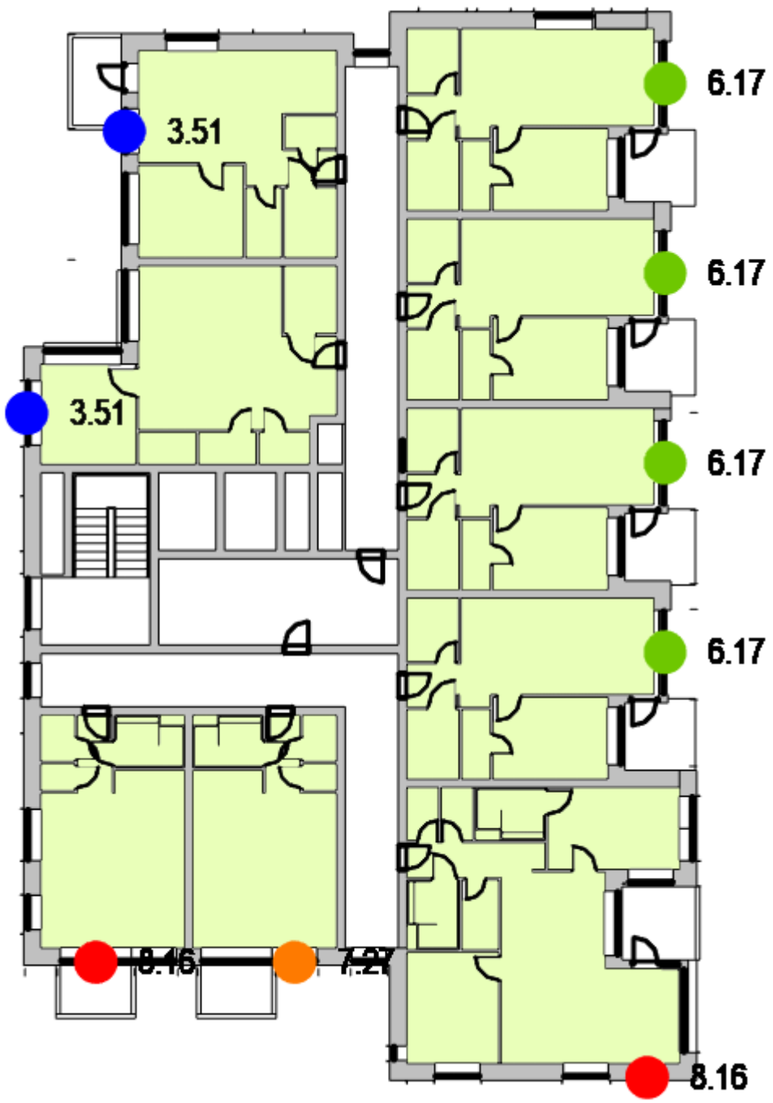




Block F – Sixth Floor

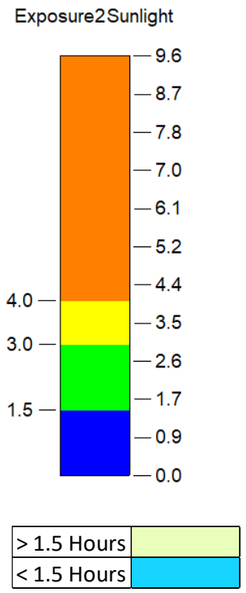
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

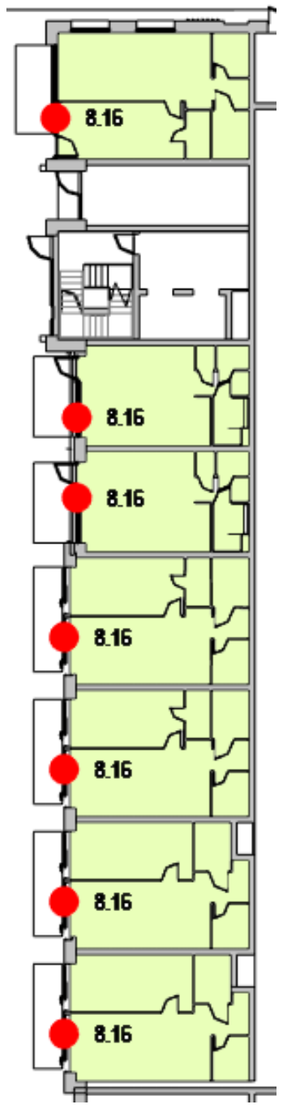




Block G – Lower Ground Floor

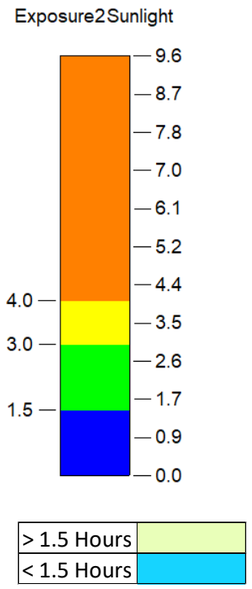
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

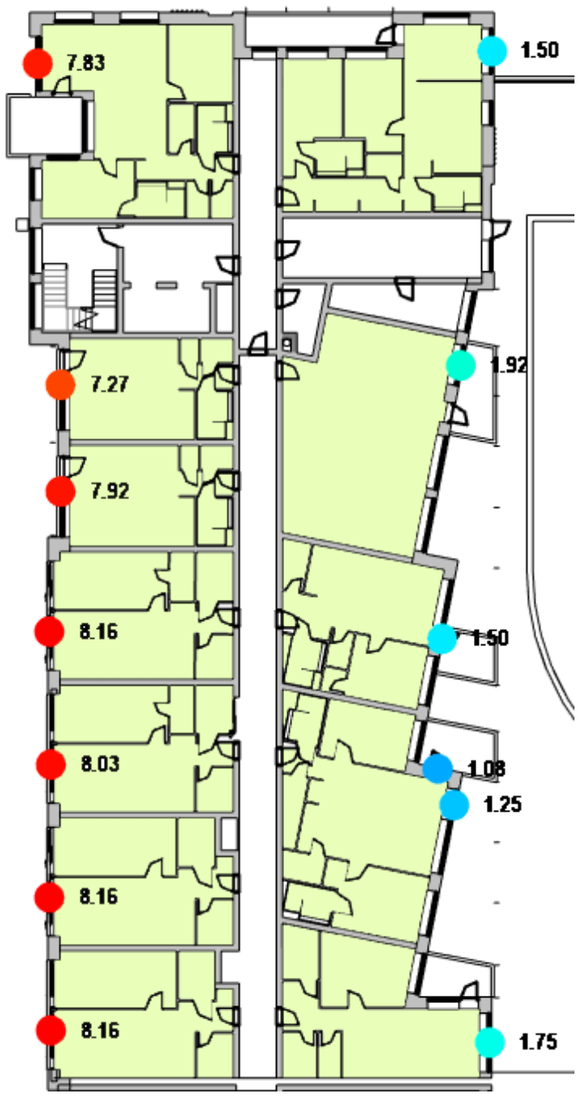




Block G – Ground Floor

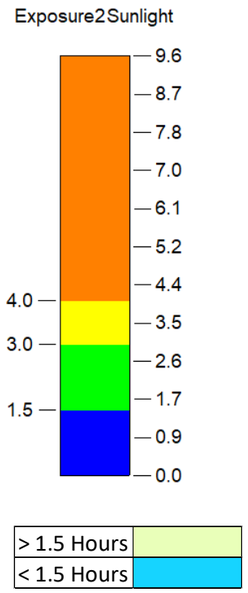
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.

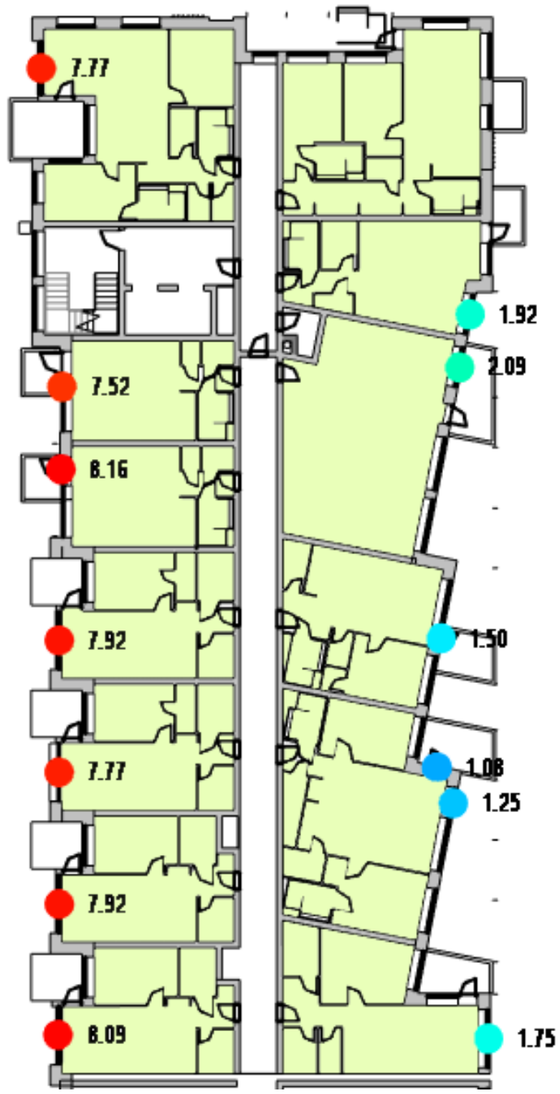




Block G – First Floor

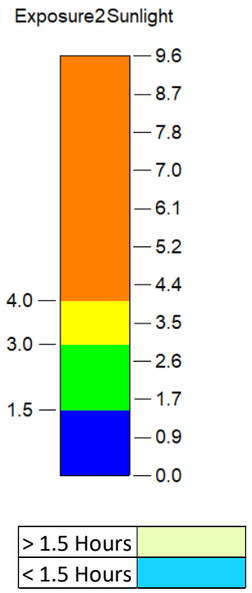
Sunlight Analysis as illustrated below, determined all units on this floor achieve the minimum recommendations.





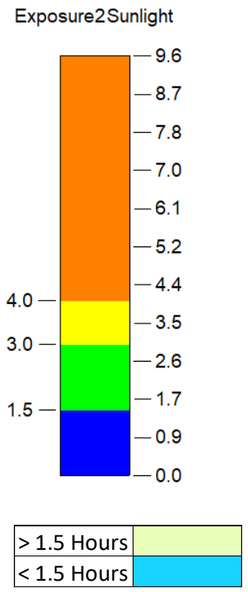
Block G – Second Floor

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



Block G – Third Floor

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



APPENDIX A – Site Shading Diagrams

Equinox March 21st

The shadow diagram shows no undue impact on neighbouring buildings and amenities. Refer to section 5.0 for quantitative assessments.

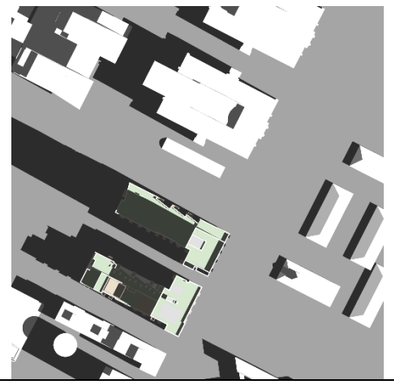
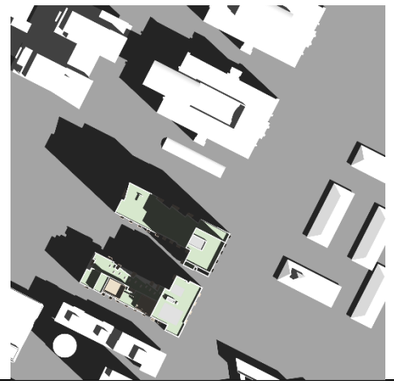
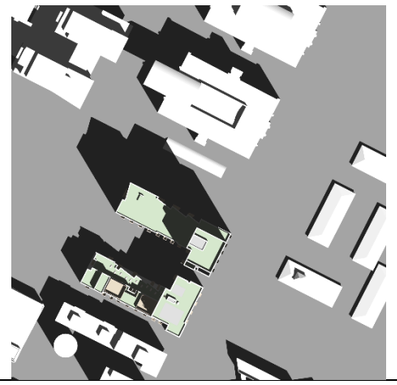
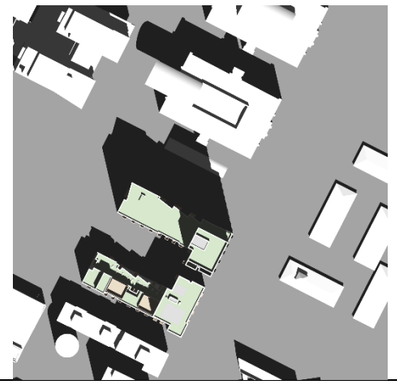
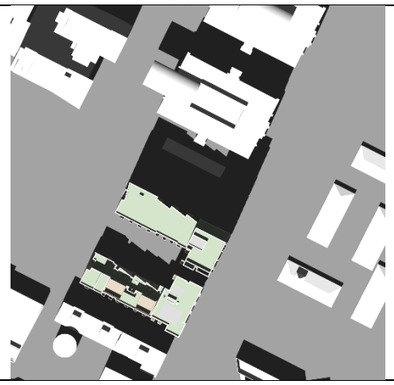
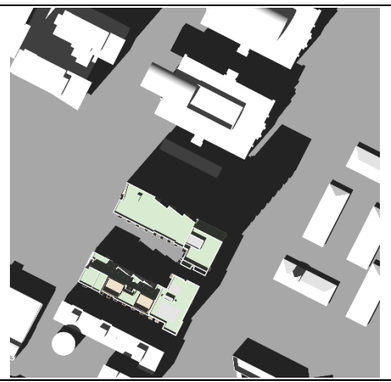
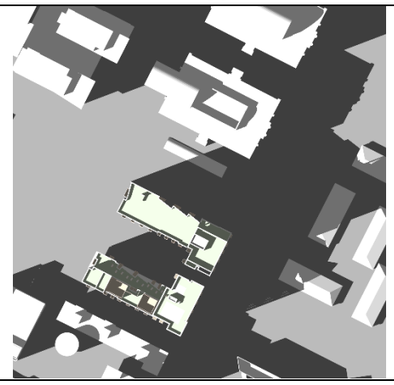
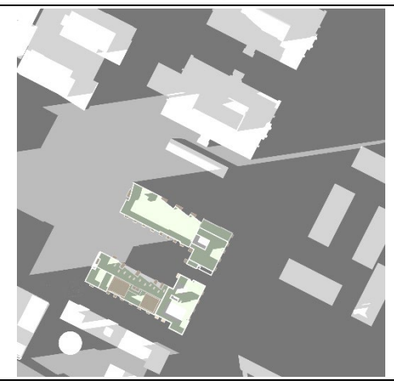
				
08:00	**09:00**	**10:00**	**11:00**	**12:00**
				
13:00	**14:00**	**15:00**	**16:00**	**17:00**

Fig A.1: Sunlight and Site Shading Diagrams - Equinox (March 21st): 08:00-17:00 hrs

Summer Solstice June 21st

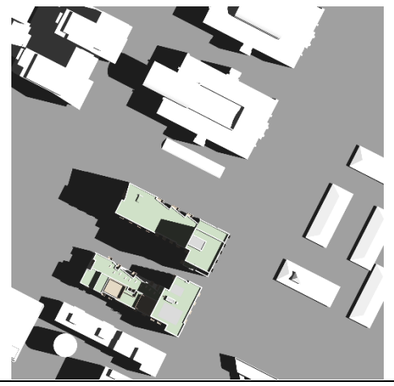
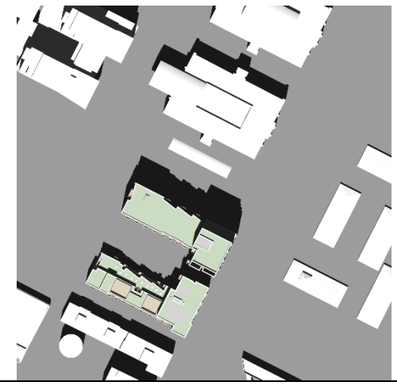
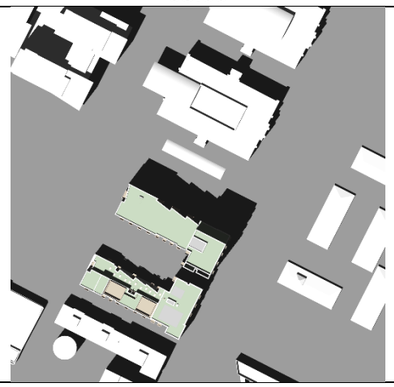
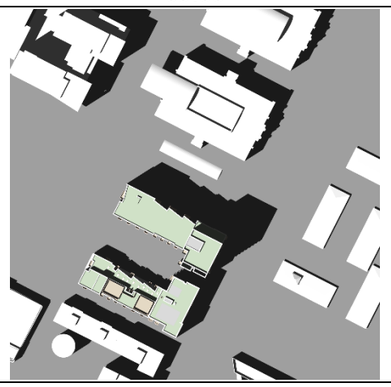
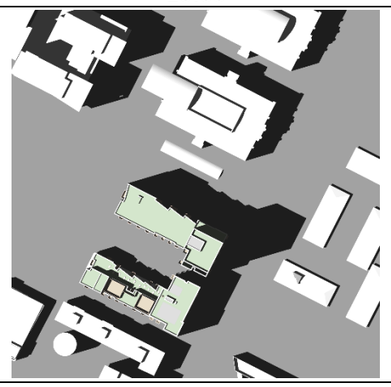
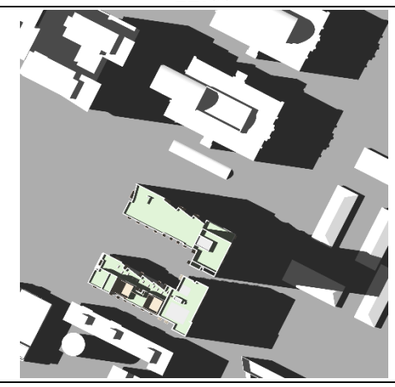
				
08:00	**09:00**	**10:00**	**11:00**	**12:00**
				
13:00	**14:00**	**15:00**	**16:00**	**17:00**

Fig A.2: Sunlight and Site Shading Diagrams - Summer Solstice (June 21st): 08:00-17:00hrs

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

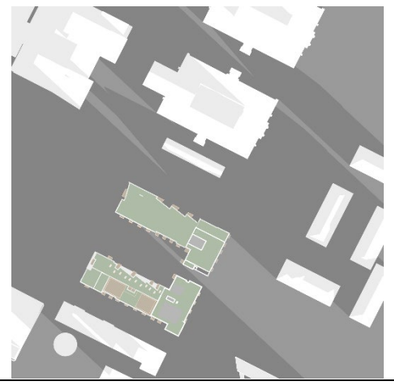
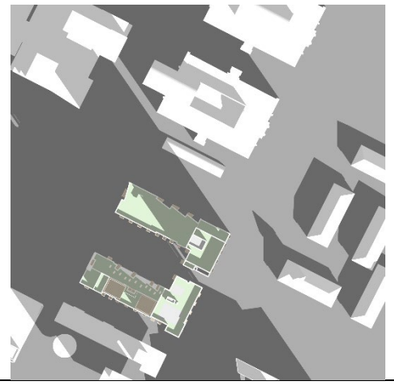
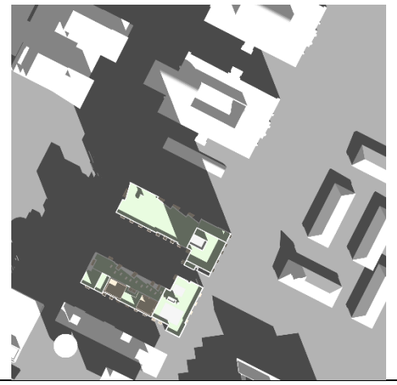
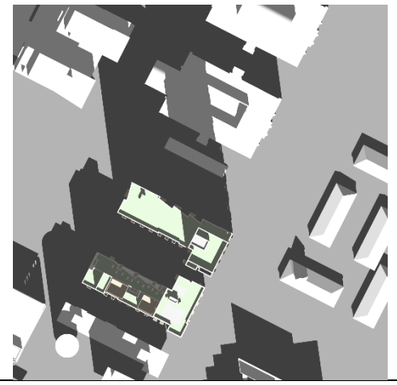
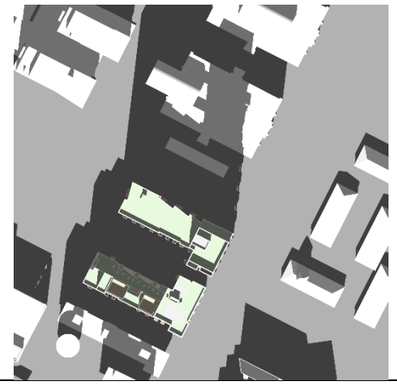
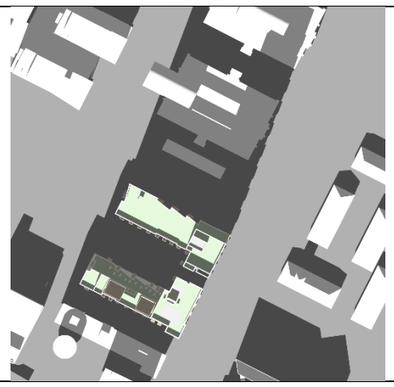
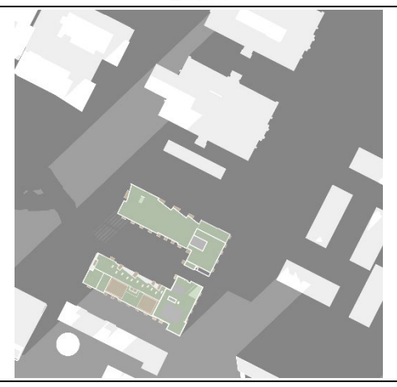
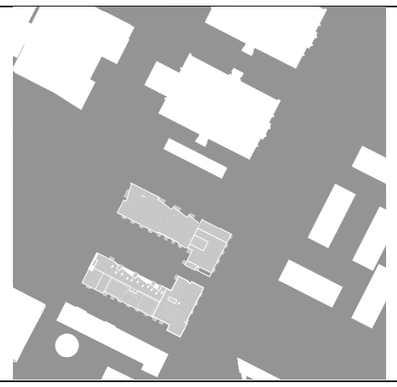
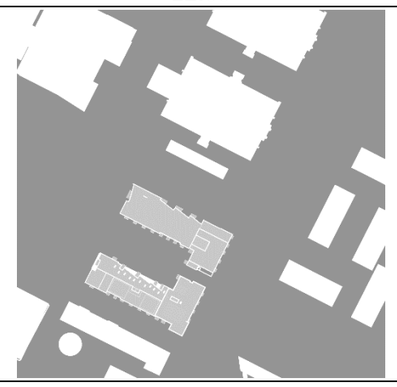
				
08:00	**09:00**	**10:00**	**11:00**	**12:00**
				
13:00	**14:00**	**15:00**	**16:00**	**17:00**

Fig A.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