



## HSQ SHD Residential Development



HPREF HSQ Investments Ltd

Daylight & Sunlight Report

IN2 Project No. D2026

24/09/2021

REV04

## Revision History

| Date       | Revision | Description          |
|------------|----------|----------------------|
| 26/07/2021 | 01       | Issued for review    |
| 17/09/2021 | 02       | Updated for comments |
| 23/09/2021 | 03       | Updated for comments |
| 24/09/2021 | 04       | Formal Issue         |

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Registered Office: Unit E, Mount Pleasant Business Park, Upper Mount Pleasant Avenue, Dublin 6

Company Registration No.: 466565

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## 1.0 Development Overview

The proposed development will consist of a residential development of 399 no. 'Build To Rent' residential units and all ancillary and associated uses, development and works, and a retail unit of 120 sq m, on a site of 1.08 ha. The proposed development consists of:

- Site clearance and localised demolitions to remove part of the podium and Basement Level -1 reinforced concrete slabs at the interface of the proposed Blocks A and B, together with the incorporation of part of the existing double basement level structure extending to approximately 7,613 sq.m over two levels (excluding an area of 3,318 sq.m that will be backfilled at Basement Level -1) within the proposed development.
- The construction of 5 no. buildings (Blocks A to E) ranging in height between 3- to 18-storeys over double basement level / podium level to provide a residential / mixed use development to provide 399 Specific BTR (Build to Rent) units with a total gross floor area of 29,391 sq.m, comprising 46 no. studios, 250 no. one bedroom units, 90 no. 2 bedroom / 4 person units and 13 no. 2 bedroom / 3 person units; internal communal ancillary residential services / amenities to include a shared co-working area / lounge (178 sq.m) and gym (102 sq.m) at lower ground floor level, and lounges on either side of a residential foyer at ground floor / podium level within Block A (196 sq.m), and a TV Room / lounge (57 sq.m) at ground floor / podium level within Block C.
- An independent retail unit (120 sq.m) is proposed at ground floor / podium level within Block B.
- A double basement is provided that will be integrated within the existing basement levels serving the wider HSQ development and will be accessed from the existing vehicular ramped accesses/egresses onto/off St. John's Road West and Military Road to the north and east, respectively. Basement level -1 provides: a refuse store; 80 no. car parking spaces (including 4 no. disabled spaces and 8 car club spaces); 4 no. motorcycle parking spaces; and, secure bicycle parking / storage in the form of 251 no. double stacked cycle parking spaces providing capacity for 502 no. secure bicycle storage spaces for residents. An additional 49 no. Sheffield type bicycle stands are provided at basement level -1 to provide 98 no. visitor cycle spaces (inclusive of 8 no. designated cargo bike spaces, that will also be available for the shared use with residents of the scheme) and a further 55 no. Sheffield type bicycle stands are provided at podium level to provide 110 no. cycle parking spaces (108 no. visitor cycle parking spaces (inclusive of 6 no. designated cargo bike spaces) and 2 no. cycle parking spaces in connection with the retail unit). All bicycle parking at basement level is accessed via a dedicated cycle lift from podium to basement level -1 that is situated to the south of Block B.
- Works proposed along the St John's Road West frontage include the omission of the existing left-turn filter lane to the vehicular ramped access to the HSQ development and re-configuration of the pedestrian crossings at the existing junction together with the re-configuration of the existing pedestrian crossing over the westbound lanes of St. John's Road West leading to an existing pedestrian refuge island. Re-alignment of the existing footpath along the site frontage onto St John's Road West to tie into the reconfigured junction arrangement and provision of a link to a new lift to provide wheelchair access from St John's Road West to the HSQ podium.
- Communal Outdoor Amenity space is provided for residents in the form of rooftop terraces (totalling 1,179sqm), and lower-level communal courtyards between blocks (totalling 960sqm).
- Hard and soft landscaping works are proposed at podium level which includes the extension and completion of the public plaza to the east of Block A; the provision of footpaths; a MUGA (Multi Use Games Area) and informal play areas for children (totalling 1,670sqm).
- A double ESB substation/switch room at ground / podium level within Block A, and a single substation/switch room at ground / podium level within Block B together with associated site development works, which includes the realignment / reprofiling of an existing vehicular access ramp at the southern end of the site between basement levels -1 and -2 and the closure / removal of a second vehicular access ramp between the subject site at basement level -1 and the raised basement level -1 under the Telford building.

## 2.0 Executive Summary

This report compiles the daylight and sunlight analysis as undertaken by IN2 Engineering Design Partnership for the Proposed development at HSQ SHD. 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 3.0 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.

| <b>Analysis Type</b> | <b>Relevance</b>                               | <b>Assessment Methodology</b>            | <b>Compliance Guidelines Targets</b> | <b>Reference section of this report</b>                           |
|----------------------|--|--|--------------------------------------|---|
| Daylight             | Proposed Development                           | Average Daylight Factors                 | BRE 209                              | Section 7.0 – Internal Daylight Analysis                          |
| Daylight             | Existing Neighbouring Buildings                | Vertical Sky Component                   | BRE 209                              | Section 6.0 – Impact on Neighbouring Buildings                    |
| Sunlight             | Proposed Development                           | Compliance with dual aspect requirements | 2020 Apartment Guidelines            | Not covered in this report. Refer to Architectural documentation. |
| Sunlight             | Existing Neighbouring Buildings                | Annual Probable Sunlight Hours           | BRE 209                              | Section 4.0 – Impact on Neighbouring Buildings                    |
| Sunlight             | Proposed Development Amenity Spaces            | Sunlight Hours                           | BRE 209                              | Section 5.0 – Site Sunlighting and Shading                        |
| Sunlight             | Existing Neighbouring Buildings Amenity Spaces | Sunlight Hours                           | BER 209                              | Section 5.0 – Site Sunlighting and Shading                        |

## Executive Summary (Cont'd)

Section 4.0 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 with 67% of the lower amenity and 97% of the upper spaces receiving more than two hours of daylight on March 21<sup>st</sup> significantly more than the BRE minimum of 50%. Whilst one lower amenity space was identified as having less than 50% of the area receiving at least 2 hours of sunlight availability on the 21<sup>st</sup> of March it can be noted that the overall quantum of amenity space is over greater than required under the Sustainable Urban Housing: Design Standards for New Apartments (December, 2020) and therefore the provision has been adjusted to discount this area accordingly.

The existing plaza amenity area was determined to achieve 75% compliance with the criteria and therefore was determined not to be impacted by the proposed development based on the BRE guidance.

The impact of the proposed development on neighbouring buildings was assessed in Section 5.0. The neighbouring buildings were assessed for both VSC, a measure of potential daylight, and Annual Probable Daylight Hours, a measure of direct sunlight. The VSC assessment determined that there would only be minor impact as a result of the proposed development and the APSH assessment determined that there would be no negative impact as a result of the proposed development. The Annual Probable Sunlight hours assessment determines the annual sunlight impact on a window and the winter sunlight impact through a quantitative assessment. Appendix A includes site shading diagrams displayed on an hourly basis for the Equinox and Summer/ Winter Solstices. However, these are for illustrative purposes only as the images are subjective and only relate to 3 days of the year, whereas the Annual Probable Sunlight Hours calculations accounts for all available annual sunlight hours for Dublin.

The internal daylight analysis, as detailed in section 6.0, has been undertaken for all units across the development. The analysis determined that 80% of rooms were in excess of the prescribed BRE/BS guidelines as set out within this report, for average daylight factors (ADF). This extent of compliance was achieved through design development, with increased glazing/ reduced balcony depths / balcony locations etc. applied to ensure the residences can benefit from maximised daylight availability.

The 2020 apartment guidelines advise that *“Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment”*, therefore section 7.0 identifies these alternative, compensatory solutions including increased communal amenity provision.

Five appendices have been included in the report for clarity on guidelines and standards implications / comparisons.

Appendix A: Site Shading Diagrams, illustrative shading diagrams to be read in conjunction with quantitative assessment as contained within section 5.0.

Appendix B: EN Daylight Standards: a comparative assessment between BS.8206-2 and the incoming EN.17037 was undertaken based on a methodology adopted from that included in the UK National Annex to the Standard and is included in Appendix B (see section 2.0 for relevance of standard). This analysis determined generally good correlation between the existing and new standards applied, with those rooms deemed compliant in the former methodology also achieving compliance under the latter.

Appendix C&D: Contain Existing vs Proposed results as applicable to section 5.0.

Appendix E: Alternative Daylight Calculations: a second daylight assessment was carried out to determine the average daylight factor (ADF) that would be achieved for the main living and dining areas of the units showing that 95% of rooms were in excess of good practice design for these delineated spaces.

In summary, this report confirms that best practice Sunlight and Daylight availability have been ensured for the proposed HSQ SHD development, with no undue impact on existing neighbouring environment.

### 3.0 Standards and Guidelines

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

- a) Sustainable Urban Housing: Design Standards for New Apartments (December 2020) (the “**2020 Apartment Guidelines**”). These are guidelines issued under section 28 of the 2000 Planning and Development Act.
- b) Dublin City Development Plan 2016-2022, (the “**Development Plan**”).
- c) The Building Research Establishment’s (BRE) Site Layout Planning for Daylight and Sunlight: A guide to good practice (BRE 209) (2nd edition) (the “**BRE Guide**”).
- d) British Standard BS 8206-2:2008 – “Lighting for Buildings – Part 2: Code of Practice for Daylighting” (the “**2008 British Standard**”).
- e) British Standard BS EN 17037:2018 – Daylight in Buildings (the “**2018 British EN Standard**”).
- f) Irish Standard IS EN 17037:2018 (the “**2018 Irish EN Standard**”).

It should be noted at the outset that the 2008 British Standard has been superseded by the 2018 British Standard. This is the UK implementation of EN 17037:2018, which was approved by the CEN on 29 July 2018. In Ireland, EN 17037:2018 has been implemented by the 2018 Irish Standard. 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. 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.”*

It can be noted from this section that the 2020 Apartment Guidelines continue to refer to the BRE Guide (published in 2011) and to the 2008 British Standard. They do not take into account the 2018 British Standard and/or the 2018 Irish Standard and as the BRE Guide is still current and applicable, the 2011 edition will therefore provide the basis for the assessments detailed within this report.

## **The Development Plan**

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

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

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

*“Development shall be guided by the principles of Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building Research Establishment Report, 2011).”*

Additionally, guidance is given to sunlight availability under the guidance of dual aspect.

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

## **The 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 in the [2008] British Standard... 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:

*“It (the guide) is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location. Appendix F explains how this can be done in a logical way, while retaining consistency with the British Standard recommendations on interior daylighting.”*

*“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.”*

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 measure will be proposed. In the context of this report, any deviations from the Guides recommendations have therefore been identified, with an approach throughout to ensure that good quality daylight/sunlight is 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) – *Based on a theoretical mathematical uniform sky (CIE overcast sky) which does not alter based on orientation.*
  - 1.1. New Development – Within this section the guide sets values for internal Average Daylight Factors (ADF) for various space types and relevant calculation methodologies.
  - 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 – This topic is addressed in the 2020 Apartment Guidelines under the issue of dual aspect units and is not covered within this report.
  - 2.2. Existing Buildings – As above, the guide has quantitative assessment for determining the impact of sunlight 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 2008 British Standard**

The BRE guide specifically refers to this standard and most of the quantitative criteria set out have already been mentioned in relation to the BRE Guide above. However the BRE guide provides more detail as to context and implementation. In relation to average daylight factor (ADF), the standard states the following:

*“The average daylight factor... is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%.”*

However, the standard then acknowledges that lower lighting levels may be applicable for dwellings, offering minimum ADFs for different room types within dwellings, i.e. 1% for bedrooms; 1.5% for living rooms; and 2% for kitchens (Table 2), and notes that:

*“Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%.”*

Whilst specifically applicable to houses, it should be noted that there is no specific reference within the British Standard to apartment internal galley type kitchens as recognised in the BRE Guide which states:

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

The standard’s guidance on loss of daylight and sunlight to existing buildings is similar to, but less extensive or detailed than, that contained in the BRE Guide, and in particular Appendix F of the BRE Guide.

### **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—approaches the assessment of daylight provision on a different basis from that utilised in the 2008 British Standard and the BRE Guide. Instead of **average** daylight factors the standard considers a new 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.”*

EN 17037:2018 also address other aspects in addition to daylight - including sunlight, glare and quality of view, which are not addressed in the context of this report.

### **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 Site Sunlighting and Shading

### 4.0 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.4.1), with compliance indicative of spaces that will receive adequate sunlight and appealing useful spaces, including that the following attributes will be achieved as identified in BRE.209:

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

Additionally, for existing garden or amenity areas, the guidance recommends:

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

An example analysis of Amenity Spaces is indicated in Figure 3.1. 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).

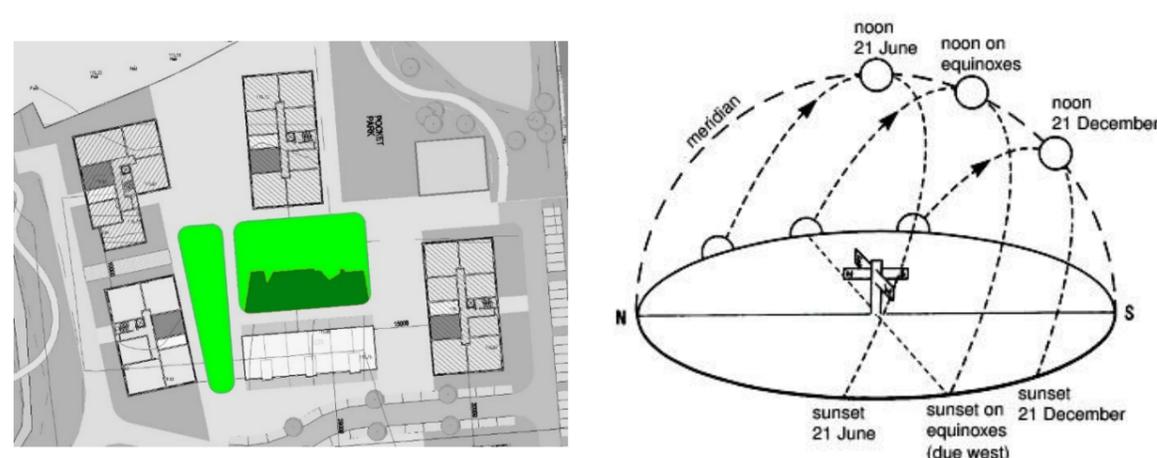


Fig 4.1 – Example Amenity Spaces

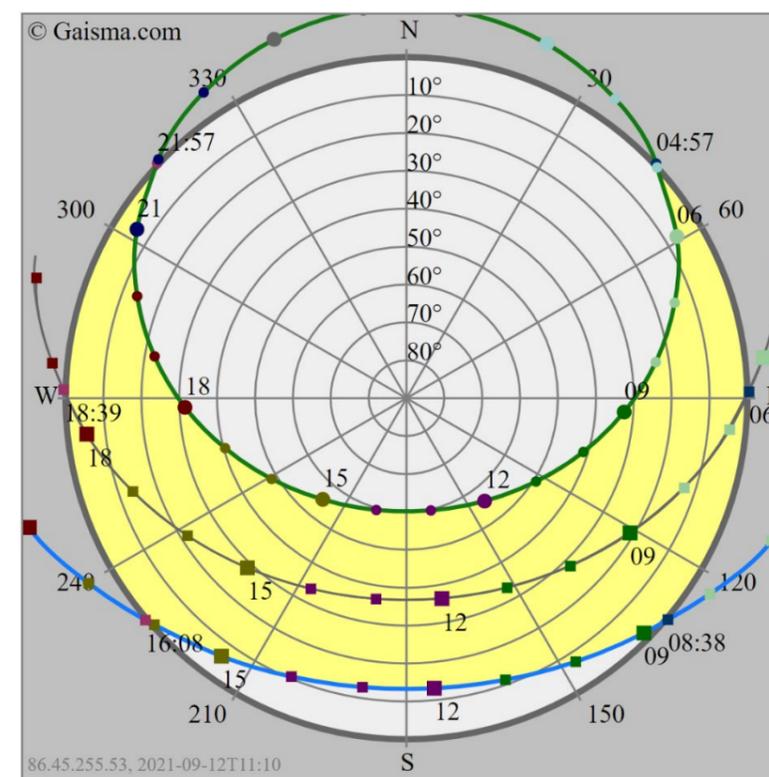


Fig 4.2 – Example Amenity Spaces

## Site Sunlighting and Shading (Cont'd)

### 4.1 Results

For the proposed development, Figure 4.2, the amenity spaces located on the lower ground and ground floor were found to be compliant with the guidelines with a total of 67% of the amenity area compliant. The amenity space (courtyard between blocks C&D) was initially found to be below the 50% target. The area of assessment in this courtyard was reduced by 94m<sup>2</sup> which was sufficient to achieve the compliance target of 50%. The overall amenity quantum following the reduction to the assessed courtyard C&D is still 1,573m<sup>2</sup> greater than required under the Sustainable Urban Housing: Design Standards for New Apartments (December, 2020).

The upper levels achieved 97% sunlight availability for a minimum of 2 hours on the Spring Equinox exceeding the BRE guideline target of 50%.

The site overall compliance is 86%.

As illustrated in Figure 4.3, the existing amenity plaza amenity space will not be negatively impact by the proposed development as it still achieves 75% sunlight availability.

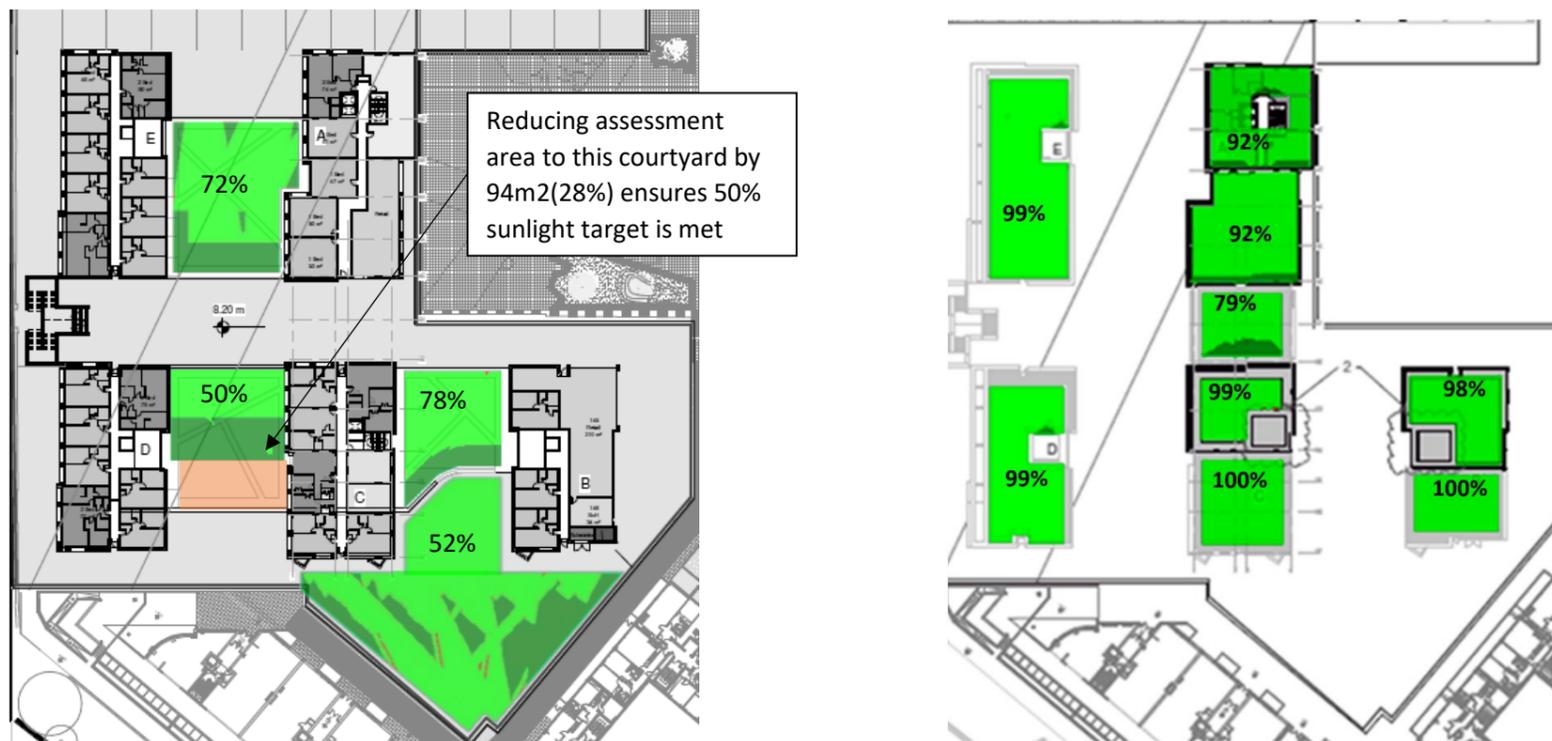


Fig 4.2 –Sunlight Availability to Amenity Spaces for Proposed Development



Fig 4.3 –Sunlight Availability to Existing Amenity Space

## 5.0 Impact on Neighbouring Buildings

### 5.0 Guidance

As set out within the introduction, the impact on existing buildings has been assessed utilising quantitative assessment method as detailed in the BRE publication “Site Layout Planning for Daylight and Sunlight – A guide to good Practice (Second Edition)”

#### **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:*

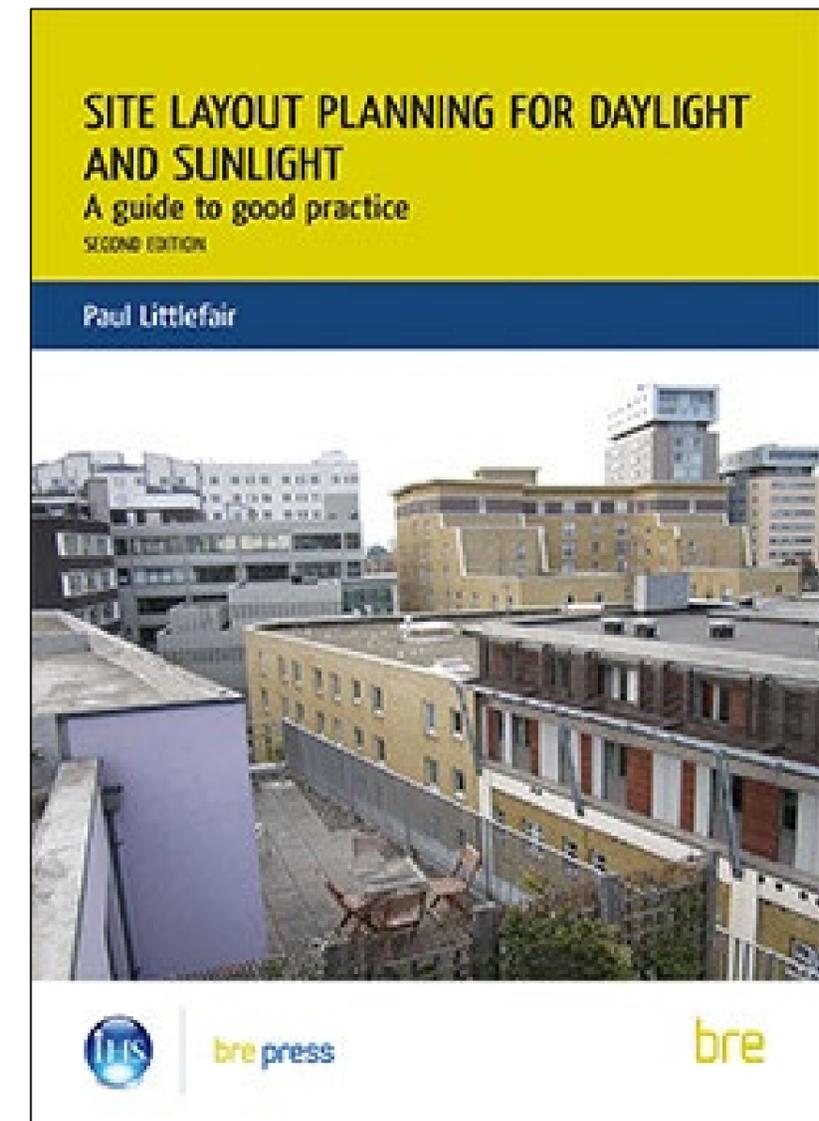
- *The VSC (Vertical Sky Component) measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value.”*

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.”*



## 5.1 Methodology

The analysis looks to assess the main windows in any neighbouring residential developments. It should be noted that for annual sunlight hours and winter sunlit hours, the methodology prescribes that only windows within 90° of south are assessed. This is due to north facing windows not receiving direct sunlight during wintertime in the northern hemisphere.

Note that due to its distance away, aspect in respect to the proposed development and the existing mature trees between it and the proposed development, the Royal Hospital Kilmainham has not been deemed outside of the assessment zone. The following neighbouring buildings were assessed.

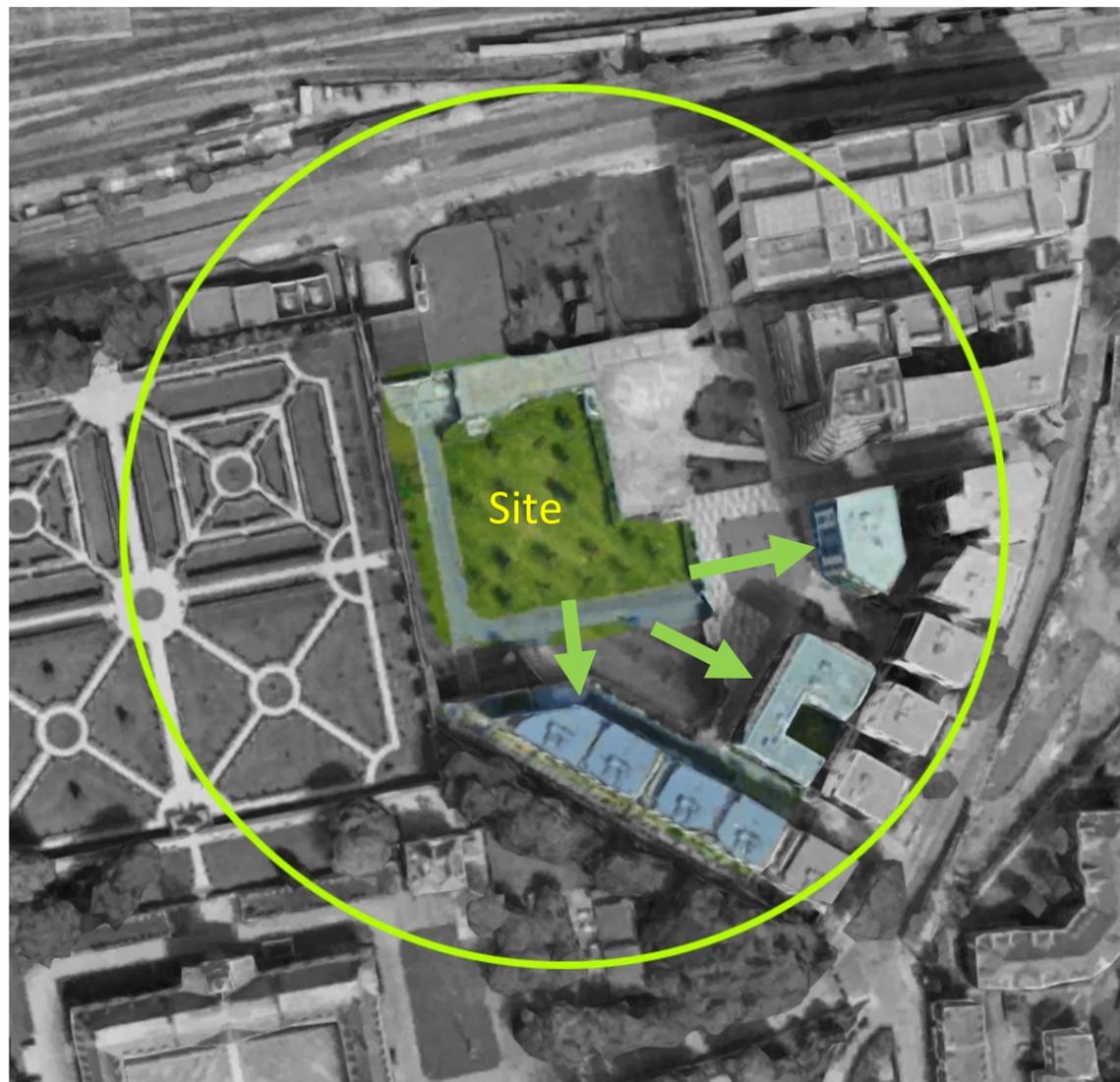


Fig 5.1 – Neighbouring Residential Buildings to be assessed for Daylight

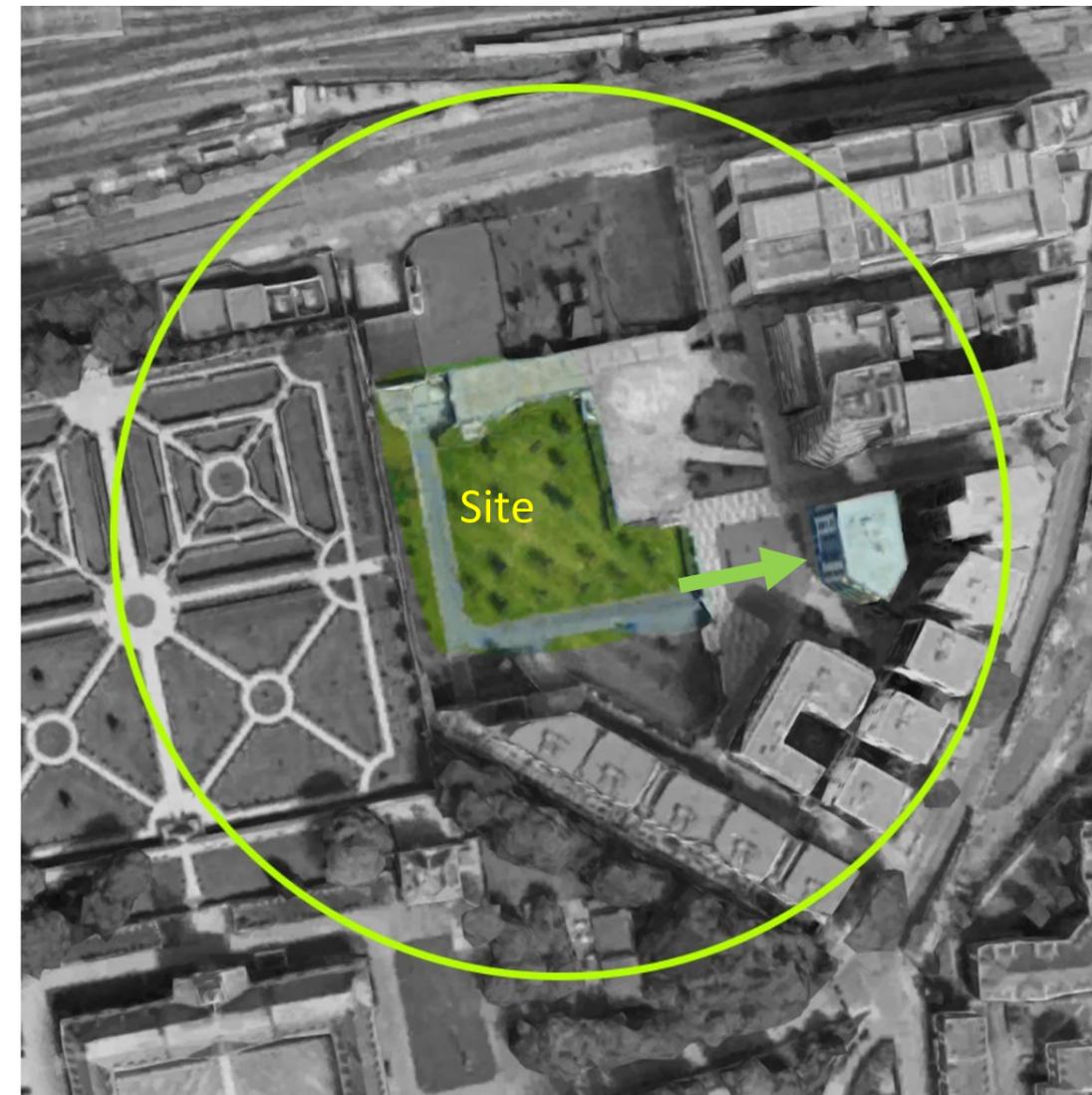


Fig 5.2 – Neighbouring Residential Buildings to be assessed for Sunlight  
i.e. within 90° of South

Analysis was undertaken by calculating sunlight availability pre and post-development for indicative window locations centred on the façade of each dwelling as illustrated in Figure 5.3 below. As it was unknown at the time of assessment which windows were bedrooms or living rooms, all windows illustrated were assessed.

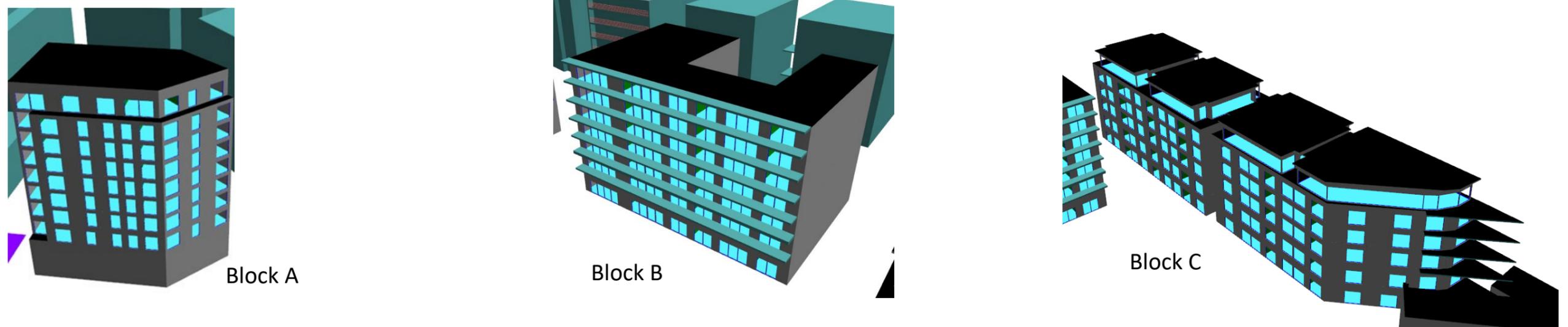


Fig 5.3 – Indicative Window Locations assessed for adjacent dwellings

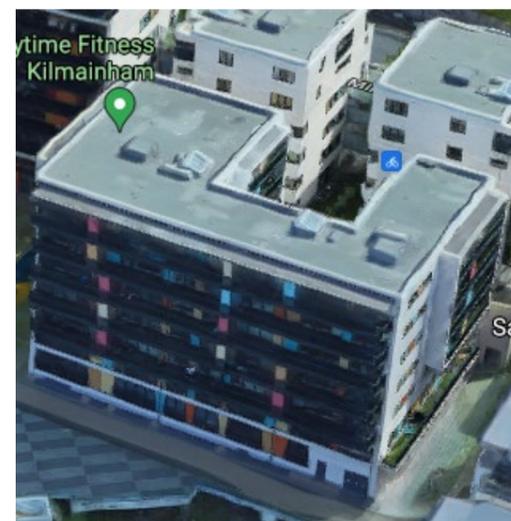
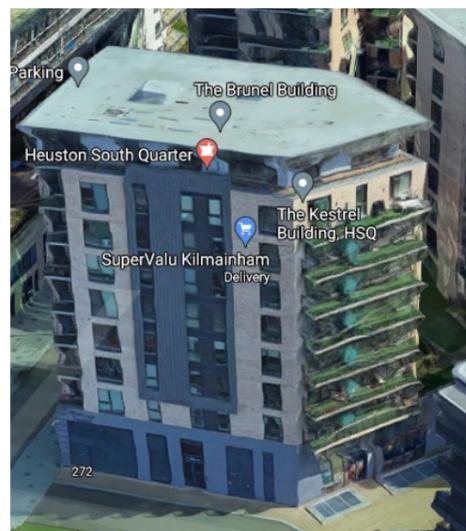


Fig 5.4 – Google Maps images of relevant buildings

## 5.2 Methodology (Cont'd)

In the case of a developed site adjacent to an underdeveloped site, the BRE Guide provides the following guidance in Appendix F: Setting alternative target values for skylight and sunlight access:

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

In order to assess existing buildings with “more than their fair share of light” due to their adjacency to vacant or undeveloped sites, the guidance recommends utilisation of a hypothetical ‘mirror image’ building equal distance from the boundary as a base to compare reduction of light. The existing apartment blocks assessed was therefore mirrored through the site boundary as per the base 3D model below. This massing keeps the street widths as established between the existing buildings. This was then compared against the massing of the proposed development.

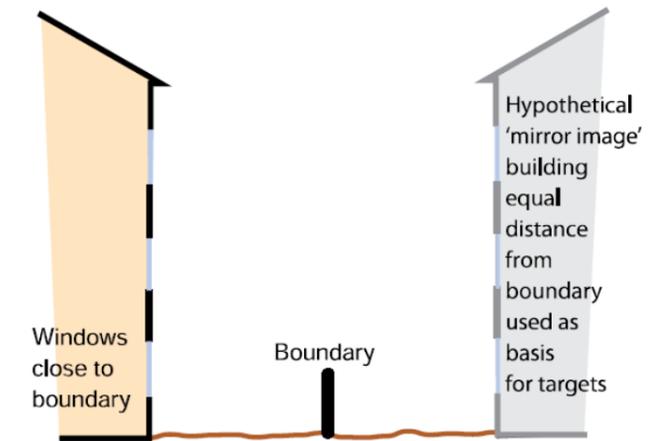


Figure F3: Use of a hypothetical mirror image building to set target daylight values

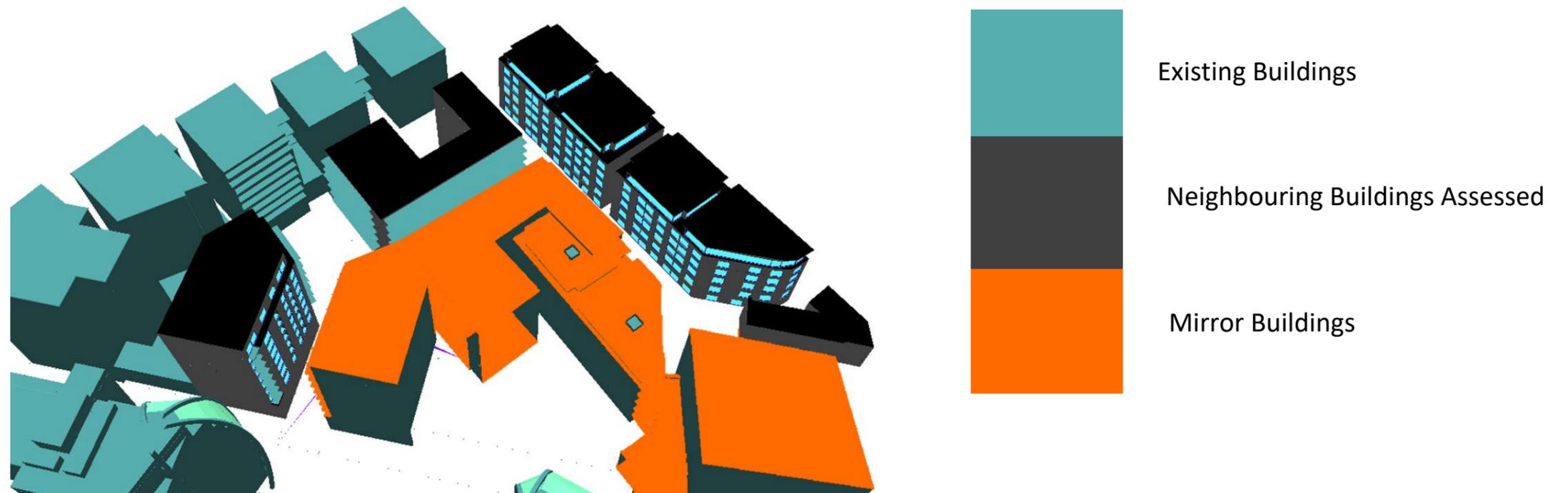


Fig 5.5 – Google Maps images of relevant buildings

### 5.3 Results - VSC

The analysis indicated that the majority of the existing residences within HSQ assessed for daylight impact were found to achieve full compliance with BRE recommendations, in some instances the proposed massing has less of an impact than the mirrored massing and the Proposed/Mirror results are >100%. Also, in some cases the mirror massing has resulted in the mirror results receiving 0% VSC, in these cases the Proposed/Mirror result is noted as compliant as a number cannot be divided by a zero. These dwellings would therefore not be adversely affected by the proposed new development in terms of receipt of natural light.

Nine windows were determined to receive a minor impact (a minor reduction in the order of 6% or less) due to the proposed massing however it can be noted that the wider planning benefits of completion of the site and the added amenity may be considered to negate these impacts.

The results for the existing building vs the proposed (no mirroring) as been included as an appendix for clarity. However, the BRE guide is very clear on the use of alternative benchmarks for underdeveloped sites such as this as reported here.

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result |
|--------------|------------------|------------------|-------------------|--------|
| Block A 01 1 | 6.68             | 12.54            | 188%              | PASS   |
| Block A 01 2 | 10.41            | 14.78            | 142%              | PASS   |
| Block A 01 2 | 9.14             | 13.61            | 149%              | PASS   |
| Block A 01 3 | 9.32             | 13.29            | 143%              | PASS   |
| Block A 01 3 | 9.33             | 13.98            | 150%              | PASS   |
| Block A 01 4 | 8.77             | 21.11            | 241%              | PASS   |
| Block A 01 4 | 9.87             | 13.98            | 142%              | PASS   |
| Block A 01 5 | 8.29             | 22.94            | 277%              | PASS   |
| Block A 01 5 | 4.59             | 21.76            | 474%              | PASS   |
| Block B 00 1 | 1.45             | 13.55            | 934%              | PASS   |
| Block B 00 1 | 0.89             | 13.65            | 1540%             | PASS   |
| Block B 00 1 | 0.59             | 14.43            | 2427%             | PASS   |
| Block B 00 1 | 0.42             | 15.02            | 3543%             | PASS   |
| Block B 00 2 | 0.34             | 16.09            | 4783%             | PASS   |
| Block B 00 2 | 0.3              | 16.98            | 5664%             | PASS   |
| Block B 00 2 | 0.32             | 16.79            | 5290%             | PASS   |
| Block B 00 2 | 0.39             | 17.1             | 4402%             | PASS   |
| Block B 00 2 | 0.35             | 17.33            | 4976%             | PASS   |
| Block B 00 2 | 0.46             | 17.46            | 3775%             | PASS   |
| Block B 00 3 | 0.57             | 18.19            | 3203%             | PASS   |
| Block B 00 3 | 0.75             | 18.28            | 2452%             | PASS   |
| Block B 00 3 | 1.08             | 18.43            | 1702%             | PASS   |
| Block B 00 3 | 1.45             | 18.51            | 1281%             | PASS   |
| Block B 00 3 | 1.84             | 18.47            | 1006%             | PASS   |
| Block B 00 4 | 3.58             | 18.27            | 511%              | PASS   |
| Block B 00 4 | 5.5              | 18               | 328%              | PASS   |
| Block A 02 1 | 6.14             | 13.59            | 221%              | PASS   |
| Block A 02 2 | 11.81            | 16.43            | 139%              | PASS   |
| Block A 02 2 | 10.71            | 15.25            | 142%              | PASS   |
| Block A 02 3 | 10.9             | 15.56            | 143%              | PASS   |
| Block A 02 3 | 10.89            | 16.07            | 148%              | PASS   |
| Block A 02 4 | 10.13            | 24.01            | 237%              | PASS   |
| Block A 02 4 | 12.16            | 16.63            | 137%              | PASS   |
| Block A 02 5 | 4.42             | 24.83            | 562%              | PASS   |
| Block A 02 5 | 9.78             | 26.1             | 267%              | PASS   |
| Block A 03 1 | 6.81             | 14.61            | 214%              | PASS   |
| Block A 03 2 | 13.72            | 18.2             | 133%              | PASS   |
| Block A 03 2 | 12.53            | 17.22            | 138%              | PASS   |
| Block A 03 3 | 12.93            | 17.37            | 134%              | PASS   |

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result       |
|--------------|------------------|------------------|-------------------|--------------|
| Block A 03 3 | 13.02            | 18.18            | 140%              | PASS         |
| Block A 03 4 | 13.79            | 26.8             | 194%              | PASS         |
| Block A 03 4 | 14.45            | 18.83            | 130%              | PASS         |
| Block A 03 5 | 7.8              | 28.06            | 360%              | PASS         |
| Block A 03 5 | 13.66            | 29               | 212%              | PASS         |
| Block A 04 1 | 7.48             | 15.64            | 209%              | PASS         |
| Block A 04 2 | 15.79            | 20.01            | 127%              | PASS         |
| Block A 04 2 | 14.99            | 19.22            | 128%              | PASS         |
| Block A 04 3 | 15.27            | 19.63            | 129%              | PASS         |
| Block A 04 3 | 15.84            | 20.6             | 130%              | PASS         |
| Block A 04 4 | 17.33            | 30.19            | 174%              | PASS         |
| Block A 04 4 | 17.3             | 21.78            | 126%              | PASS         |
| Block A 04 5 | 11.29            | 31.31            | 277%              | PASS         |
| Block A 04 5 | 17.42            | 32.13            | 184%              | PASS         |
| Block A 05 1 | 9.37             | 17.05            | 182%              | PASS         |
| Block A 05 2 | 18.18            | 22.31            | 123%              | PASS         |
| Block A 05 2 | 17.47            | 21.52            | 123%              | PASS         |
| Block A 05 3 | 18.26            | 22.38            | 123%              | PASS         |
| Block A 05 3 | 19.13            | 23.35            | 122%              | PASS         |
| Block A 05 4 | 21.49            | 33.57            | 156%              | PASS         |
| Block A 05 4 | 20.54            | 24.68            | 120%              | PASS         |
| Block A 05 5 | 14.85            | 34.87            | 235%              | PASS         |
| Block A 05 5 | 22.07            | 35.75            | 162%              | PASS         |
| Block A 06 1 | 12.04            | 18.83            | 156%              | PASS         |
| Block A 06 2 | 22.46            | 24.21            | 108%              | PASS         |
| Block A 06 2 | 22.15            | 23.89            | 108%              | PASS         |
| Block A 06 3 | 22.7             | 24.96            | 110%              | PASS         |
| Block A 06 3 | 23.41            | 26.04            | 111%              | PASS         |
| Block A 06 4 | 26.3             | 35.8             | 136%              | PASS         |
| Block A 06 4 | 24.91            | 27.54            | 111%              | PASS         |
| Block A 06 5 | 20.79            | 36.82            | 177%              | PASS         |
| Block A 06 5 | 27.29            | 37.39            | 137%              | PASS         |
| Block A 07 1 | 13.48            | 21.43            | 159%              | PASS         |
| Block A 07 2 | 28.03            | 26.31            | 94%               | MINOR IMPACT |
| Block A 07 2 | 27.76            | 26.11            | 94%               | MINOR IMPACT |
| Block A 07 3 | 28.22            | 27.07            | 96%               | PASS         |
| Block A 07 3 | 28.5             | 28.16            | 99%               | PASS         |
| Block A 07 4 | 35.78            | 36.67            | 102%              | PASS         |
| Block A 07 4 | 29.81            | 29.47            | 99%               | PASS         |
| Block A 07 5 | 36.83            | 37.28            | 101%              | PASS         |

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result |
|--------------|------------------|------------------|-------------------|--------|
| Block A 07 5 | 37.25            | 37.77            | 101%              | PASS   |
| Block A 08 1 | 33.32            | 29.82            | 90%               | PASS   |
| Block A 08 1 | 33.33            | 29.69            | 89%               | PASS   |
| Block A 08 2 | 33.74            | 29.28            | 87%               | PASS   |
| Block A 08 2 | 34.38            | 30.22            | 88%               | PASS   |
| Block A 08 3 | 37.59            | 37.34            | 99%               | PASS   |
| Block A 08 3 | 34.82            | 31.09            | 89%               | PASS   |
| Block A 08 3 | 34.85            | 32.22            | 92%               | PASS   |
| Block A 08 4 | 38.29            | 37.99            | 99%               | PASS   |
| Block A 08 4 | 37.92            | 37.67            | 99%               | PASS   |
| Block B 01 1 | 0.24             | 15.01            | 6258%             | PASS   |
| Block B 01 1 | 0                | 16.06            | compliant         | PASS   |
| Block B 01 1 | 0                | 16.22            | compliant         | PASS   |
| Block B 01 1 | 0                | 17.17            | compliant         | PASS   |
| Block B 01 2 | 0                | 18.81            | compliant         | PASS   |
| Block B 01 2 | 0                | 19.06            | compliant         | PASS   |
| Block B 01 2 | 0                | 19.35            | compliant         | PASS   |
| Block B 01 2 | 0                | 20               | compliant         | PASS   |
| Block B 01 2 | 0                | 20.09            | compliant         | PASS   |
| Block B 01 2 | 0                | 20.18            | compliant         | PASS   |
| Block B 01 3 | 0                | 21.03            | compliant         | PASS   |
| Block B 01 3 | 0                | 21.37            | compliant         | PASS   |
| Block B 01 3 | 0                | 21.53            | compliant         | PASS   |
| Block B 01 3 | 0                | 21.43            | compliant         | PASS   |
| Block B 01 3 | 0                | 21.38            | compliant         | PASS   |
| Block B 01 4 | 0.26             | 21.27            | 8145%             | PASS   |
| Block B 01 4 | 1.19             | 21.29            | 1783%             | PASS   |
| Block b 02 1 | 0.33             | 16.81            | 5116%             | PASS   |
| Block b 02 1 | 0                | 17.37            | compliant         | PASS   |
| Block b 02 1 | 0                | 17.89            | compliant         | PASS   |
| Block b 02 1 | 0                | 18.76            | compliant         | PASS   |
| Block b 02 2 | 0                | 20.71            | compliant         | PASS   |
| Block b 02 2 | 0                | 21.07            | compliant         | PASS   |
| Block b 02 2 | 0                | 21.58            | compliant         | PASS   |
| Block b 02 2 | 0                | 21.42            | compliant         | PASS   |
| Block b 02 2 | 0                | 22.11            | compliant         | PASS   |
| Block b 02 2 | 0                | 22.28            | compliant         | PASS   |
| Block b 02 3 | 0                | 23.21            | compliant         | PASS   |
| Block b 02 3 | 0                | 23.16            | compliant         | PASS   |
| Block b 02 3 | 0                | 23.2             | compliant         | PASS   |

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result |
|--------------|------------------|------------------|-------------------|--------|
| Block b 02 3 | 0                | 23.84            | compliant         | PASS   |
| Block b 02 3 | 0.02             | 23.85            | 103231%           | PASS   |
| Block b 02 4 | 0.58             | 23.39            | 4054%             | PASS   |
| Block b 02 4 | 1.53             | 23.52            | 1535%             | PASS   |
| Block B 03 1 | 0.47             | 18.41            | 3931%             | PASS   |
| Block B 03 1 | 0                | 19.08            | compliant         | PASS   |
| Block B 03 1 | 0                | 20.19            | compliant         | PASS   |
| Block B 03 1 | 0                | 20.77            | compliant         | PASS   |
| Block B 03 2 | 0                | 22.86            | compliant         | PASS   |
| Block B 03 2 | 0                | 23.05            | compliant         | PASS   |
| Block B 03 2 | 0                | 23.46            | compliant         | PASS   |
| Block B 03 2 | 0                | 23.47            | compliant         | PASS   |
| Block B 03 2 | 0                | 24.24            | compliant         | PASS   |
| Block B 03 2 | 0.04             | 24.58            | 56265%            | PASS   |
| Block B 03 3 | 0.03             | 25.07            | 99097%            | PASS   |
| Block B 03 3 | 0.03             | 25.79            | 76362%            | PASS   |
| Block B 03 3 | 0.19             | 25.61            | 13710%            | PASS   |
| Block B 03 3 | 0.22             | 25.66            | 11492%            | PASS   |
| Block B 03 3 | 0.48             | 25.74            | 5419%             | PASS   |
| Block B 03 4 | 1.28             | 26.01            | 2036%             | PASS   |
| Block B 03 4 | 2.4              | 25.91            | 1082%             | PASS   |
| Block B 04 1 | 0.67             | 20.79            | 3086%             | PASS   |
| Block B 04 1 | 0                | 21.38            | compliant         | PASS   |
| Block B 04 1 | 0.01             | 22.22            | 349470%           | PASS   |
| Block B 04 1 | 0.01             | 23.2             | 233884%           | PASS   |
| Block B 04 2 | 0.02             | 24.68            | 139413%           | PASS   |
| Block B 04 2 | 0.02             | 25.55            | 117704%           | PASS   |
| Block B 04 2 | 0.02             | 25.66            | 117807%           | PASS   |
| Block B 04 2 | 0.01             | 26.05            | 207093%           | PASS   |
| Block B 04 2 | 0.05             | 26.28            | 54407%            | PASS   |
| Block B 04 2 | 0.11             | 26.77            | 24212%            | PASS   |
| Block B 04 3 | 0.16             | 27.41            | 16890%            | PASS   |
| Block B 04 3 | 0.25             | 27.82            | 11309%            | PASS   |
| Block B 04 3 | 0.48             | 27.87            | 5820%             | PASS   |
| Block B 04 3 | 0.66             | 28.25            | 4300%             | PASS   |
| Block B 04 3 | 1.02             | 28.78            | 2830%             | PASS   |
| Block B 04 4 | 1.98             | 28.52            | 1437%             | PASS   |
| Block B 04 4 | 3.78             | 28.1             | 743%              | PASS   |
| Block B 05 1 | 1.89             | 23.32            | 1237%             | PASS   |
| Block B 05 1 | 0.9              | 23.92            | 2658%             | PASS   |

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result |
|--------------|------------------|------------------|-------------------|--------|
| Block B 05 1 | 0.99             | 25.06            | 2528%             | PASS   |
| Block B 05 1 | 0.9              | 25.56            | 2842%             | PASS   |
| Block B 05 2 | 0.87             | 27.07            | 3093%             | PASS   |
| Block B 05 2 | 0.89             | 27.72            | 3113%             | PASS   |
| Block B 05 2 | 0.9              | 27.84            | 3083%             | PASS   |
| Block B 05 2 | 0.87             | 28.47            | 3276%             | PASS   |
| Block B 05 2 | 0.88             | 28.74            | 3280%             | PASS   |
| Block B 05 2 | 0.99             | 29.03            | 2919%             | PASS   |
| Block B 05 3 | 0.99             | 29.63            | 2996%             | PASS   |
| Block B 05 3 | 1.01             | 29.83            | 2951%             | PASS   |
| Block B 05 3 | 1.39             | 30.2             | 2180%             | PASS   |
| Block B 05 3 | 1.6              | 30.23            | 1894%             | PASS   |
| Block B 05 3 | 2                | 30.45            | 1523%             | PASS   |
| Block B 05 4 | 3.49             | 31.05            | 889%              | PASS   |
| Block B 05 4 | 5.47             | 30.89            | 564%              | PASS   |
| Block B 06 1 | 7.64             | 26.62            | 349%              | PASS   |
| Block B 06 1 | 6.78             | 26.86            | 396%              | PASS   |
| Block B 06 1 | 7.17             | 27.63            | 385%              | PASS   |
| Block B 06 1 | 7.35             | 27.99            | 381%              | PASS   |
| Block B 06 2 | 8.42             | 29.63            | 352%              | PASS   |
| Block B 06 2 | 8.62             | 30.02            | 348%              | PASS   |
| Block B 06 2 | 8.76             | 30.03            | 343%              | PASS   |
| Block B 06 2 | 9.14             | 30.4             | 333%              | PASS   |
| Block B 06 2 | 9.7              | 30.52            | 315%              | PASS   |
| Block B 06 2 | 9.53             | 30.91            | 324%              | PASS   |
| Block B 06 3 | 9.99             | 31.35            | 314%              | PASS   |
| Block B 06 3 | 10.09            | 31.41            | 311%              | PASS   |
| Block B 06 3 | 10.24            | 32.1             | 313%              | PASS   |
| Block B 06 3 | 10.47            | 32.27            | 308%              | PASS   |
| Block B 06 3 | 10.84            | 32.55            | 300%              | PASS   |
| Block B 06 4 | 11.71            | 32.81            | 280%              | PASS   |
| Block B 06 4 | 12.85            | 33.11            | 258%              | PASS   |
| Block D 00 1 | 9.62             | 13.9             | 144%              | PASS   |
| Block D 00 2 | 12.42            | 17.34            | 140%              | PASS   |
| Block D 00 2 | 8.86             | 16.61            | 187%              | PASS   |
| Block D 00 3 | 8.9              | 17.51            | 197%              | PASS   |
| Block D 00 3 | 8.68             | 17.09            | 197%              | PASS   |
| Block D 00 3 | 8.63             | 16.58            | 192%              | PASS   |
| Block D 00 4 | 8.17             | 17.84            | 218%              | PASS   |
| Block D 00 4 | 7.83             | 18.21            | 233%              | PASS   |

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result |
|--------------|------------------|------------------|-------------------|--------|
| Block D 00 4 | 8.15             | 17.68            | 217%              | PASS   |
| Block D 00 4 | 7.83             | 18.14            | 232%              | PASS   |
| Block D 00 4 | 7.6              | 18.06            | 238%              | PASS   |
| Block D 00 5 | 7.3              | 17.76            | 243%              | PASS   |
| Block D 00 5 | 8.49             | 16.85            | 199%              | PASS   |
| Block D 00 6 | 9.09             | 16.07            | 177%              | PASS   |
| Block D 00 6 | 9.42             | 15.45            | 164%              | PASS   |
| Block D 00 6 | 8.11             | 13.18            | 163%              | PASS   |
| Block D 00 7 | 7.62             | 11.64            | 153%              | PASS   |
| Block D 00 7 | 7.79             | 11.83            | 152%              | PASS   |
| Block D 00 7 | 7.68             | 12.52            | 163%              | PASS   |
| Block D 00 8 | 8.43             | 14.69            | 174%              | PASS   |
| Block D 00 8 | 10.06            | 17.16            | 171%              | PASS   |
| Block D 01 1 | 10.45            | 11.1             | 106%              | PASS   |
| Block D 01 1 | 14.53            | 16.44            | 113%              | PASS   |
| Block D 01 1 | 17.13            | 20.53            | 120%              | PASS   |
| Block D 01 2 | 15.89            | 21.15            | 133%              | PASS   |
| Block D 01 2 | 11.79            | 18.48            | 157%              | PASS   |
| Block D 01 3 | 12.16            | 19.53            | 161%              | PASS   |
| Block D 01 3 | 11.93            | 19.06            | 160%              | PASS   |
| Block D 01 3 | 11.42            | 19.45            | 170%              | PASS   |
| Block D 01 4 | 10.82            | 19.93            | 184%              | PASS   |
| Block D 01 4 | 10.5             | 20.37            | 194%              | PASS   |
| Block D 01 4 | 10.29            | 20.69            | 201%              | PASS   |
| Block D 01 5 | 10.56            | 20.1             | 190%              | PASS   |
| Block D 01 5 | 11.39            | 19.2             | 169%              | PASS   |
| Block D 01 6 | 12.31            | 18.68            | 152%              | PASS   |
| Block D 01 6 | 12.34            | 17.47            | 142%              | PASS   |
| Block D 01 6 | 10.6             | 15.46            | 146%              | PASS   |
| Block D 01 7 | 9.5              | 13.31            | 140%              | PASS   |
| Block D 01 7 | 9.75             | 13.7             | 140%              | PASS   |
| Block D 01 7 | 9.35             | 14.15            | 151%              | PASS   |
| Block D 01 8 | 9.83             | 16.23            | 165%              | PASS   |
| Block D 01 8 | 11.38            | 18.96            | 167%              | PASS   |
| Block D 02 1 | 8.38             | 10.47            | 125%              | PASS   |
| Block D 02 1 | 15.52            | 18.2             | 117%              | PASS   |
| Block D 02 1 | 21.67            | 24.37            | 112%              | PASS   |
| Block D 02 2 | 20.48            | 24.25            | 118%              | PASS   |
| Block D 02 2 | 16.52            | 20.67            | 125%              | PASS   |
| Block D 02 3 | 16.05            | 21.93            | 137%              | PASS   |
| Block D 02 3 | 15.5             | 21.72            | 140%              | PASS   |
| Block D 02 3 | 15.46            | 21.8             | 141%              | PASS   |

Fig 4.4 – Predicted VSC Results

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result       |
|--------------|------------------|------------------|-------------------|--------------|
| Block D 02 4 | 14.67            | 22.64            | 154%              | PASS         |
| Block D 02 4 | 14.33            | 23.34            | 163%              | PASS         |
| Block D 02 4 | 14.13            | 23.33            | 165%              | PASS         |
| Block D 02 5 | 14.03            | 22.88            | 163%              | PASS         |
| Block D 02 5 | 15.23            | 22.36            | 147%              | PASS         |
| Block D 02 6 | 16.44            | 21.49            | 131%              | PASS         |
| Block D 02 6 | 15.87            | 20.27            | 128%              | PASS         |
| Block D 02 6 | 14.39            | 17.9             | 124%              | PASS         |
| Block D 02 7 | 13.28            | 15.93            | 120%              | PASS         |
| Block D 02 7 | 12.96            | 15.98            | 123%              | PASS         |
| Block D 02 7 | 12.6             | 16.37            | 130%              | PASS         |
| Block D 02 8 | 13.06            | 18.72            | 143%              | PASS         |
| Block D 02 8 | 14.61            | 21.62            | 148%              | PASS         |
| Block D 03 1 | 10.51            | 13.33            | 127%              | PASS         |
| Block D 03 1 | 19.22            | 21.74            | 113%              | PASS         |
| Block D 03 1 | 25.76            | 27.77            | 108%              | PASS         |
| Block D 03 2 | 24.89            | 26.92            | 108%              | PASS         |
| Block D 03 2 | 20.61            | 23.46            | 114%              | PASS         |
| Block D 03 3 | 20.72            | 24.23            | 117%              | PASS         |
| Block D 03 3 | 20.65            | 23.62            | 114%              | PASS         |
| Block D 03 3 | 20.45            | 24.44            | 120%              | PASS         |
| Block D 03 4 | 19.47            | 25.1             | 129%              | PASS         |
| Block D 03 4 | 18.89            | 25.59            | 135%              | PASS         |
| Block D 03 4 | 18.76            | 25.68            | 137%              | PASS         |
| Block D 03 5 | 18.67            | 25.86            | 138%              | PASS         |
| Block D 03 5 | 19.7             | 24.95            | 127%              | PASS         |
| Block D 03 6 | 20.57            | 24.4             | 119%              | PASS         |
| Block D 03 6 | 20.46            | 23.19            | 113%              | PASS         |
| Block D 03 6 | 19.22            | 21.71            | 113%              | PASS         |
| Block D 03 7 | 18.17            | 19.63            | 108%              | PASS         |
| Block D 03 7 | 18.05            | 20.11            | 111%              | PASS         |
| Block D 03 7 | 17.52            | 20.24            | 116%              | PASS         |
| Block D 03 8 | 17.77            | 22.39            | 126%              | PASS         |
| Block D 03 8 | 18.49            | 24.53            | 133%              | PASS         |
| Block D 04 1 | 12.84            | 15.43            | 120%              | PASS         |
| Block D 04 1 | 23.3             | 25.24            | 108%              | PASS         |
| Block D 04 1 | 30.01            | 31.17            | 104%              | PASS         |
| Block D 04 2 | 29.62            | 29.77            | 101%              | PASS         |
| Block D 04 2 | 26.75            | 26.05            | 97%               | MINOR IMPACT |
| Block D 04 3 | 26.68            | 26.6             | 100%              | PASS         |
| Block D 04 3 | 26.34            | 26.45            | 100%              | PASS         |
| Block D 04 3 | 25.82            | 26.8             | 104%              | PASS         |
| Block D 04 4 | 24.95            | 28.07            | 112%              | PASS         |
| Block D 04 4 | 24.45            | 27.91            | 114%              | PASS         |

| Roof Ref     | VSC Mirrored (%) | VSC Proposed (%) | Proposed/Mirrored | Result       |
|--------------|------------------|------------------|-------------------|--------------|
| Block D 04 4 | 24.45            | 27.94            | 114%              | PASS         |
| Block D 04 4 | 24.48            | 28.44            | 116%              | PASS         |
| Block D 04 5 | 24.74            | 28.55            | 115%              | PASS         |
| Block D 04 5 | 25.68            | 28.12            | 110%              | PASS         |
| Block D 04 6 | 25.94            | 27.7             | 107%              | PASS         |
| Block D 04 6 | 25.68            | 27.09            | 106%              | PASS         |
| Block D 04 6 | 25.19            | 25.87            | 103%              | PASS         |
| Block D 04 7 | 24.07            | 24.39            | 101%              | PASS         |
| Block D 04 7 | 23.97            | 25.04            | 104%              | PASS         |
| Block D 04 7 | 23.21            | 25.06            | 108%              | PASS         |
| Block D 04 8 | 23.64            | 27.74            | 117%              | PASS         |
| Block D 04 8 | 23.85            | 30.11            | 126%              | PASS         |
| Block D 06 1 | 35.26            | 35.26            | 100%              | PASS         |
| Block D 06 1 | 34.03            | 35.45            | 104%              | PASS         |
| Block D 06 1 | 32.16            | 33.41            | 104%              | PASS         |
| Block D 06 1 | 32.76            | 33.1             | 101%              | PASS         |
| Block D 06 1 | 31.47            | 30.73            | 98%               | PASS         |
| Block D 06 1 | 29.53            | 27               | 91%               | PASS         |
| Block D 06 1 | 16.15            | 16.87            | 104%              | PASS         |
| Block D 06 1 | 4.75             | 4.65             | 98%               | MINOR IMPACT |
| Block D 06 1 | 17.3             | 17.3             | 100%              | PASS         |
| Block D 06 2 | 4.67             | 4.48             | 96%               | MINOR IMPACT |
| Block D 06 2 | 15.75            | 15.54            | 99%               | MINOR IMPACT |
| Block D 06 2 | 29.35            | 28.82            | 98%               | PASS         |
| Block D 06 2 | 25.43            | 26.08            | 103%              | PASS         |
| Block D 06 2 | 27.03            | 27.25            | 101%              | PASS         |
| Block D 06 2 | 24.46            | 24.46            | 100%              | PASS         |
| Block D 06 2 | 36.41            | 36.41            | 100%              | PASS         |
| Block D 06 3 | 22.82            | 22.05            | 97%               | MINOR IMPACT |
| Block D 06 3 | 28.51            | 28.01            | 98%               | PASS         |
| Block D 06 3 | 19.69            | 20.36            | 103%              | PASS         |
| Block D 06 3 | 12.36            | 12.36            | 100%              | PASS         |
| Block D 06 3 | 19.37            | 19.37            | 100%              | PASS         |
| Block D 06 3 | 36.01            | 36.01            | 100%              | PASS         |
| Block D 06 3 | 24.76            | 24.76            | 100%              | PASS         |
| Block D 06 3 | 27.34            | 26.79            | 98%               | MINOR IMPACT |
| Block D 06 4 | 12.22            | 12.23            | 100%              | PASS         |
| Block D 06 4 | 18.99            | 17.86            | 94%               | MINOR IMPACT |
| Block D 06 4 | 27.87            | 28.79            | 103%              | PASS         |
| Block D 06 4 | 29.06            | 31.72            | 109%              | PASS         |
| Block D 06 4 | 36.36            | 37.7             | 104%              | PASS         |
| Block D 06 4 | 30.15            | 30.15            | 100%              | PASS         |
| Block D 06 4 | 36.28            | 36.28            | 100%              | PASS         |
| Block D 06 4 | 19.99            | 19.99            | 100%              | PASS         |

Fig 4.5 – Predicted VSC Results

### 5.4 Results - APSH

Due to the orientation of the neighbouring residential buildings, there is only one block that can be assessed for direct sunlight. As the sun is in the south of the sky in the northern hemisphere, buildings south of the proposed development will not be impacted for direct sunlight.

As with VSC, the mirrored massing has been utilised for the benchmark for the assessment and Existing vs Proposed are contained in the appendix.

The analysis determined that there would be no negative impact on the sunlight to the neighbouring residential buildings as a result of the proposed development.

|              | Annual Mirrored (%) | Annual Pr (%) | Pr/Mi | Winter Mirrored (%) | Winter Pr (%) | Winter Pr/Mi | Total Potential Annual Sunny Hours | Max Allowable Ann Reduction | Actual Ann Reduction | Criterion 1<br>Ann < 25% or Win <5% | Criterion 2<br>Ann or Win <80% of Ex | Criterion 3<br>Ann reduction > 4% | OVERALL COMPLIANCE |
|--------------|---------------------|---------------|-------|---------------------|---------------|--------------|------------------------------------|-----------------------------|----------------------|-------------------------------------|--------------------------------------|-----------------------------------|--------------------|
| Block A 01 1 | 2                   | 5             | 250%  | 0                   | 0             | 100%         | 1277                               | 51                          | -38                  | NO                                  | YES                                  | YES                               | Pass               |
| Block A 01 2 | 16                  | 25            | 156%  | 4                   | 6             | 150%         | 1277                               | 51                          | -115                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 01 2 | 16                  | 24            | 150%  | 4                   | 6             | 150%         | 1277                               | 51                          | -102                 | NO                                  | YES                                  | YES                               | Pass               |
| Block A 01 3 | 21                  | 27            | 129%  | 4                   | 5             | 125%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 01 3 | 21                  | 26            | 124%  | 3                   | 5             | 167%         | 1277                               | 51                          | -64                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 01 4 | 16                  | 40            | 250%  | 2                   | 5             | 250%         | 1277                               | 51                          | -306                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 01 4 | 20                  | 26            | 130%  | 2                   | 5             | 250%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 01 5 | 23                  | 38            | 165%  | 0                   | 2             | 100%         | 1277                               | 51                          | -192                 | NO                                  | YES                                  | YES                               | Pass               |
| Block A 01 5 | 9                   | 40            | 444%  | 1                   | 4             | 400%         | 1277                               | 51                          | -396                 | NO                                  | YES                                  | YES                               | Pass               |
| Block A 02 1 | 2                   | 6             | 300%  | 0                   | 0             | 100%         | 1277                               | 51                          | -51                  | NO                                  | YES                                  | YES                               | Pass               |
| Block A 02 2 | 17                  | 27            | 159%  | 5                   | 8             | 160%         | 1277                               | 51                          | -128                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 2 | 18                  | 28            | 156%  | 7                   | 9             | 129%         | 1277                               | 51                          | -128                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 3 | 25                  | 31            | 124%  | 7                   | 8             | 114%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 3 | 23                  | 31            | 135%  | 6                   | 8             | 133%         | 1277                               | 51                          | -102                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 4 | 17                  | 48            | 282%  | 4                   | 9             | 225%         | 1277                               | 51                          | -396                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 4 | 24                  | 34            | 142%  | 5                   | 7             | 140%         | 1277                               | 51                          | -128                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 5 | 8                   | 47            | 588%  | 3                   | 7             | 233%         | 1277                               | 51                          | -498                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 02 5 | 21                  | 47            | 224%  | 2                   | 5             | 250%         | 1277                               | 51                          | -332                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 1 | 2                   | 6             | 300%  | 0                   | 0             | 100%         | 1277                               | 51                          | -51                  | NO                                  | YES                                  | YES                               | Pass               |
| Block A 03 2 | 22                  | 30            | 136%  | 8                   | 11            | 138%         | 1277                               | 51                          | -102                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 2 | 24                  | 31            | 129%  | 9                   | 11            | 122%         | 1277                               | 51                          | -89                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 3 | 27                  | 35            | 130%  | 9                   | 11            | 122%         | 1277                               | 51                          | -102                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 3 | 27                  | 34            | 126%  | 9                   | 10            | 111%         | 1277                               | 51                          | -89                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 4 | 23                  | 54            | 235%  | 10                  | 13            | 130%         | 1277                               | 51                          | -396                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 4 | 32                  | 39            | 122%  | 9                   | 10            | 111%         | 1277                               | 51                          | -89                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 5 | 14                  | 54            | 386%  | 9                   | 12            | 133%         | 1277                               | 51                          | -511                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 5 | 30                  | 55            | 183%  | 7                   | 10            | 143%         | 1277                               | 51                          | -319                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 1 | 2                   | 10            | 500%  | 0                   | 0             | 100%         | 1277                               | 51                          | -102                 | NO                                  | YES                                  | YES                               | Pass               |
| Block A 04 2 | 25                  | 34            | 136%  | 9                   | 12            | 133%         | 1277                               | 51                          | -115                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 2 | 29                  | 36            | 124%  | 11                  | 14            | 127%         | 1277                               | 51                          | -89                  | YES                                 | YES                                  | YES                               | Pass               |



|              | Annual Mirrored (%) | Annual Pr (%) | Pr/Mi | Winter Mirrored (%) | Winter Pr (%) | Winter Pr/Mi | Total Potential Annual Sunny Hours | Max Allowable Ann Reduction | Actual Ann Reduction | Criterion 1<br>Ann < 25% or Win <5% | Criterion 2<br>Ann or Win <80% of Ex | Criterion 3<br>Ann reduction > 4% | OVERALL COMPLIANCE |
|--------------|---------------------|---------------|-------|---------------------|---------------|--------------|------------------------------------|-----------------------------|----------------------|-------------------------------------|--------------------------------------|-----------------------------------|--------------------|
| Block A 04 3 | 31                  | 39            | 126%  | 13                  | 14            | 108%         | 1277                               | 51                          | -102                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 3 | 31                  | 41            | 132%  | 13                  | 14            | 108%         | 1277                               | 51                          | -128                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 4 | 30                  | 64            | 213%  | 17                  | 21            | 124%         | 1277                               | 51                          | -434                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 4 | 38                  | 44            | 116%  | 13                  | 14            | 108%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 5 | 21                  | 65            | 310%  | 15                  | 20            | 133%         | 1277                               | 51                          | -562                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 5 | 39                  | 63            | 162%  | 14                  | 17            | 121%         | 1277                               | 51                          | -306                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 1 | 5                   | 12            | 240%  | 0                   | 0             | 100%         | 1277                               | 51                          | -89                  | NO                                  | YES                                  | YES                               | Pass               |
| Block A 05 2 | 29                  | 38            | 131%  | 9                   | 13            | 144%         | 1277                               | 51                          | -115                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 2 | 32                  | 38            | 119%  | 12                  | 15            | 125%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 3 | 34                  | 40            | 118%  | 13                  | 15            | 115%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 3 | 39                  | 42            | 108%  | 14                  | 16            | 114%         | 1277                               | 51                          | -38                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 4 | 40                  | 71            | 178%  | 22                  | 27            | 123%         | 1277                               | 51                          | -396                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 4 | 40                  | 47            | 118%  | 16                  | 16            | 100%         | 1277                               | 51                          | -89                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 5 | 26                  | 73            | 281%  | 20                  | 26            | 130%         | 1277                               | 51                          | -600                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 5 | 47                  | 70            | 149%  | 19                  | 23            | 121%         | 1277                               | 51                          | -294                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 1 | 11                  | 17            | 155%  | 0                   | 0             | 100%         | 1277                               | 51                          | -77                  | NO                                  | YES                                  | YES                               | Pass               |
| Block A 06 2 | 35                  | 41            | 117%  | 10                  | 14            | 140%         | 1277                               | 51                          | -77                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 2 | 38                  | 41            | 108%  | 13                  | 16            | 123%         | 1277                               | 51                          | -38                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 3 | 40                  | 42            | 105%  | 14                  | 16            | 114%         | 1277                               | 51                          | -26                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 3 | 42                  | 44            | 105%  | 15                  | 16            | 107%         | 1277                               | 51                          | -26                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 4 | 48                  | 73            | 152%  | 24                  | 29            | 121%         | 1277                               | 51                          | -319                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 4 | 42                  | 47            | 112%  | 16                  | 16            | 100%         | 1277                               | 51                          | -64                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 5 | 39                  | 75            | 192%  | 23                  | 28            | 122%         | 1277                               | 51                          | -460                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 5 | 57                  | 73            | 128%  | 23                  | 26            | 113%         | 1277                               | 51                          | -204                 | YES                                 | YES                                  | YES                               | Pass               |
| Block A 07 1 | 15                  | 26            | 173%  | 1                   | 0             | 0%           | 1277                               | 51                          | -140                 | NO                                  | NO                                   | YES                               | Pass               |
| Block A 07 2 | 45                  | 45            | 100%  | 12                  | 14            | 117%         | 1277                               | 51                          | 0                    | YES                                 | YES                                  | YES                               | Pass               |
| Block A 07 2 | 46                  | 43            | 93%   | 14                  | 16            | 114%         | 1277                               | 51                          | 38                   | YES                                 | YES                                  | YES                               | Pass               |
| Block A 07 3 | 47                  | 44            | 94%   | 15                  | 16            | 107%         | 1277                               | 51                          | 38                   | YES                                 | YES                                  | YES                               | Pass               |
| Block A 07 3 | 48                  | 46            | 96%   | 15                  | 16            | 107%         | 1277                               | 51                          | 26                   | YES                                 | YES                                  | YES                               | Pass               |
| Block A 07 4 | 75                  | 75            | 100%  | 29                  | 30            | 103%         | 1277                               | 51                          | 0                    | YES                                 | YES                                  | YES                               | Pass               |

## 6.0 Daylight Analysis

### 6.0 Methodology

Daylighting analysis was undertaken for the proposed residential development using radiance lighting software to determine Average Daylight Factors (ADF's) in accordance with BRE 209 and BS. 8206-2, as referenced in the Sustainable Urban Housing: Design Standards for New Apartments (December 2020), as well as an assessment comparison to BS EN 17037 (National Annex). These guidelines and standards have been outlined in section 2.0.

ADF's were determined for a CIE Overcast Sky equivalent to providing an external, unobstructed ground illumination level of 10,000 Lux. CIE Overcast skies are theoretical sky models, with brightness highest at the zenith and reducing to the horizon, but also unidirectional (as illustrated in Figure 5.0.1); therefore ADF's do not differ for façade orientation, with North facing rooms achieving identical metric performance to South facing, (all else being equal), as results account for diffuse natural light only and exclude any direct sunlight effects.

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 5.0.2 such as balcony structures, window frames, reveal and cill depth etc. in accordance with the architectural design.

The daylighting models were calculated based on the following assumptions regarding transmittance and reflectance (based on measured manufacturer's test data):

- Glazing Transmission = 70%
- Ceilings: 82% reflectance (BS 00E55 White)
- Walls: 62% reflectance (BS 10C31 Ivory)
- Floors: 36% reflectance (BS 00A05 Platinum Grey)

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 to enable a detailed calculation within each room, the average of which was then determined to calculate ADF.

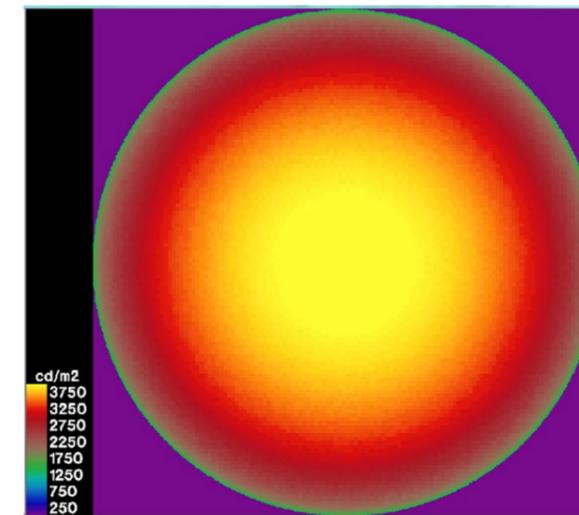


Fig 6.0.1 - CIE Overcast sky as viewed from below.

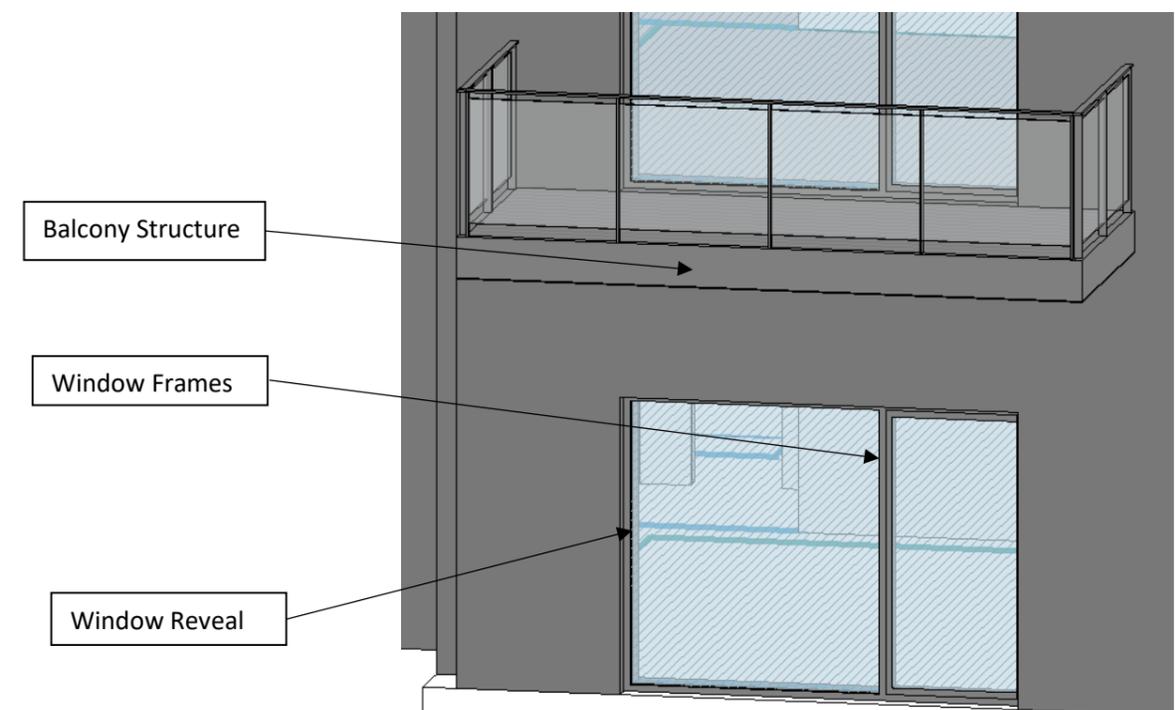


Fig 6.0.2 – Typical Building Details included within Daylight Analysis

## Methodology (Cont'd)

In relation to daylight, the BRE Guide suggest that:

*“Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space... [The 2008 British Standard] recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In **housing** [the 2008 British Standard] also gives minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.” (emphasis added)*

The 2008 British Standard further clarifies the targets by stipulating:

*“Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%.”*

With regard to the above, the minimum values targeted for relevant spaces are:

- > 2.0% for Kitchen/Living/ Dining Areas (KLD)
- > 1.0% for Bedrooms

Notwithstanding the above, it may be noted that these are minimum targets, and that the vast majority of spaces were determined to comfortably exceed the values, as summarised in the results section below. In addition, sub-standard daylighting performance has been avoided wherever viable and practical with the following design enhancements applied to maximise natural light availability and therefore internal environments:

- Maximise glazing,
- Minimise / offset balcony structures,
- Increase glazing / floor heights.

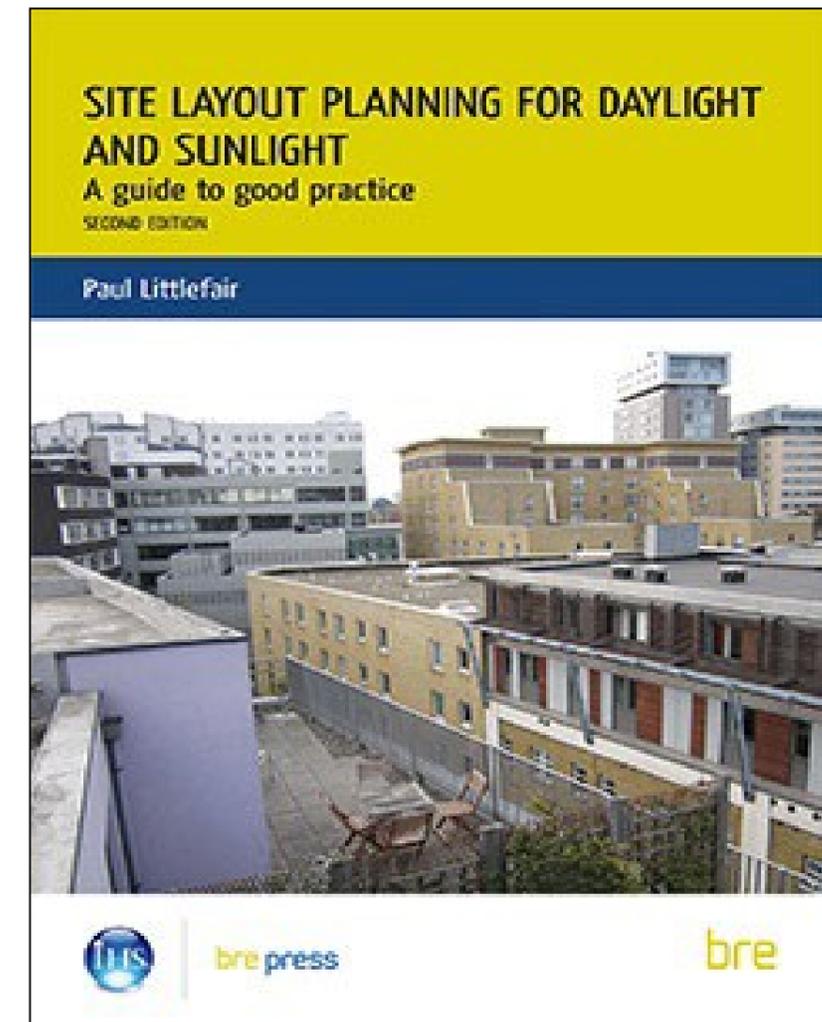


Fig 6.0.3 – The BRE Guide

### 6.1 Results Summary

Figure 6.1.1 indicates the overall summary of ADF's determined for the Proposed Development, at each floor level. It can be seen that **80%** of KLD and Bedrooms assessed (totalling 666 of 833 rooms) were determined to be compliant based on the following compliance, in accordance with BS.8206-2: 2008

- >2.0% for Kitchen/Living/ Dining Areas (KLD)
- > 1.0% for Bedrooms

However, aside from meeting minimum requirements, most KLD Areas and Bedrooms were determined to receive Daylighting comfortably exceeding these ADF targets, it was determined that an average ADF of above 3.5% would be provided for half the bedroom spaces across the development, with 50% of the living spaces achieving an ADF in excess of 3.25%, as illustrated in Figures 6.1.2 and 6.1.3.

| Level           | Pass | Fail | Total |
|-----------------|------|------|-------|
| LGF             | 17   | 17   | 34    |
| GF              | 41   | 21   | 62    |
| 1               | 57   | 33   | 90    |
| 2               | 68   | 21   | 89    |
| 3               | 62   | 24   | 86    |
| 4               | 64   | 17   | 81    |
| 5               | 42   | 10   | 52    |
| 6               | 42   | 10   | 52    |
| 7               | 45   | 7    | 52    |
| 8               | 43   | 4    | 47    |
| 9               | 43   | 3    | 46    |
| 10              | 46   | 0    | 46    |
| 11              | 46   | 0    | 46    |
| 12              | 10   | 0    | 10    |
| 13              | 10   | 0    | 10    |
| 14              | 10   | 0    | 10    |
| 15              | 10   | 0    | 10    |
| 16              | 10   | 0    | 10    |
| Total           | 666  | 167  | 833   |
| Percentage Rate | 80%  | 20%  |       |

Fig 6.1.1 – Daylight Summary – Development

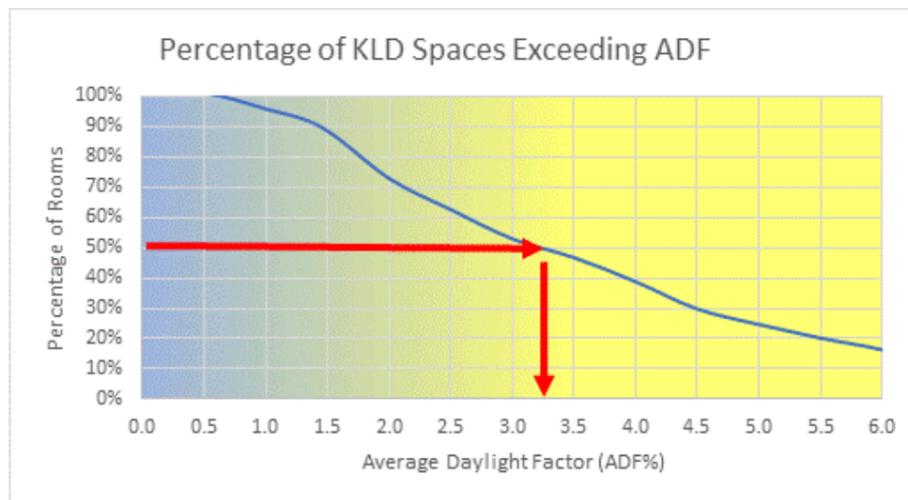


Fig 6.1.2 Frequency Graph for Living/Dining Spaces

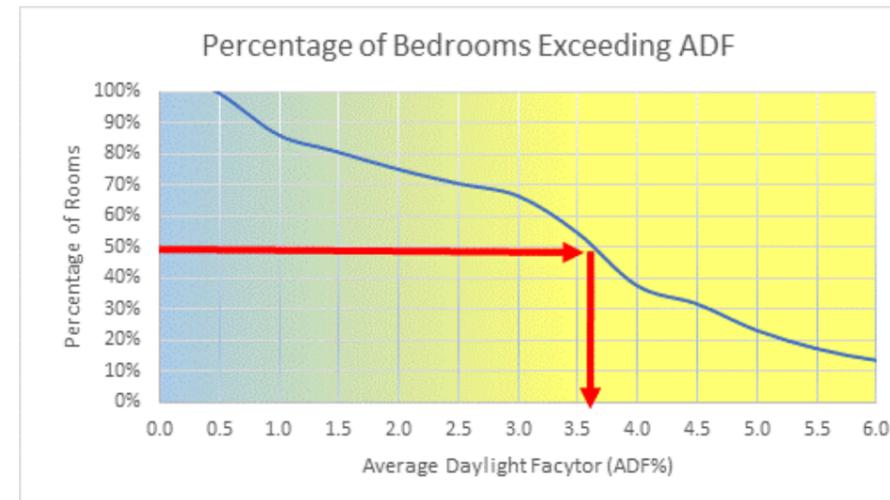
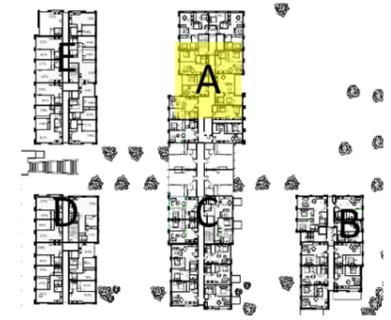
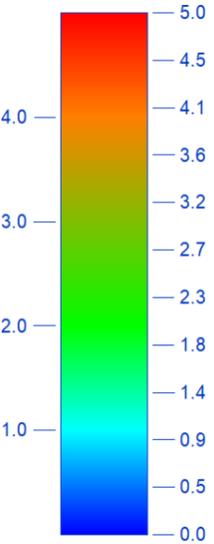


Fig 6.1.3 Frequency Graph for Bedroom Spaces

6.2 Building A



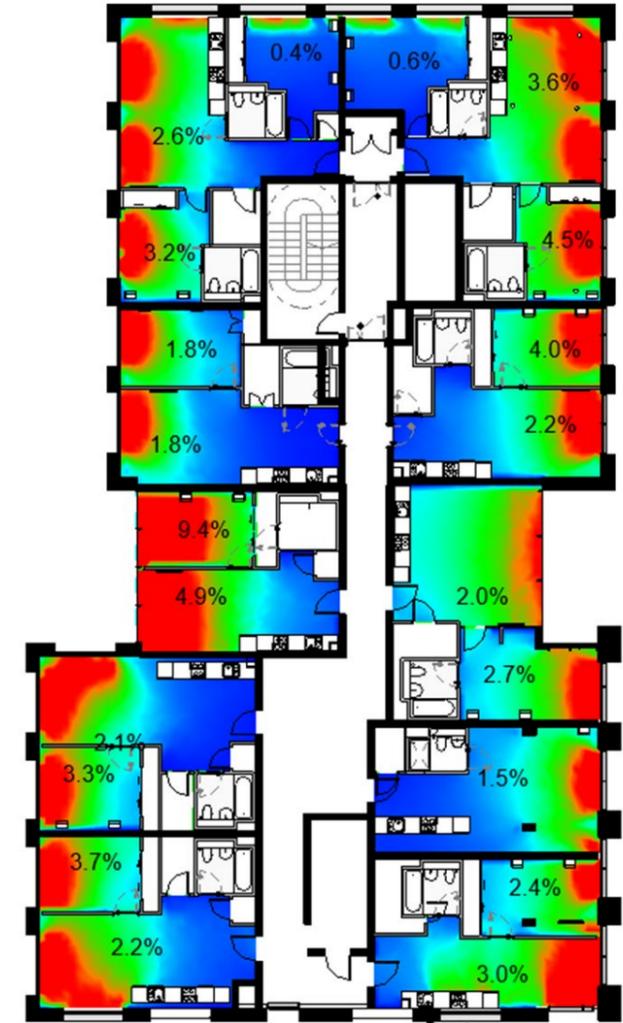
Daylight Factor



Building A – Lower Ground Floor



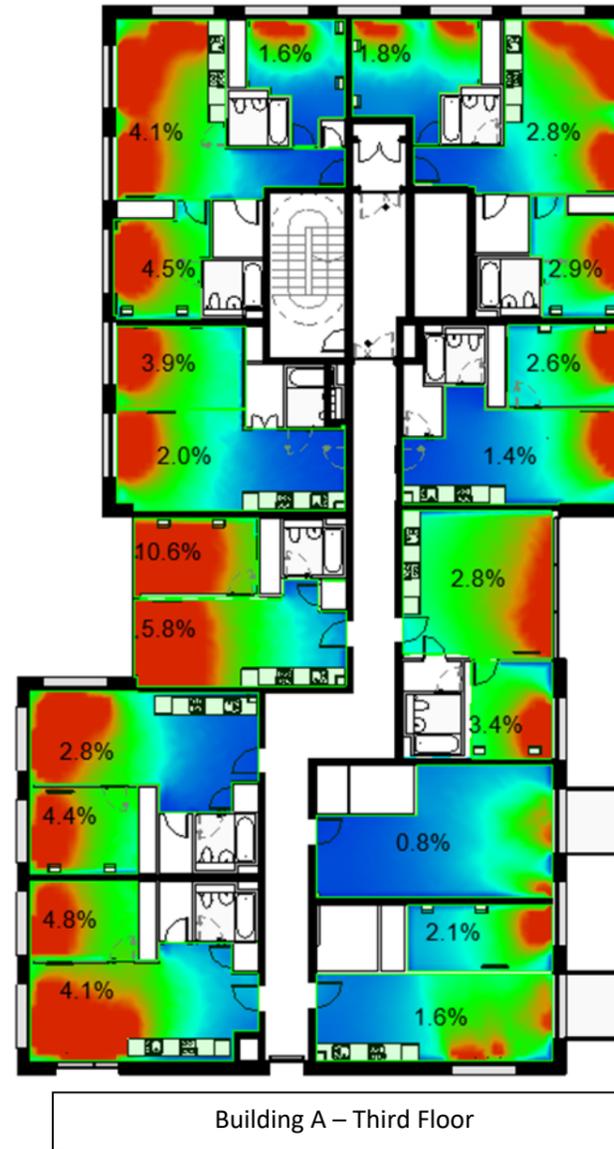
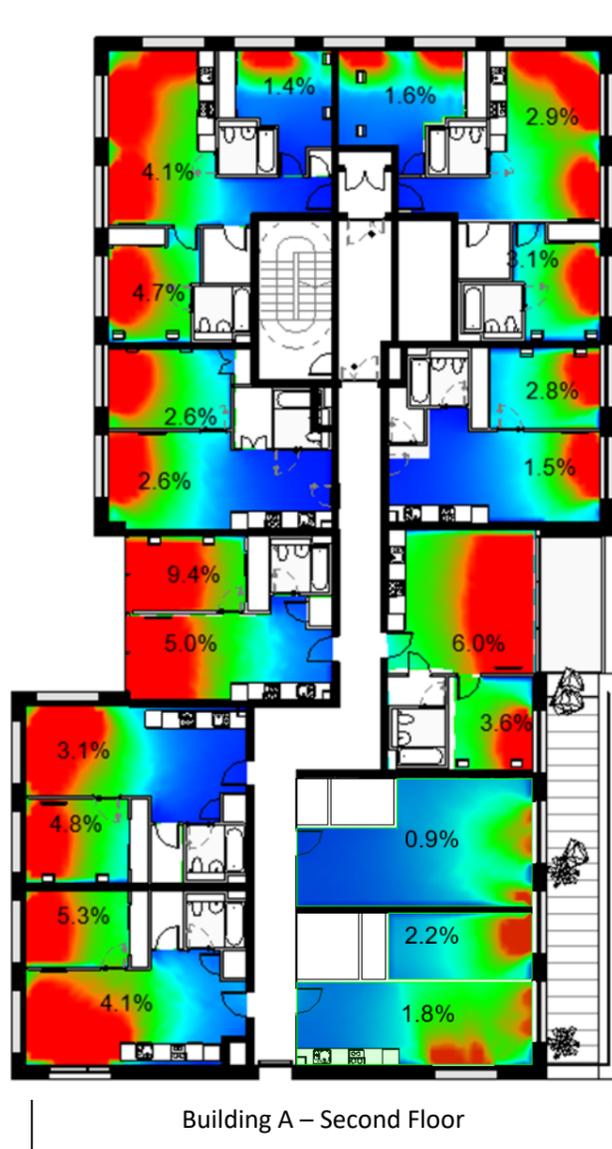
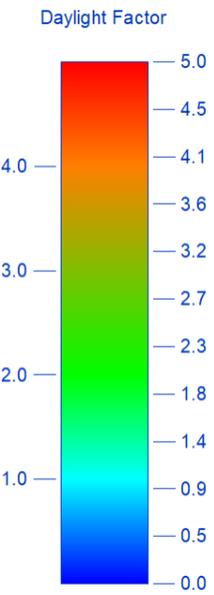
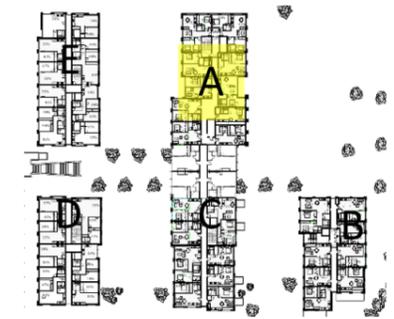
Building A – Ground Floor



Building A – First Floor

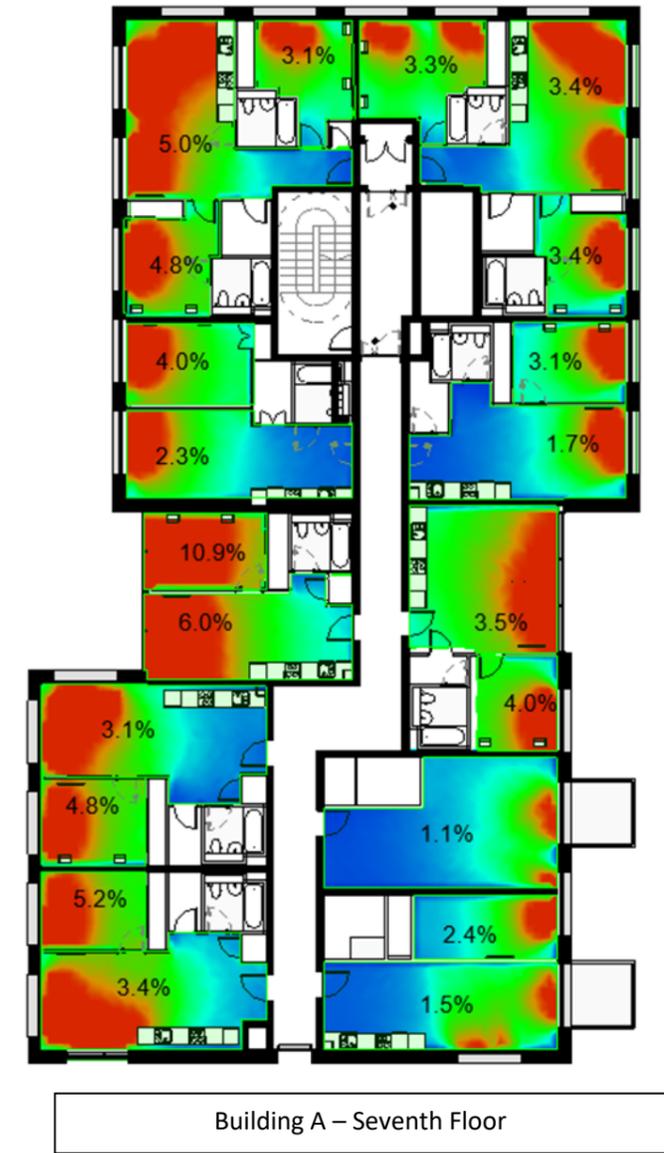
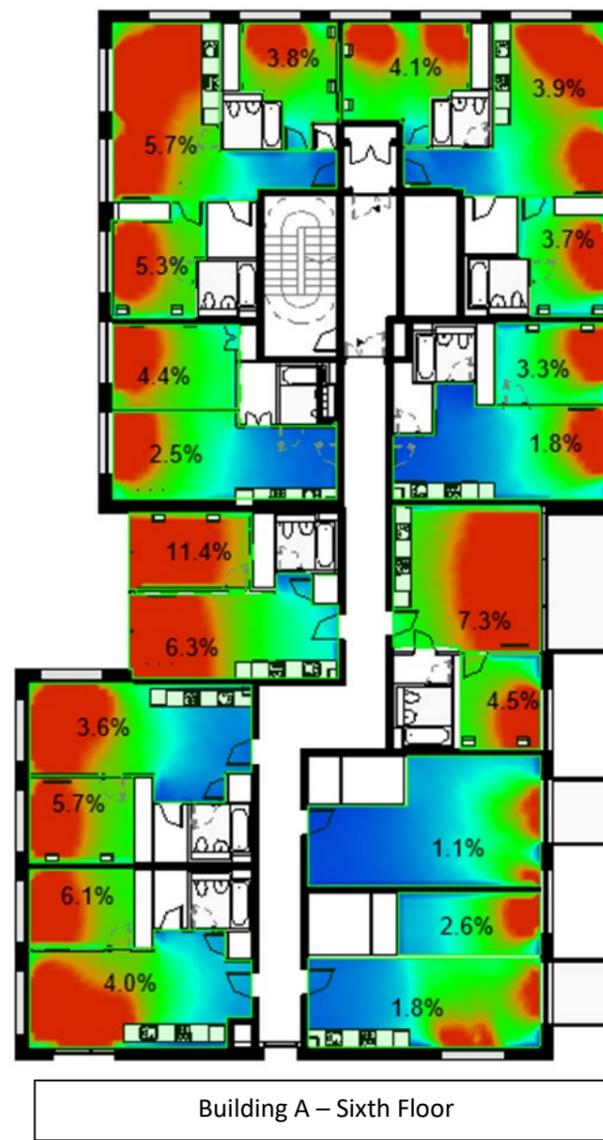
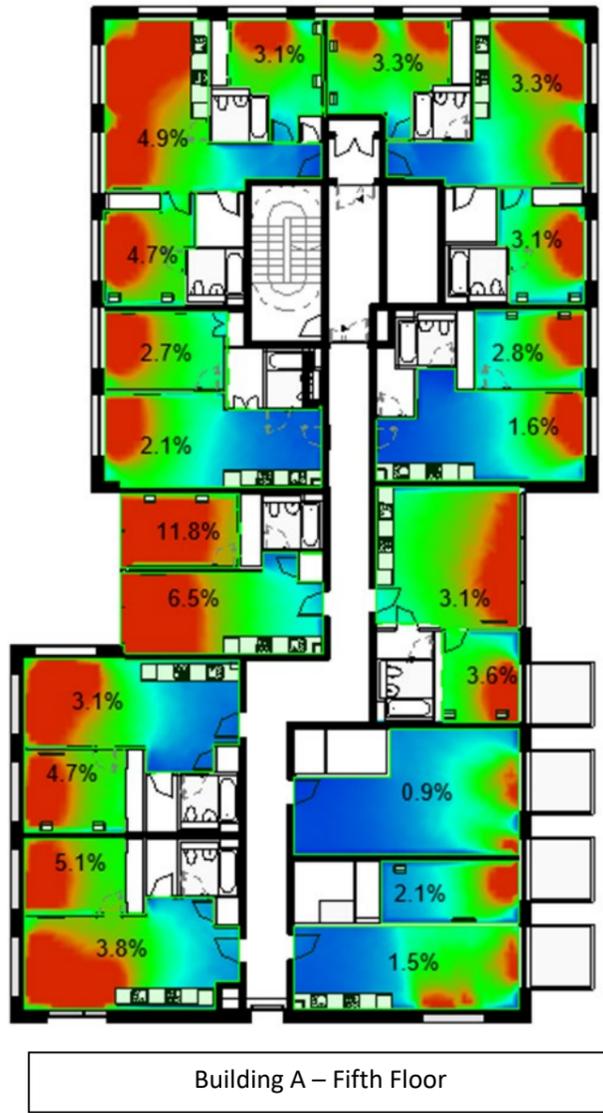
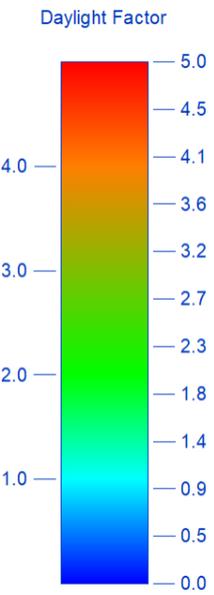
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.3 Building A



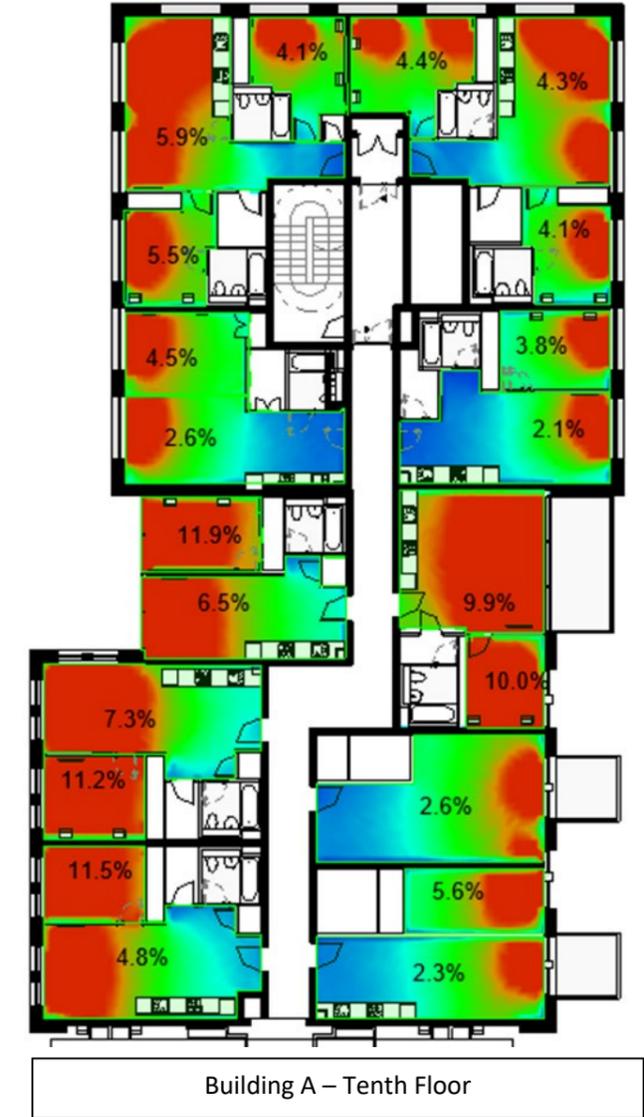
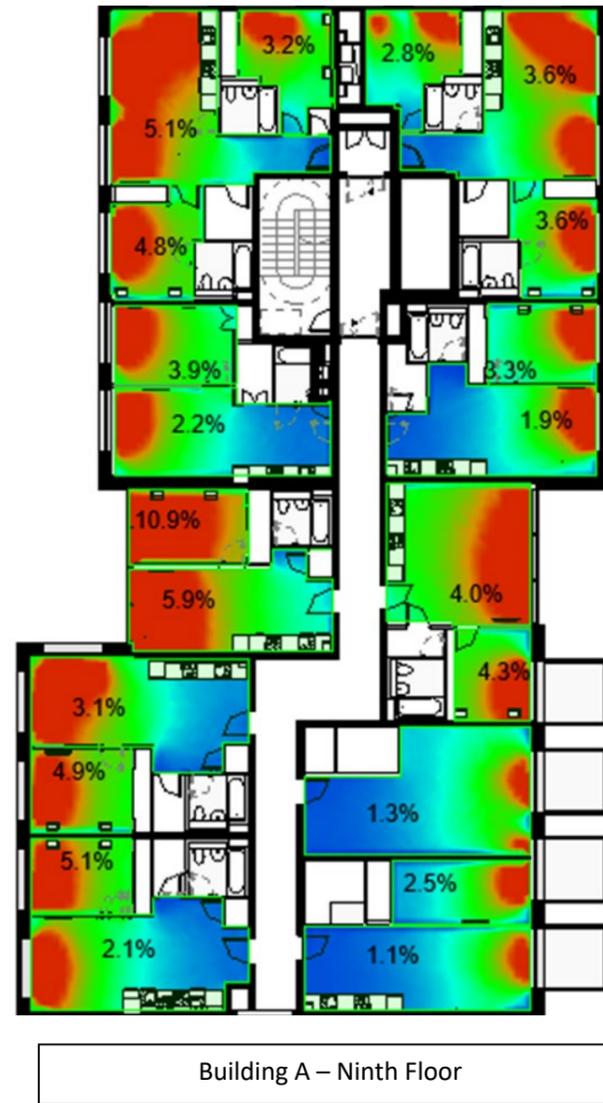
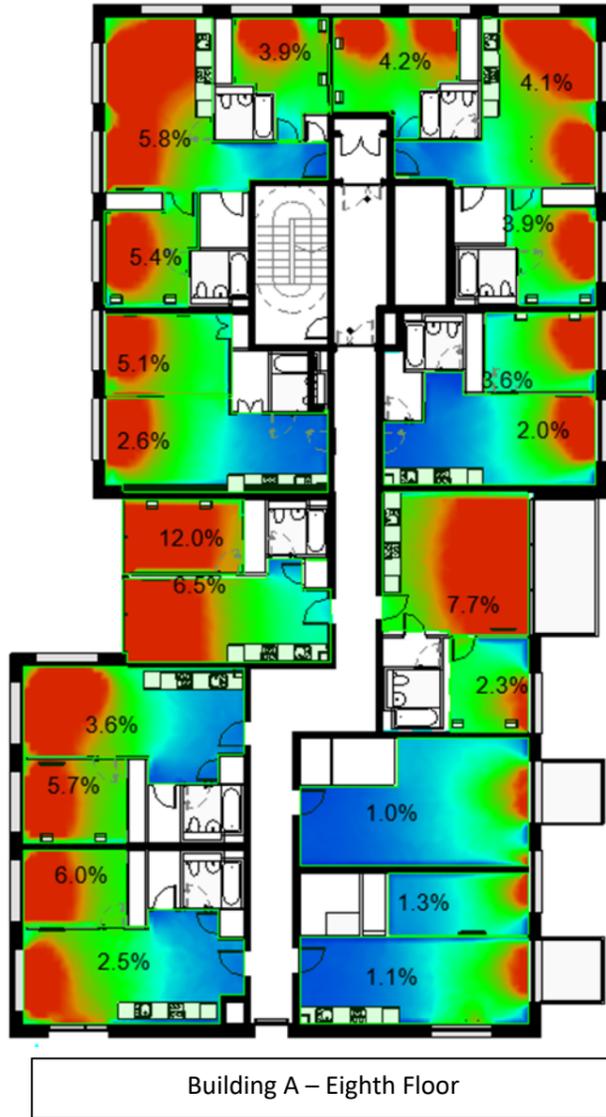
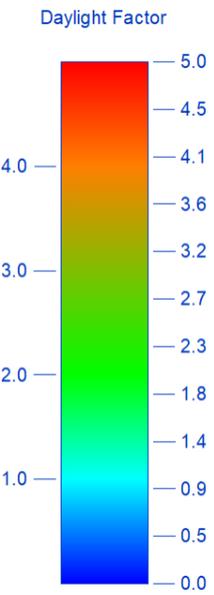
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.4 Building A



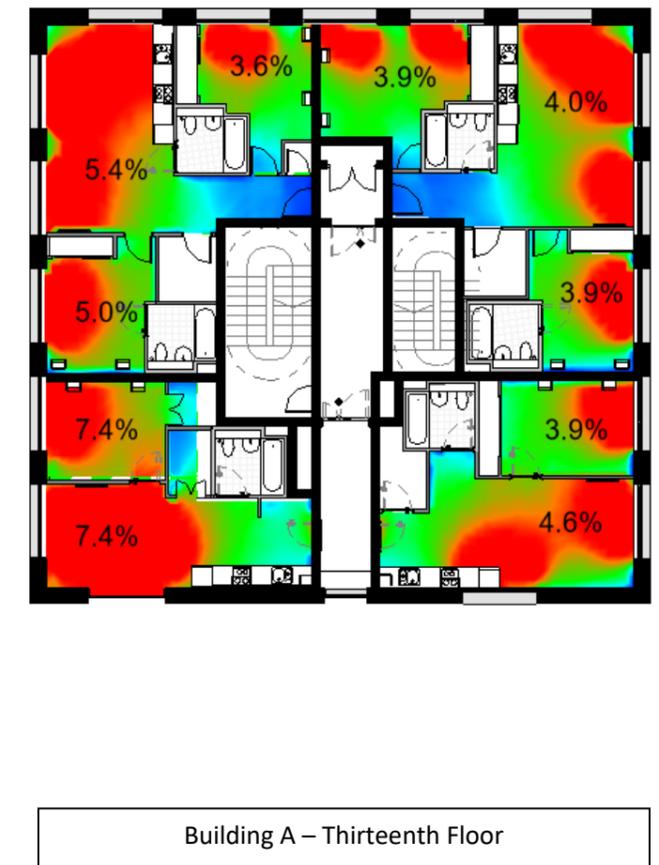
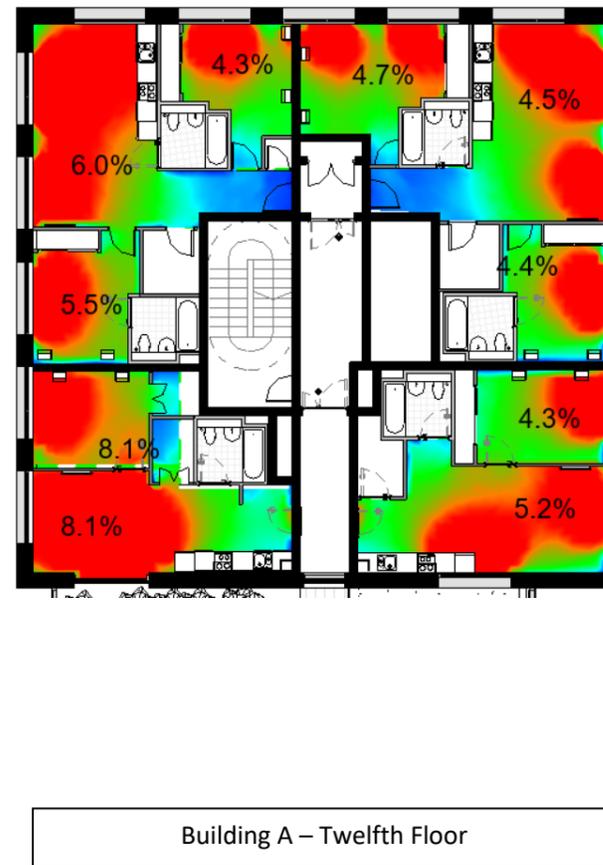
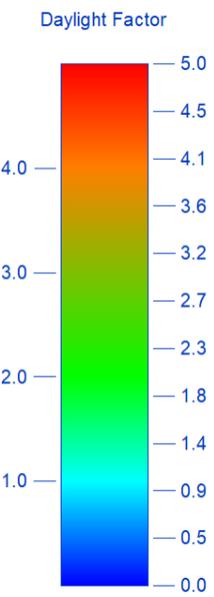
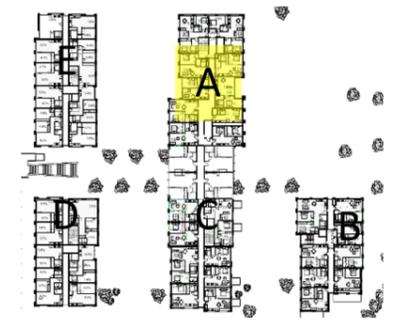
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.5 Building A



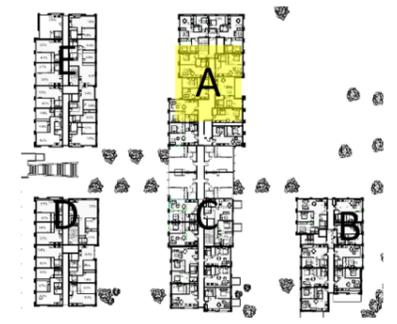
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.6 Building A

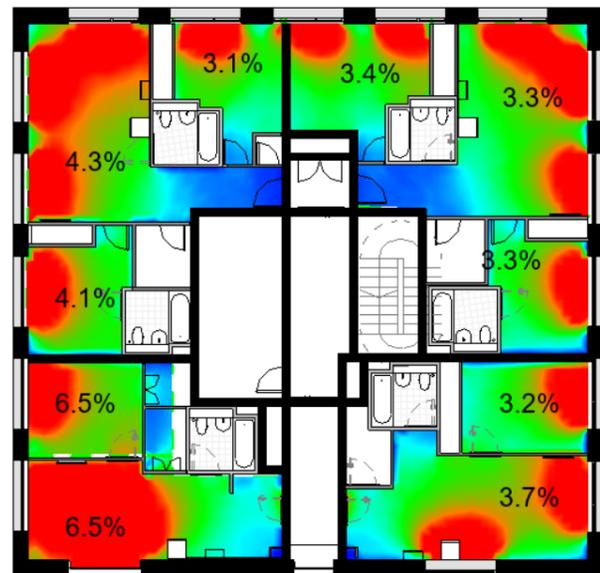
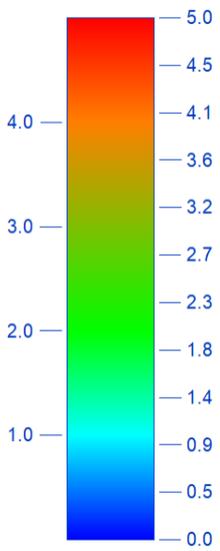


| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

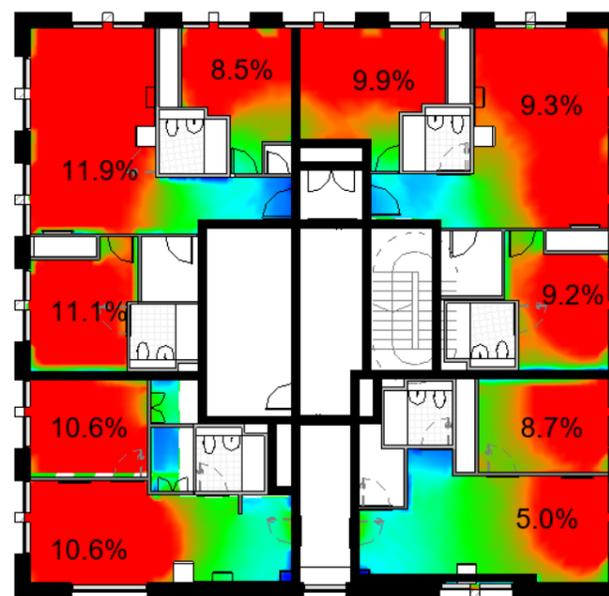
6.7 Building A



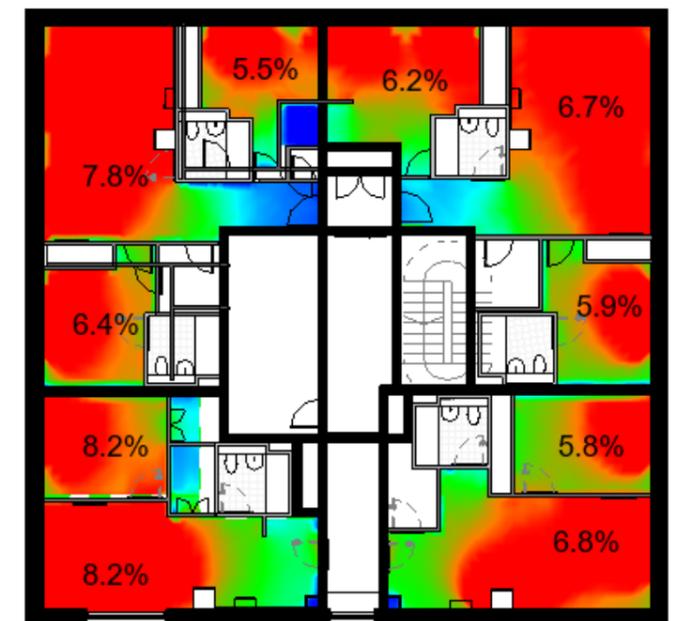
Daylight Factor



Building A – Fourteenth Floor



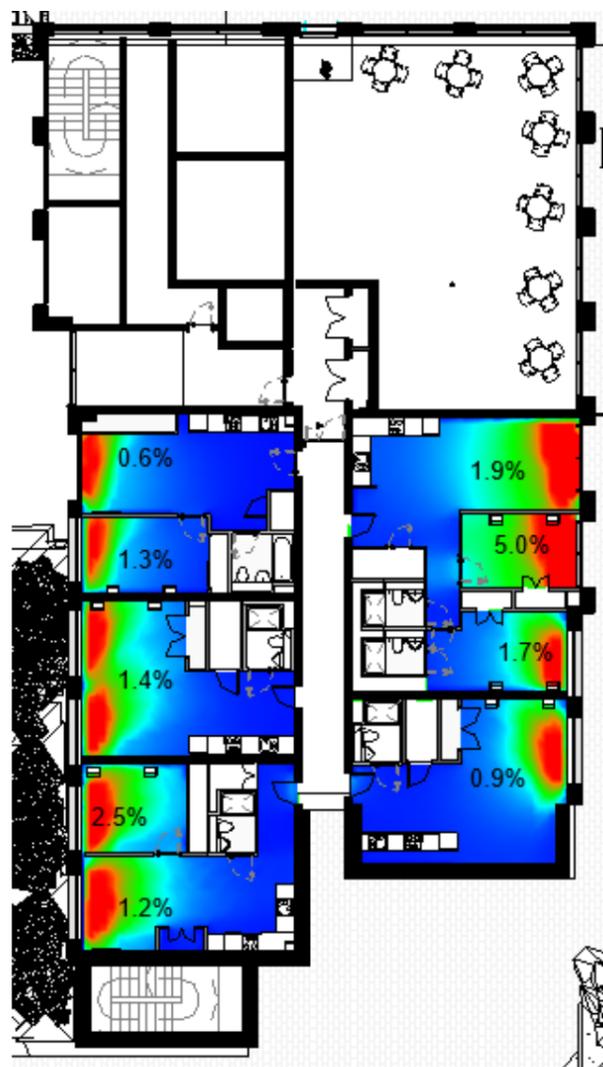
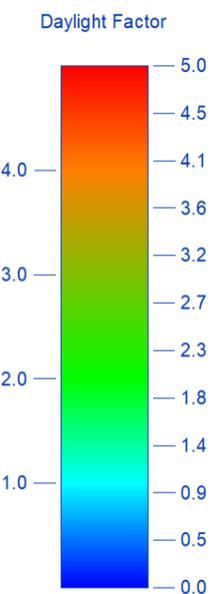
Building A – Fifteenth Floor



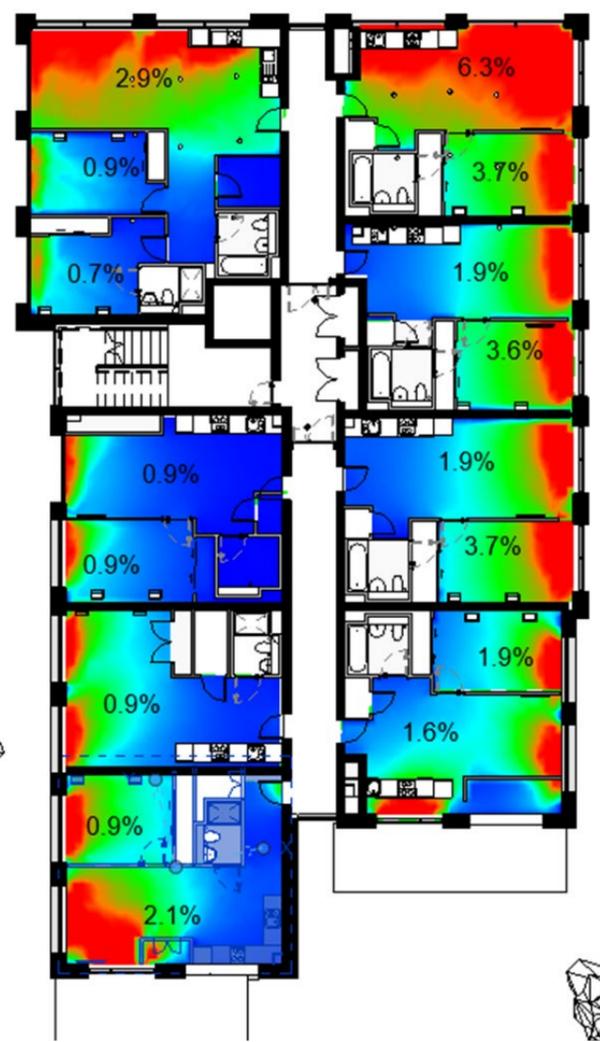
Building A – Sixteenth Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

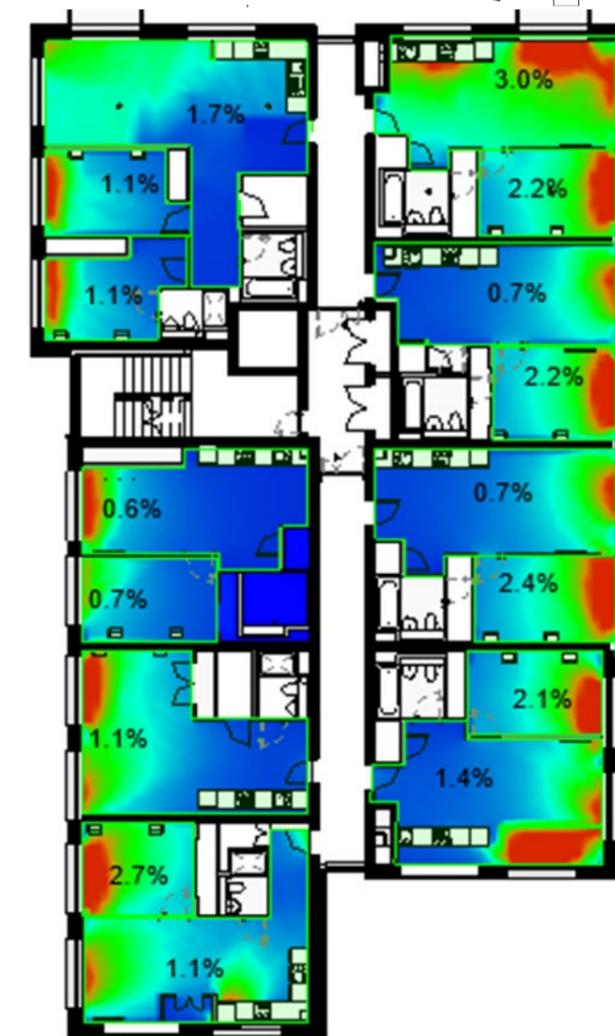
6.8 Building B



Building B – Ground Floor



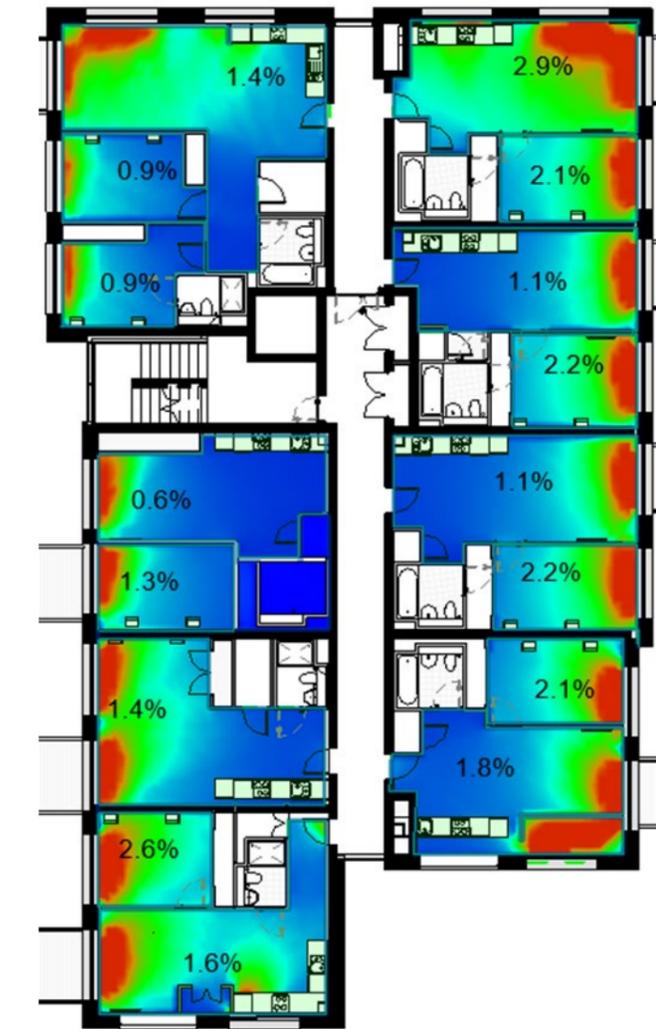
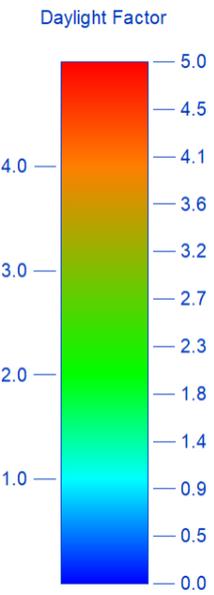
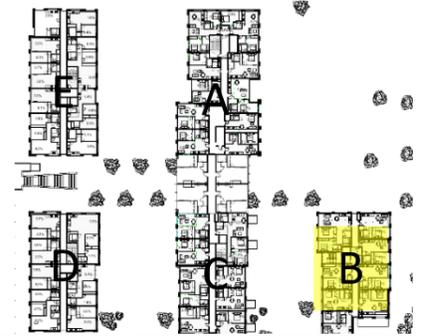
Building B – First Floor



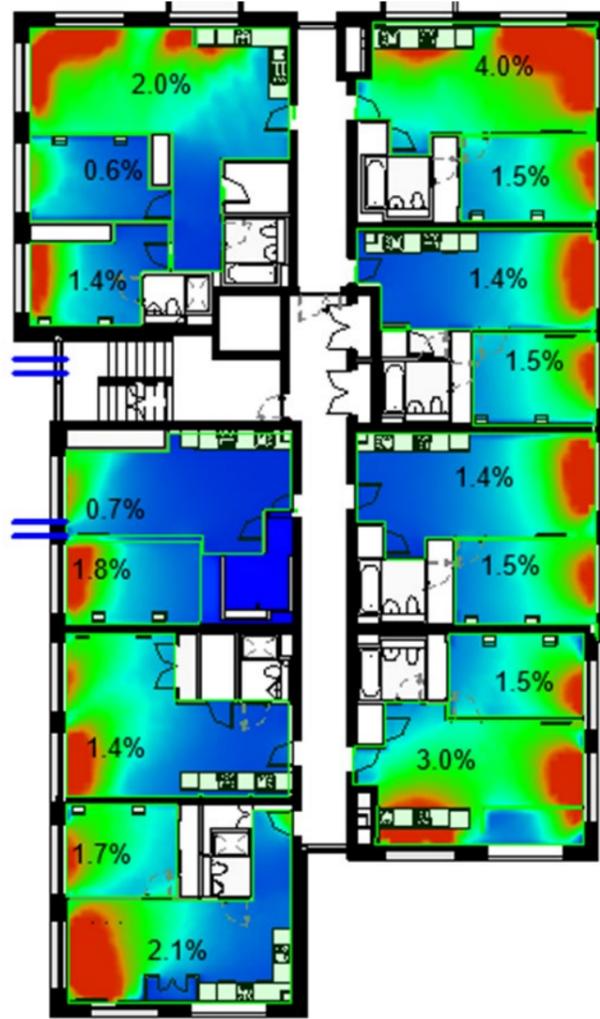
Building B – Second Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

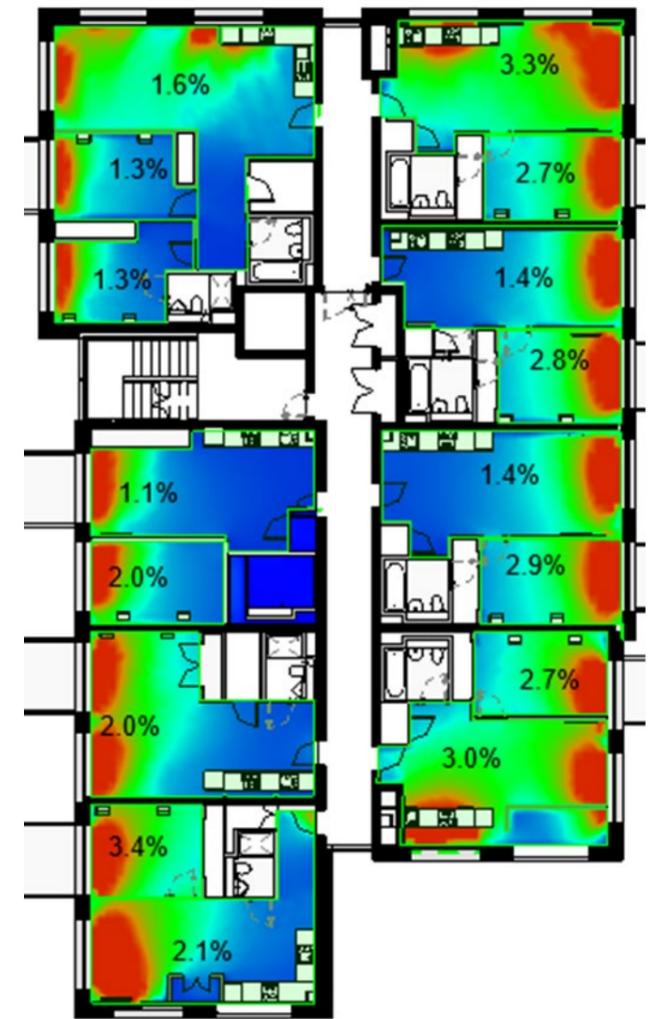
6.9 Building B



Building B – Third Floor



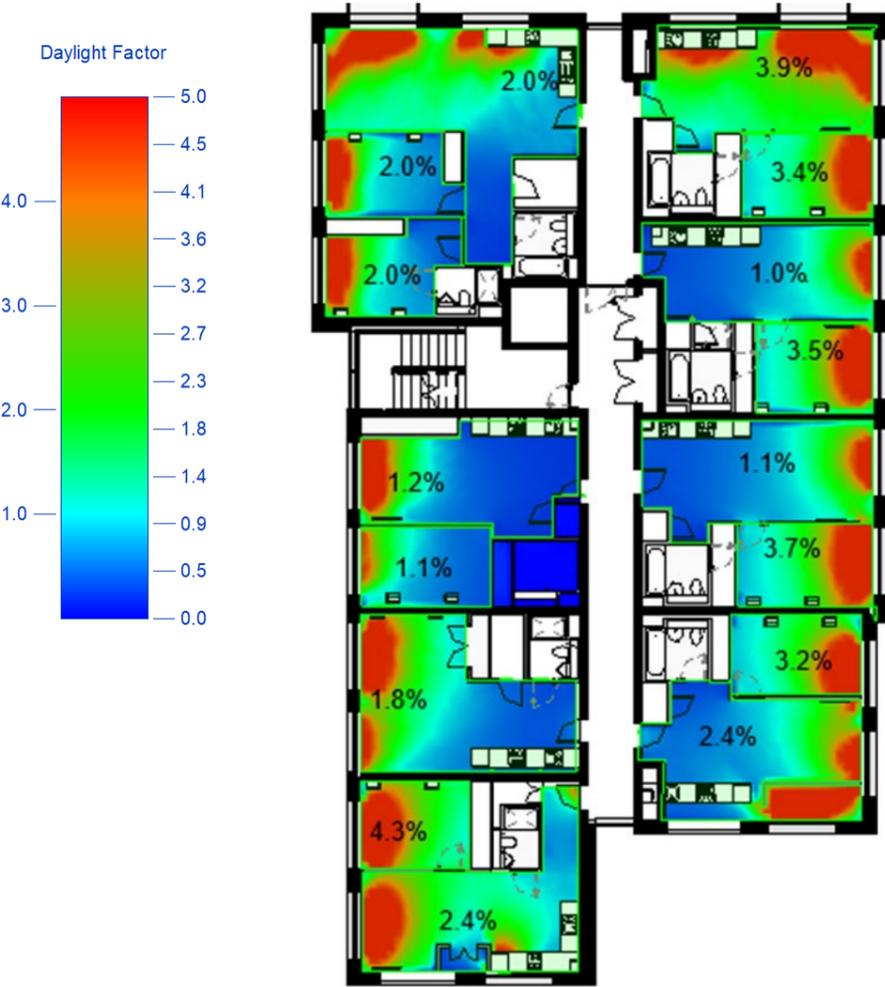
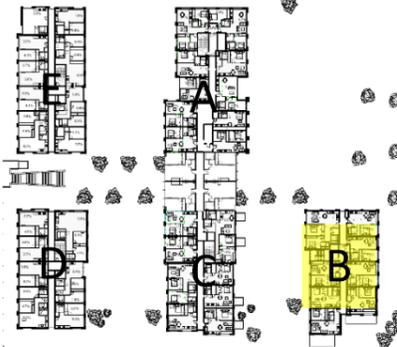
Building B – Fourth Floor



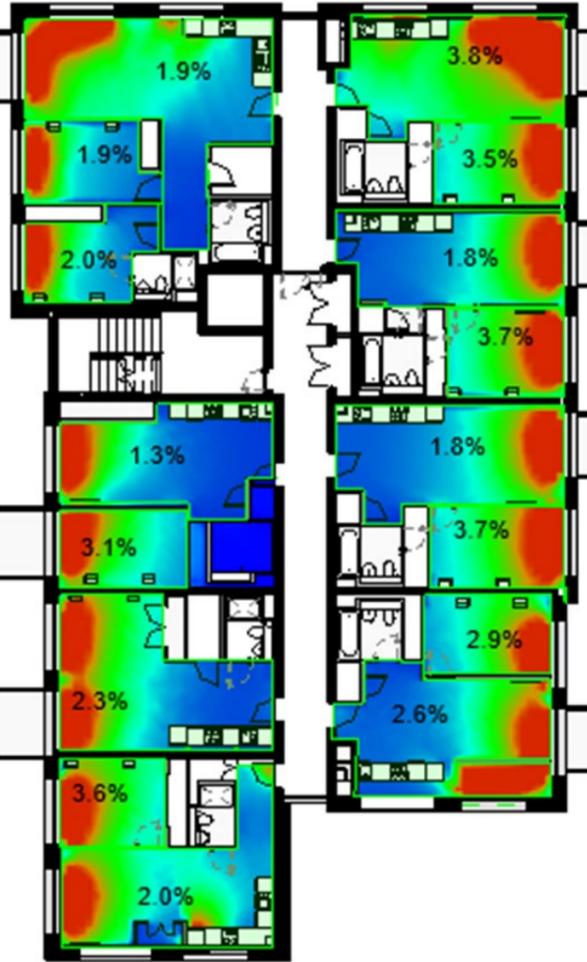
Building B – Fifth Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

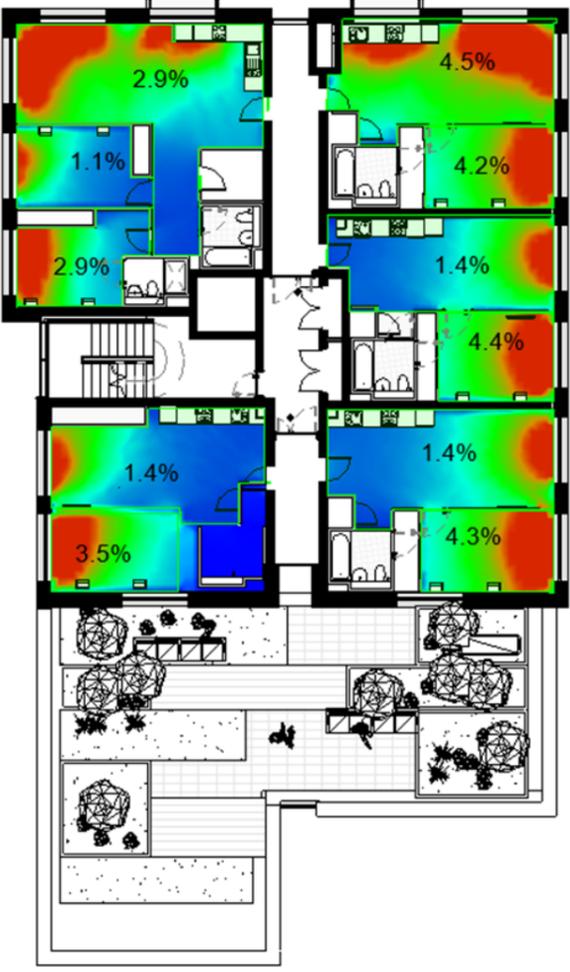
6.10 Building B



Building B – Sixth Floor



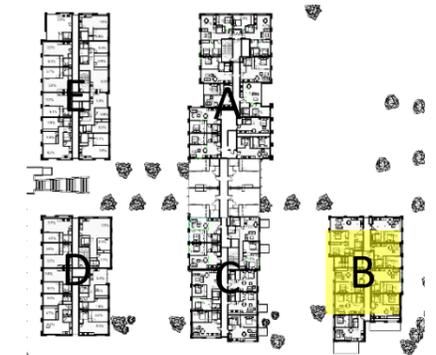
Building B – Seventh Floor



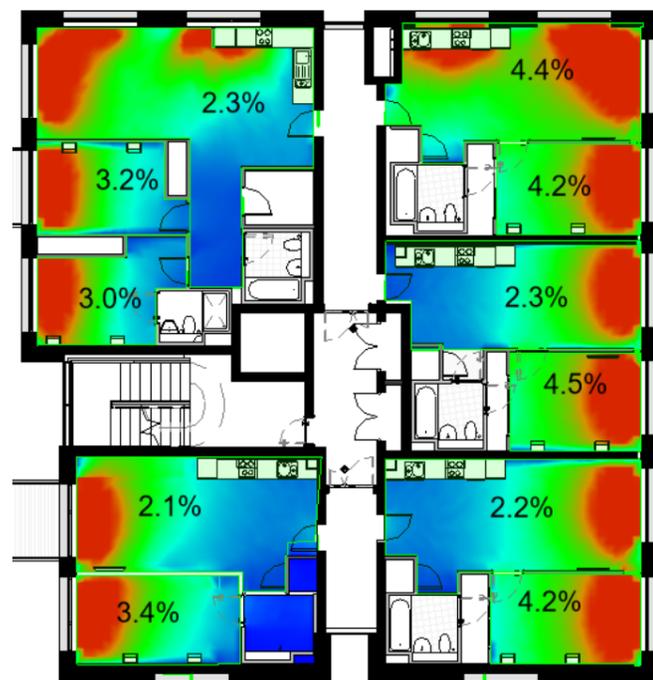
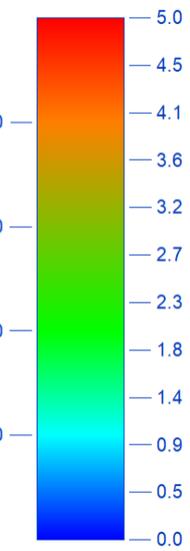
Building B – Eighth Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

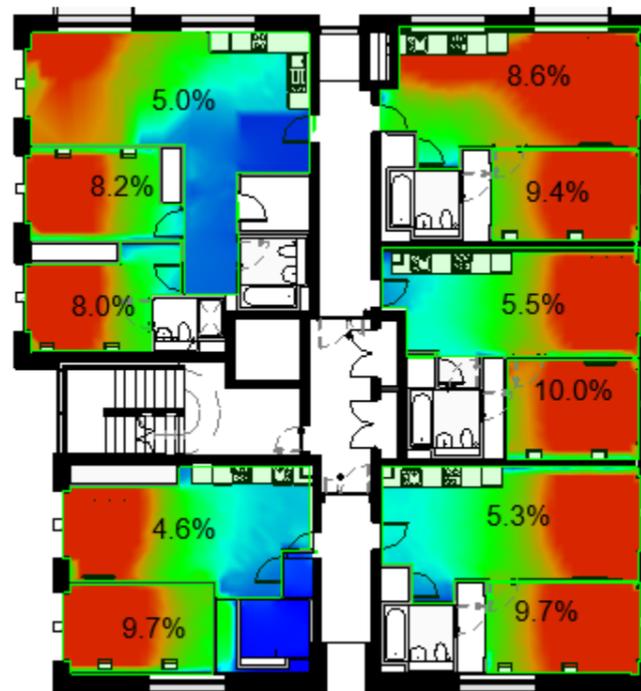
6.11 Building B



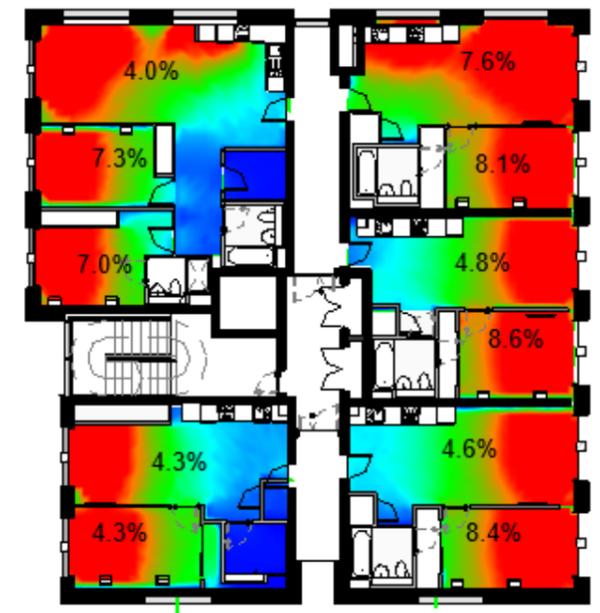
Daylight Factor



Building B – Ninth Floor



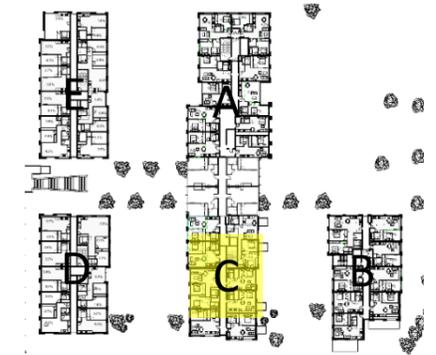
Building B – Tenth Floor



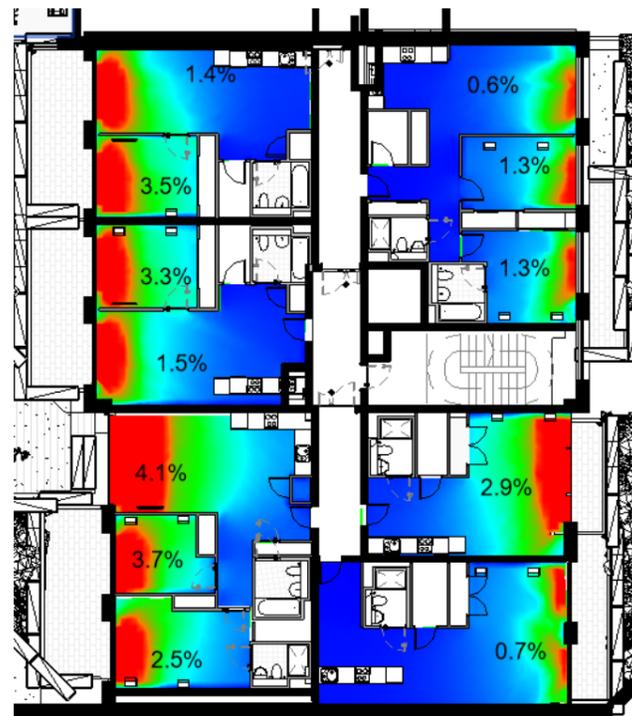
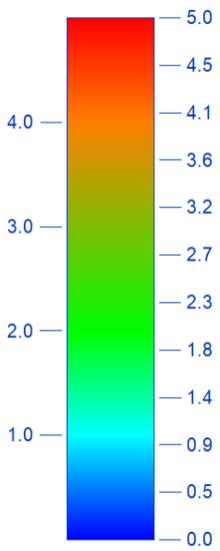
Building B – Eleventh Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

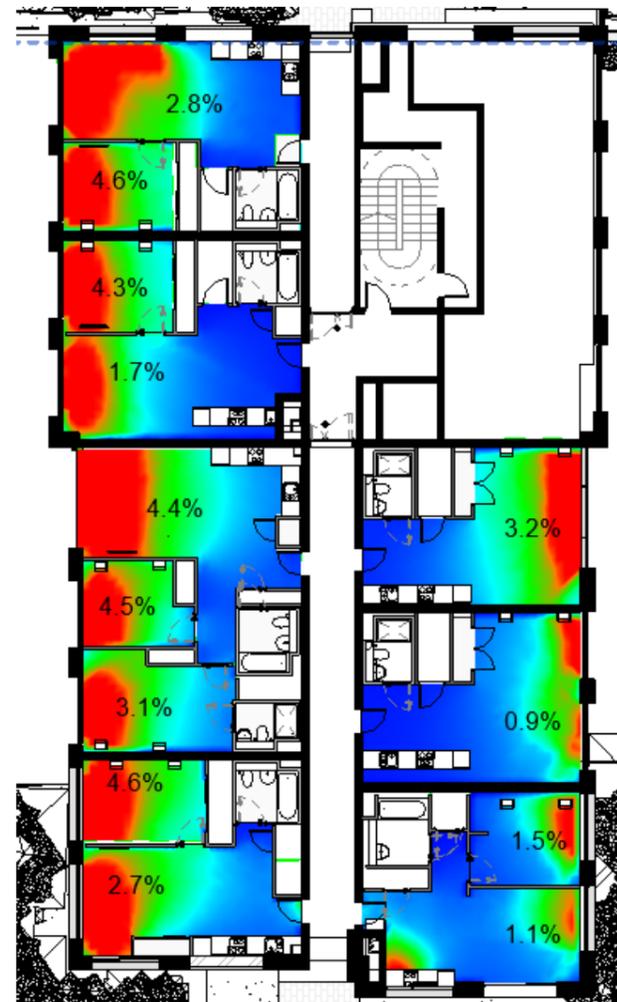
6.12 Building C



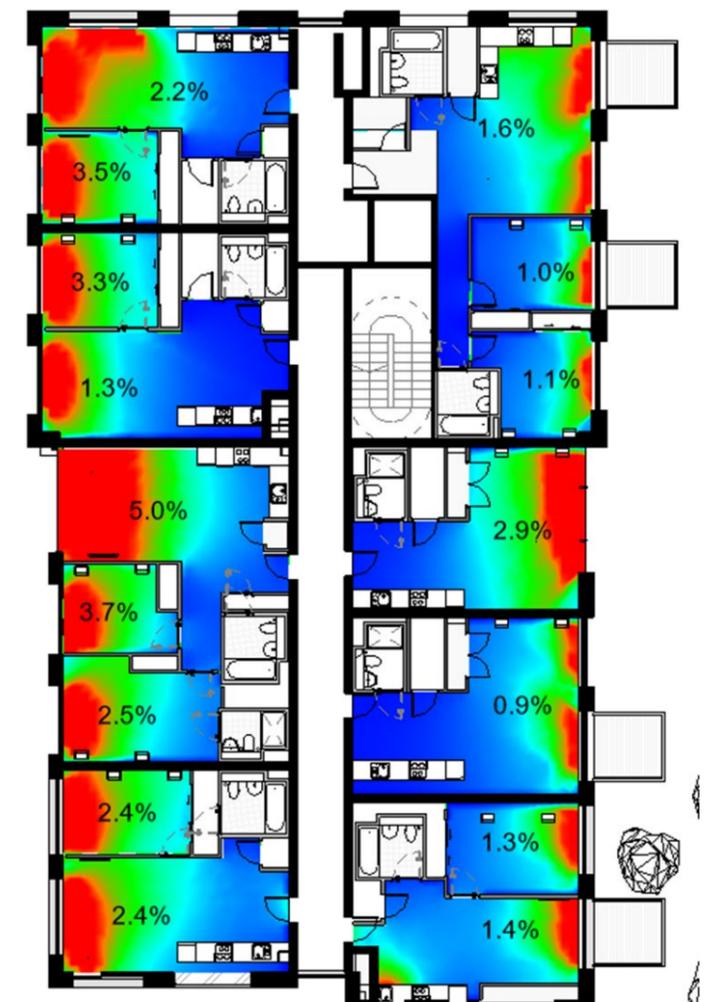
Daylight Factor



Building C – Lower Ground Floor



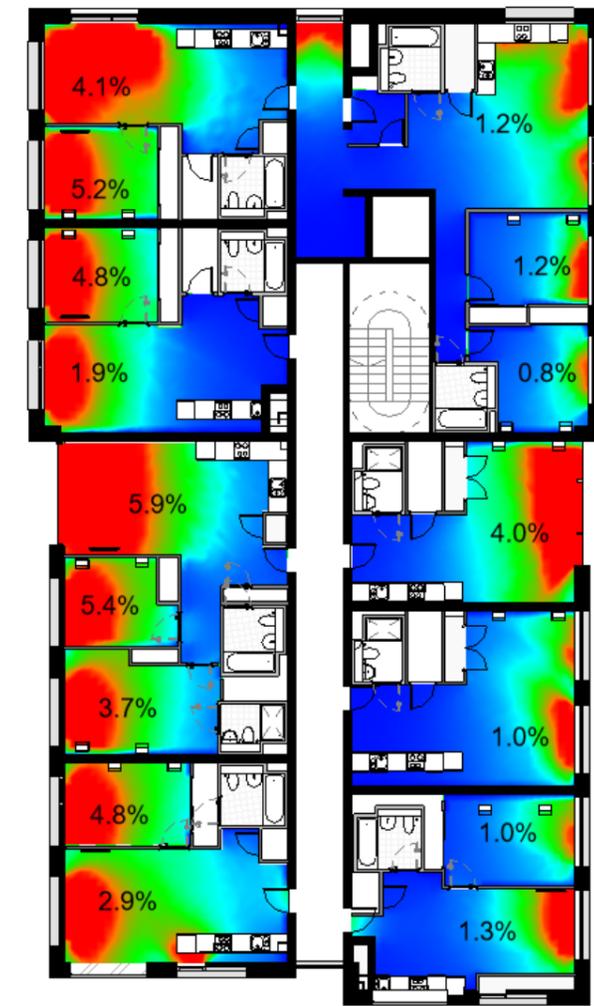
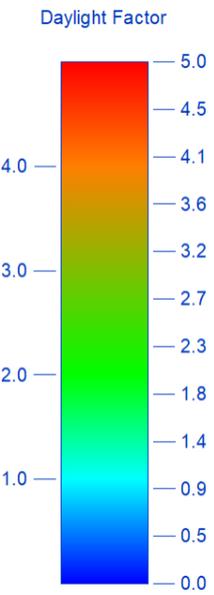
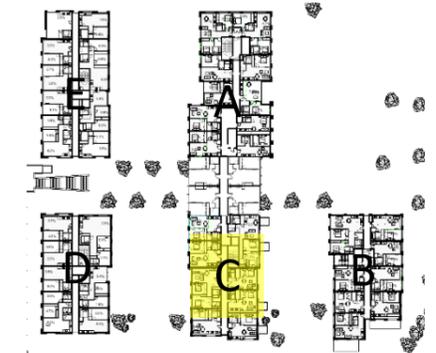
Building C – Ground Floor



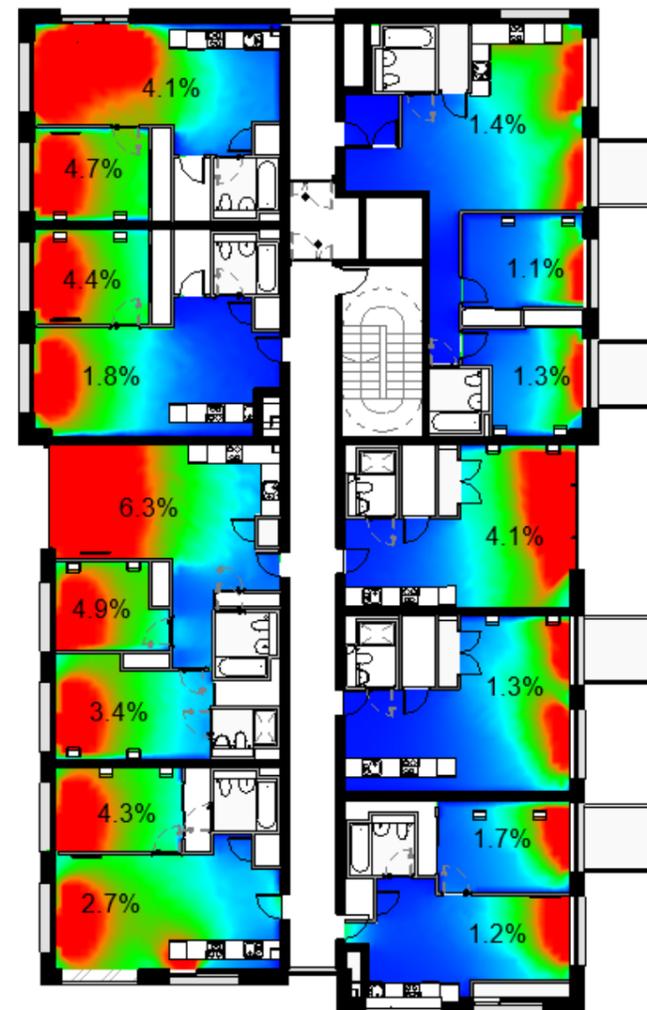
Building C – First Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

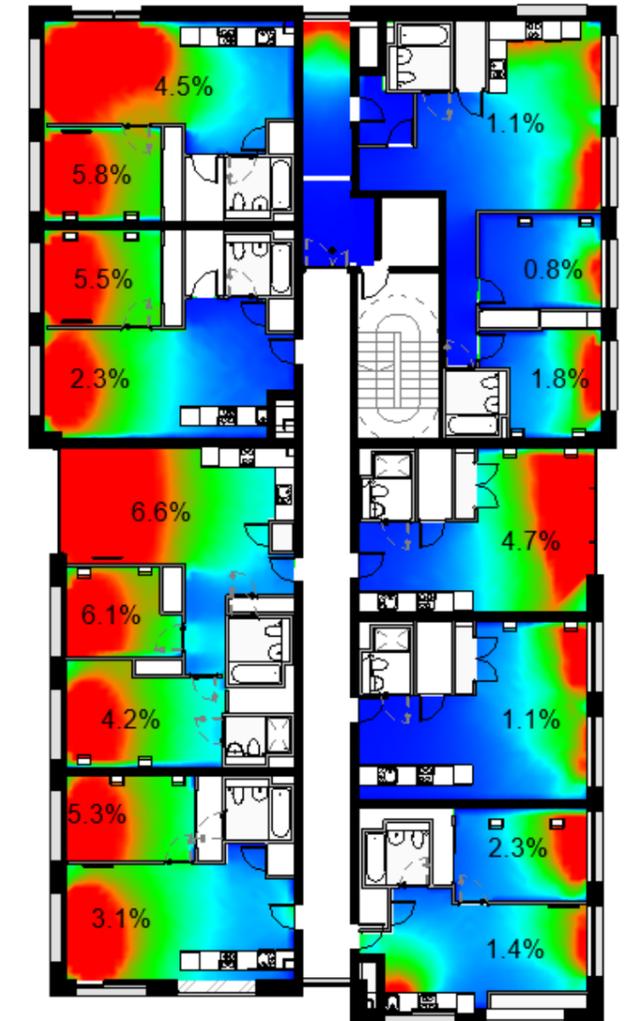
6.13 Building C



Building C – Second Floor



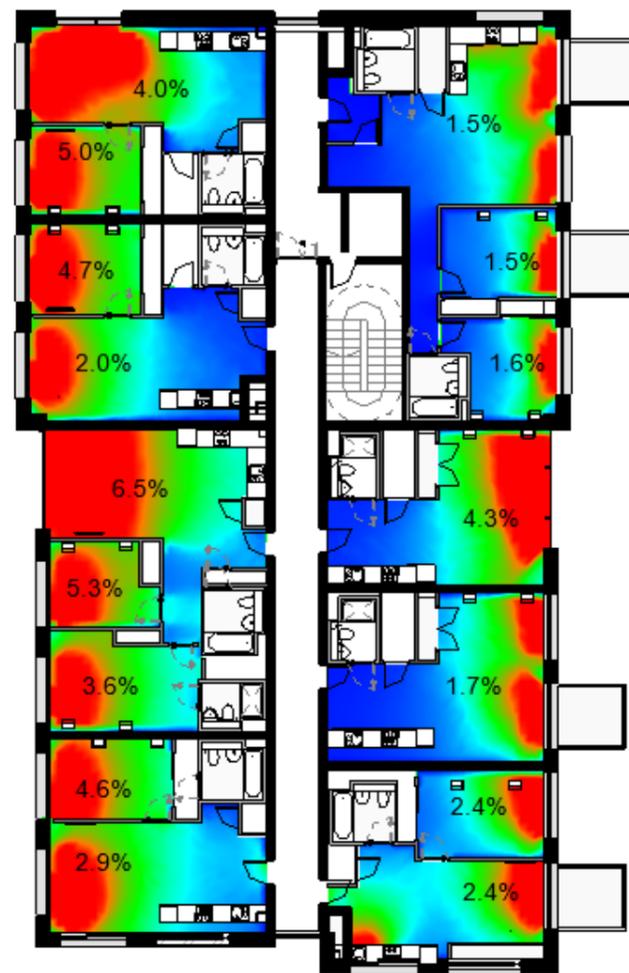
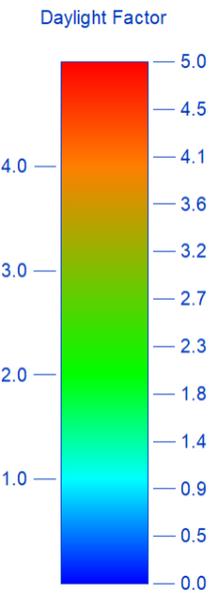
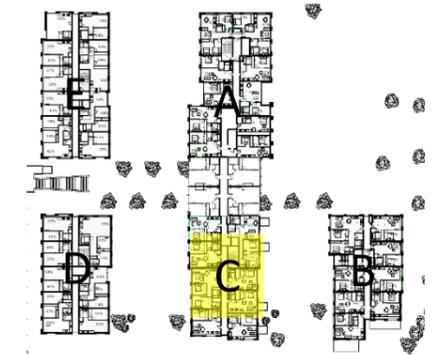
Building C – Third Floor



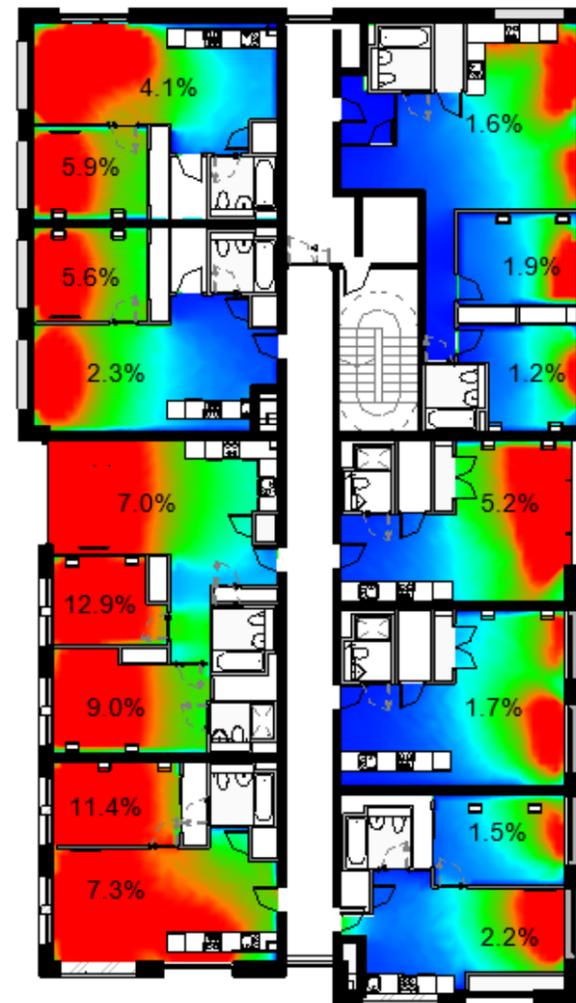
Building C – Fourth Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

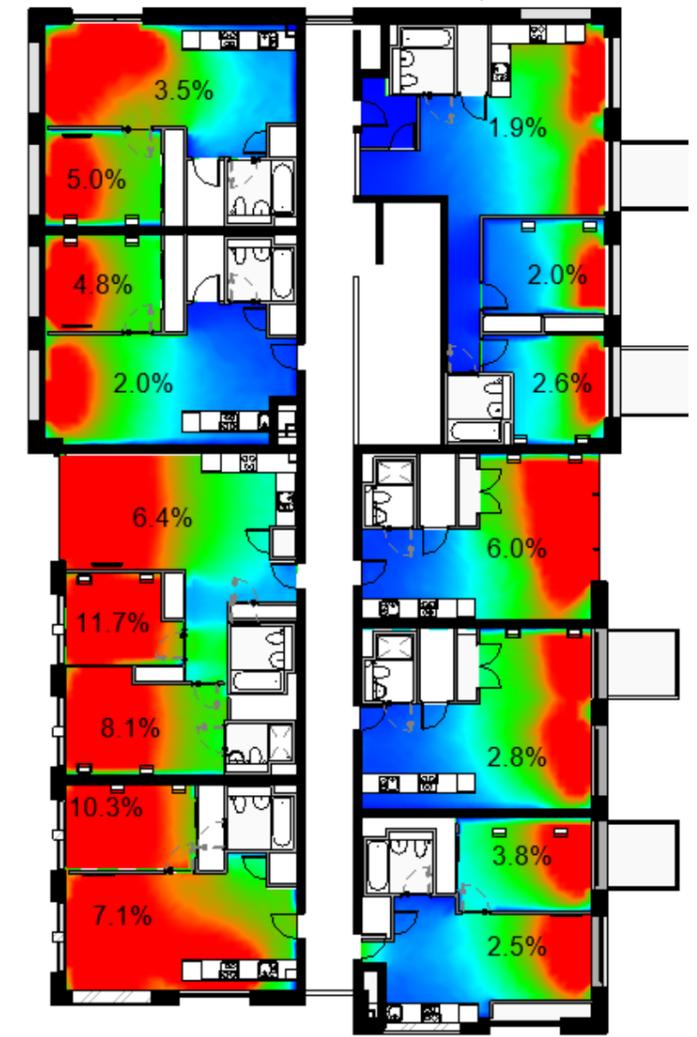
6.14 Building C



Building C – Fifth Floor



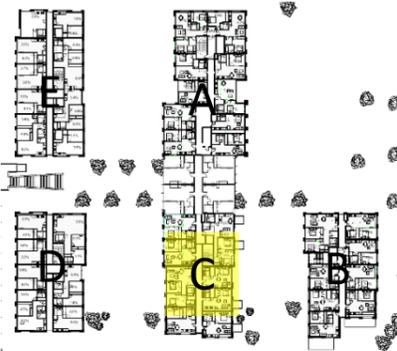
Building C – Sixth Floor



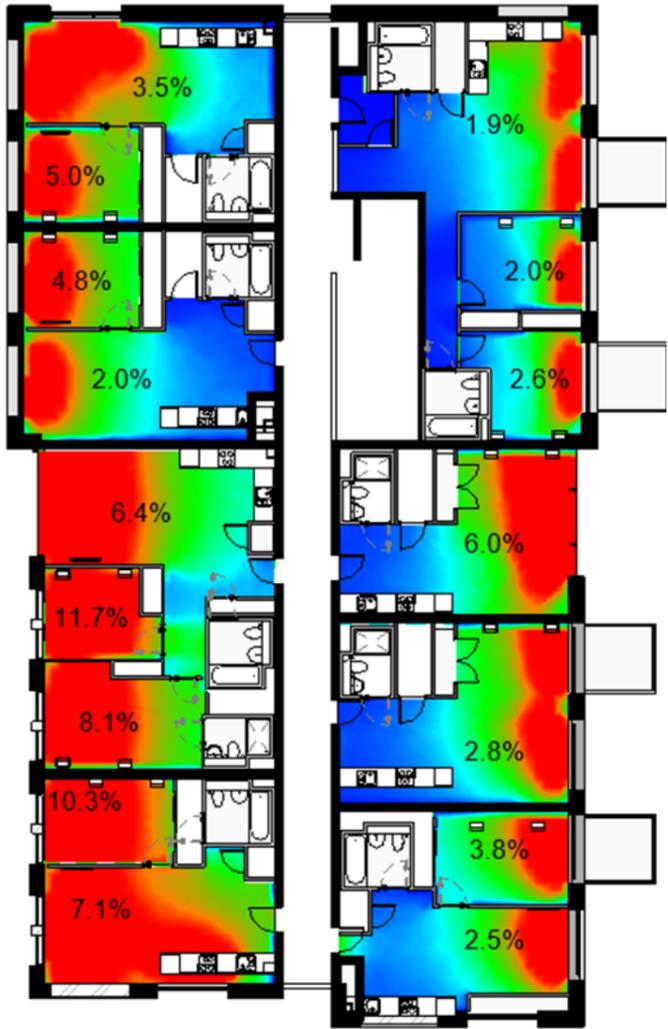
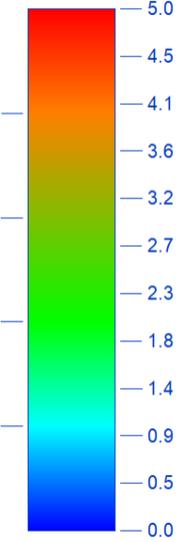
Building C – Seventh Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

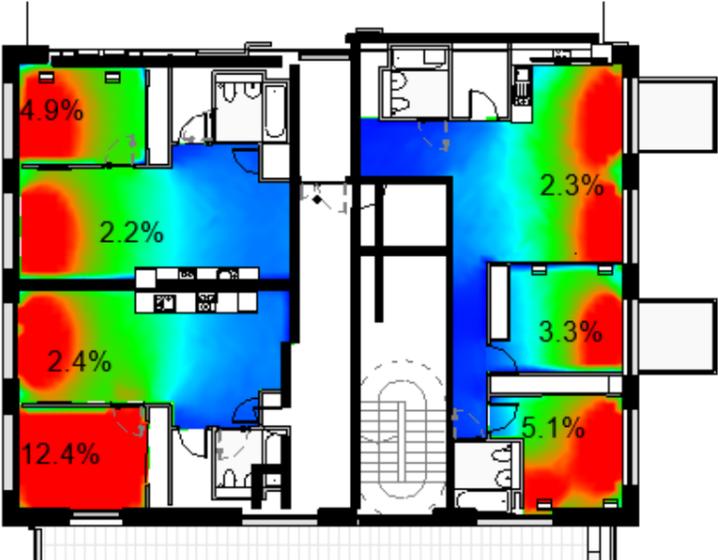
6.15 Building C



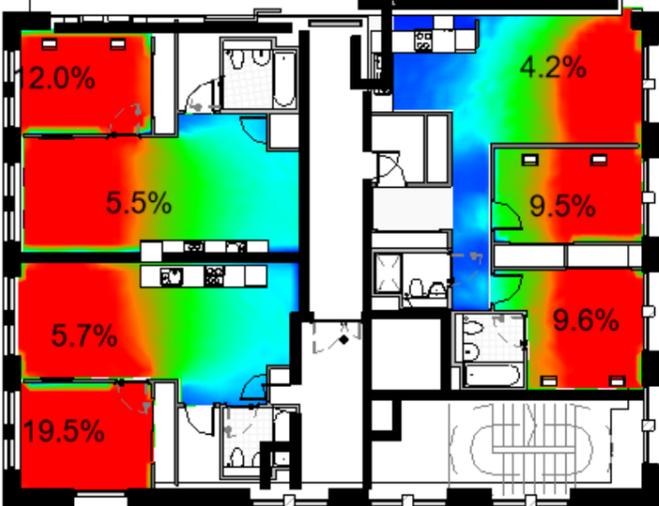
Daylight Factor



Building C – Eighth Floor



Building C – Ninth Floor

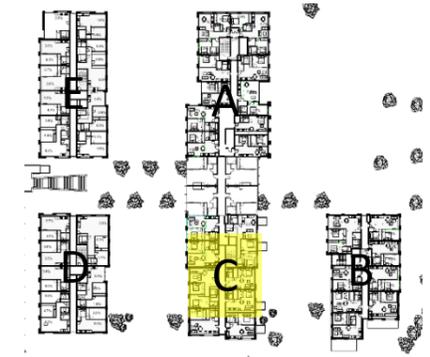


Building C – Tenth Floor

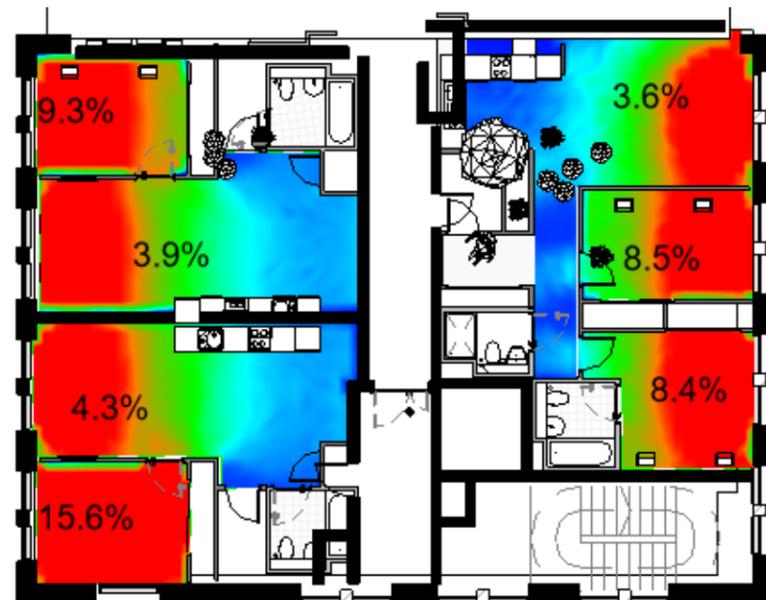
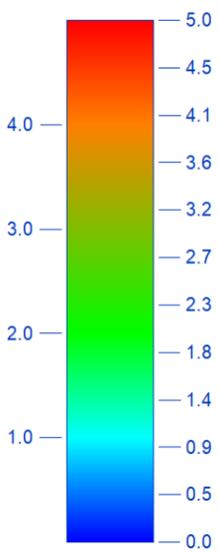
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

### 6.16 Building C

All rooms are compliant with BRE guidelines.



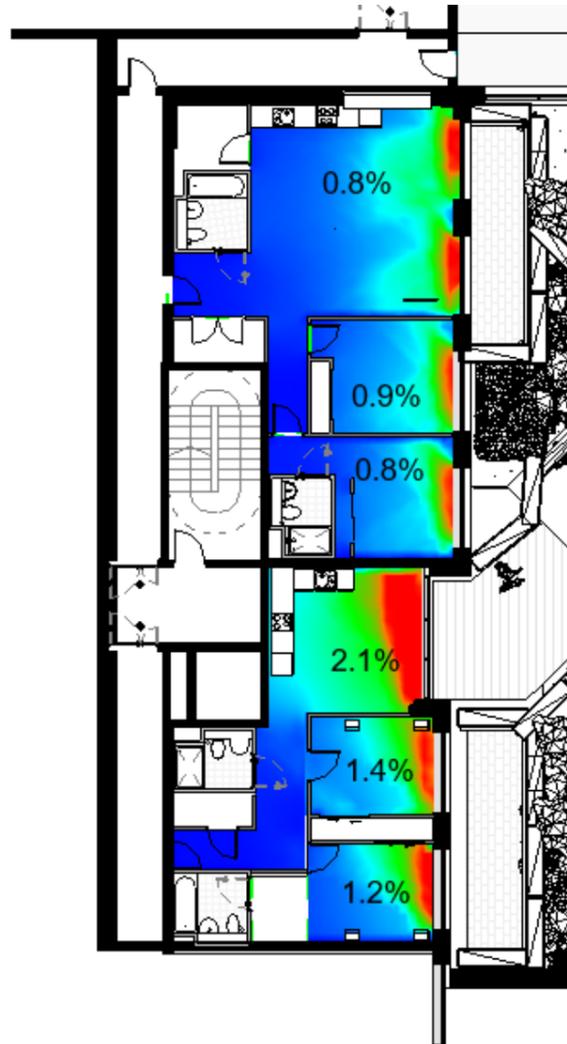
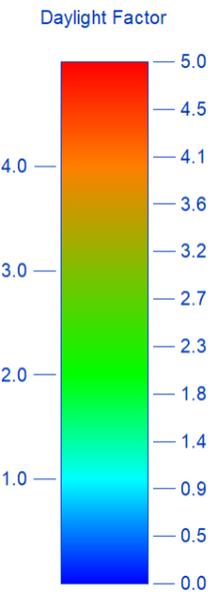
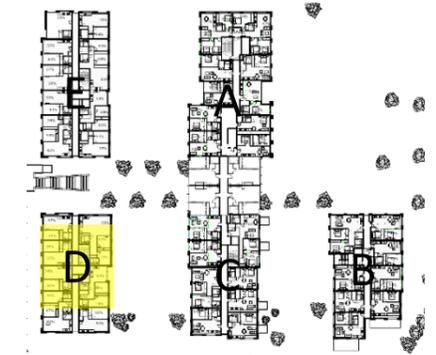
Daylight Factor



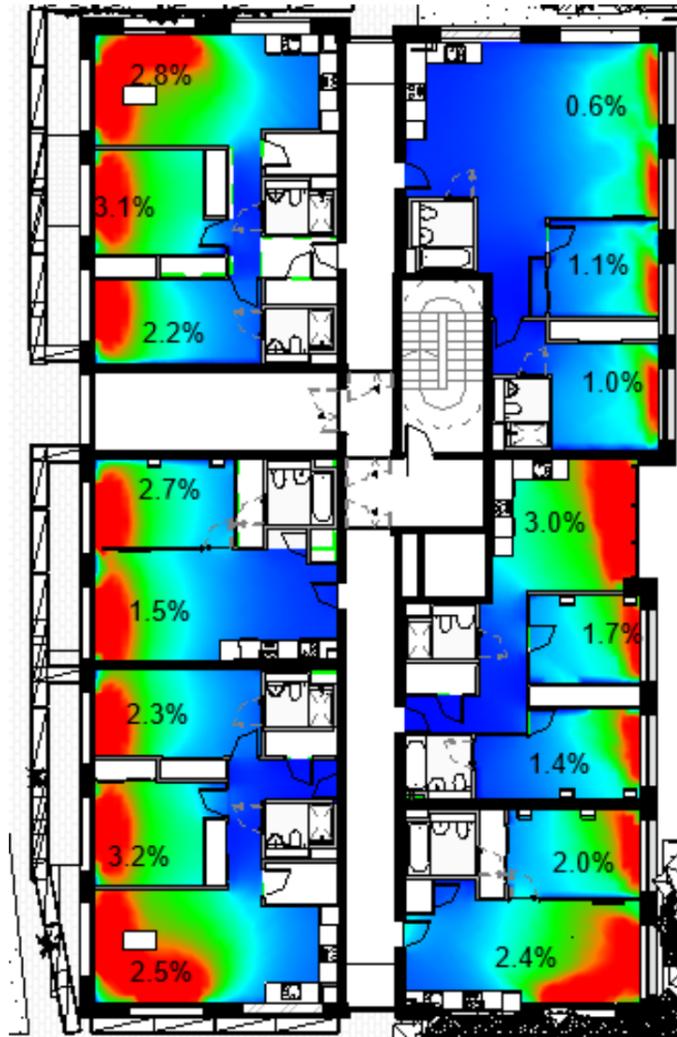
Building C – Eleventh Floor

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

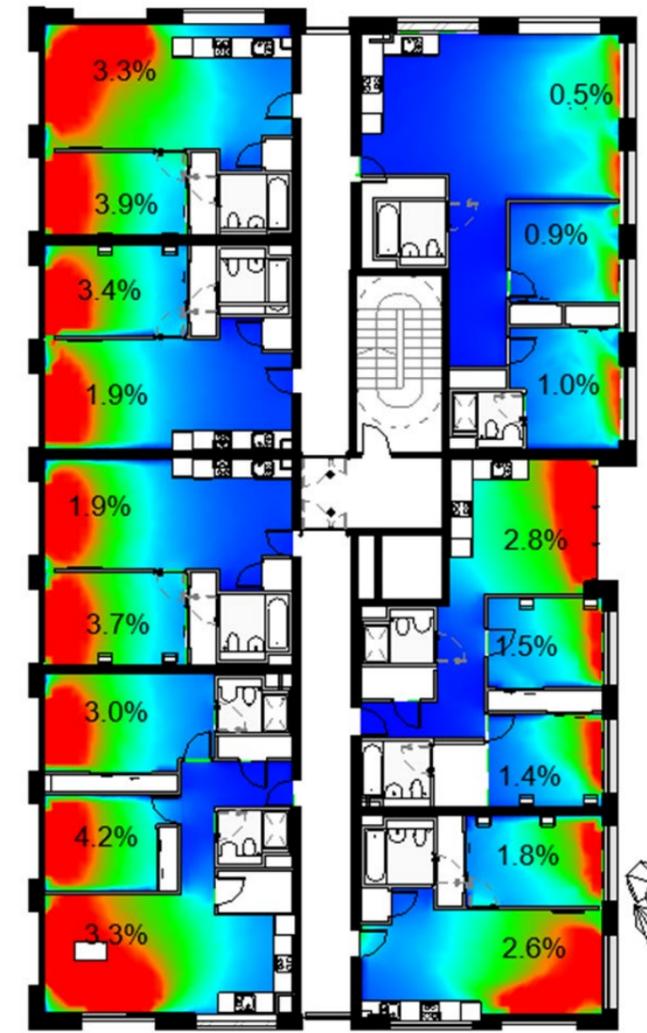
6.17 Building D



Building D – Lower Ground Floor



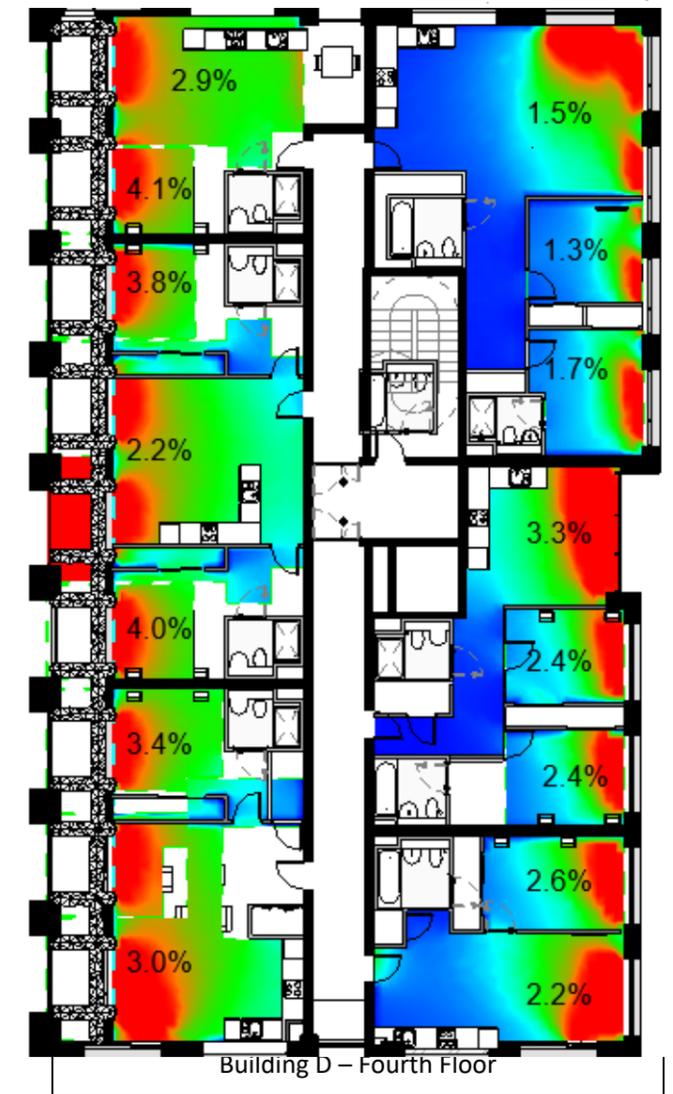
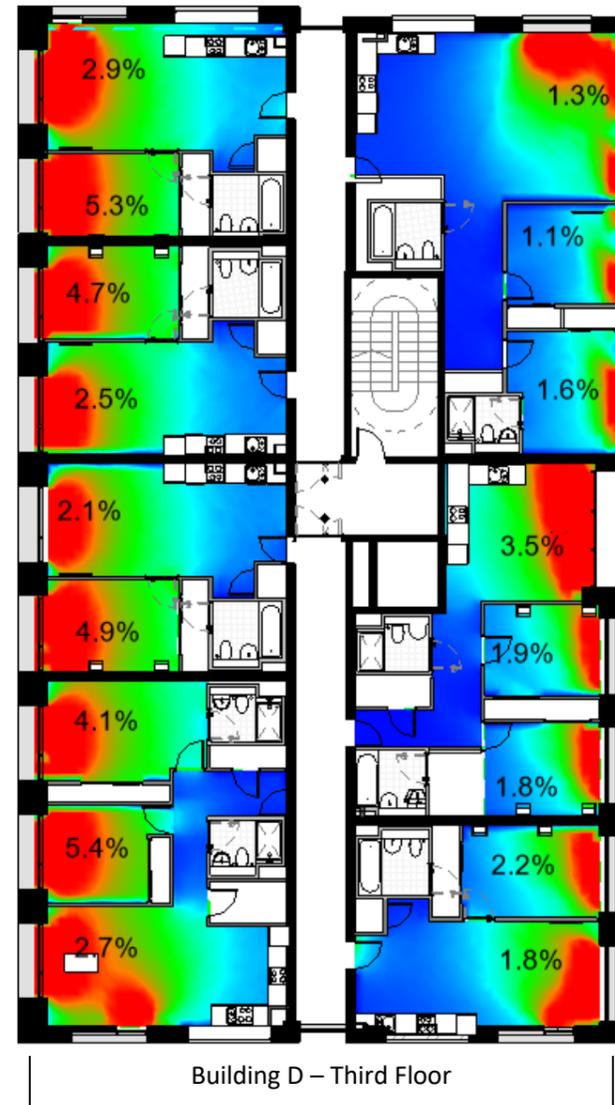
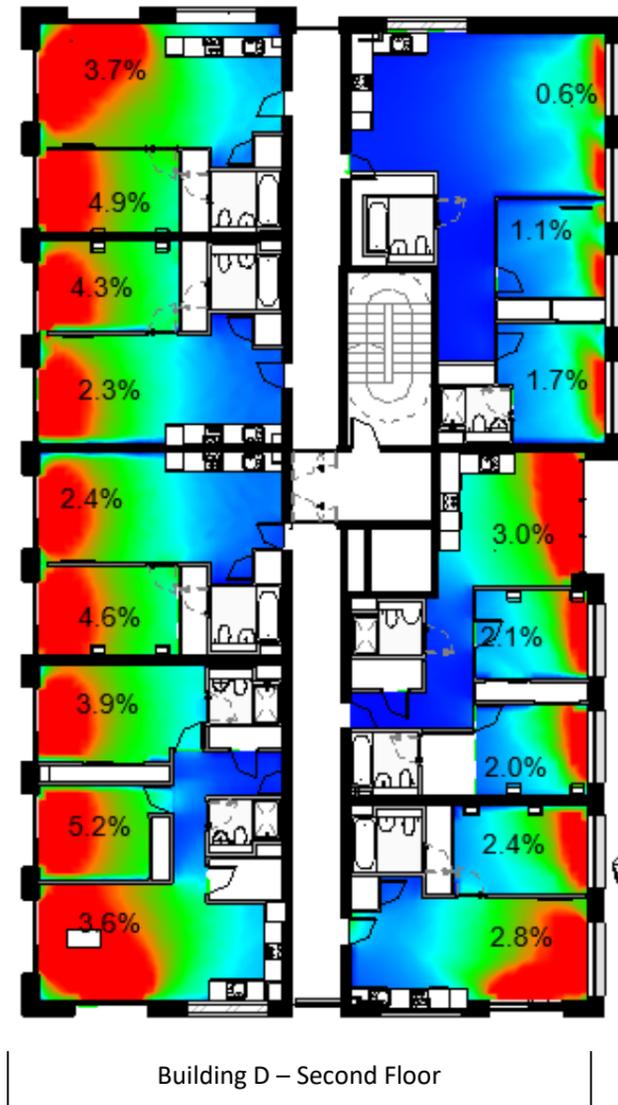
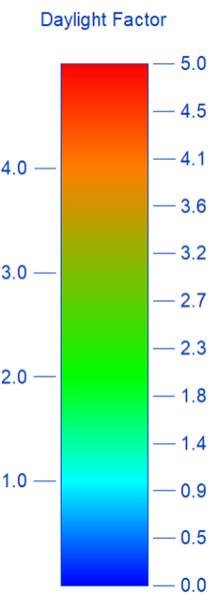
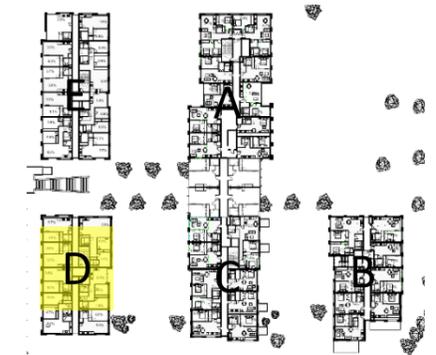
Building D – Ground Floor



Building D – First Floor

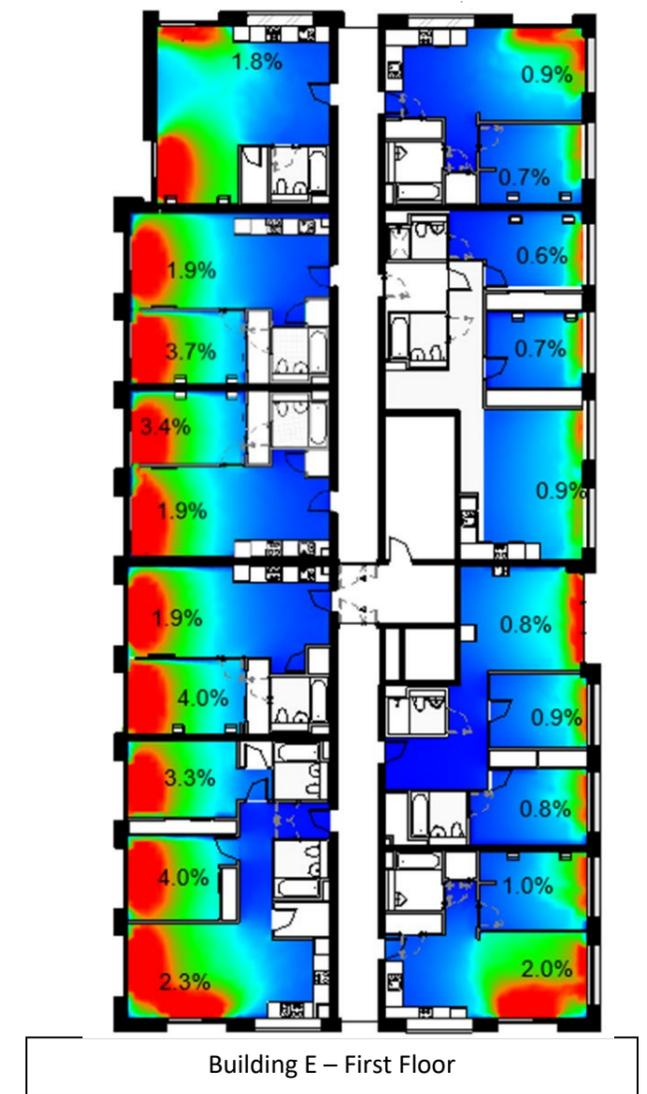
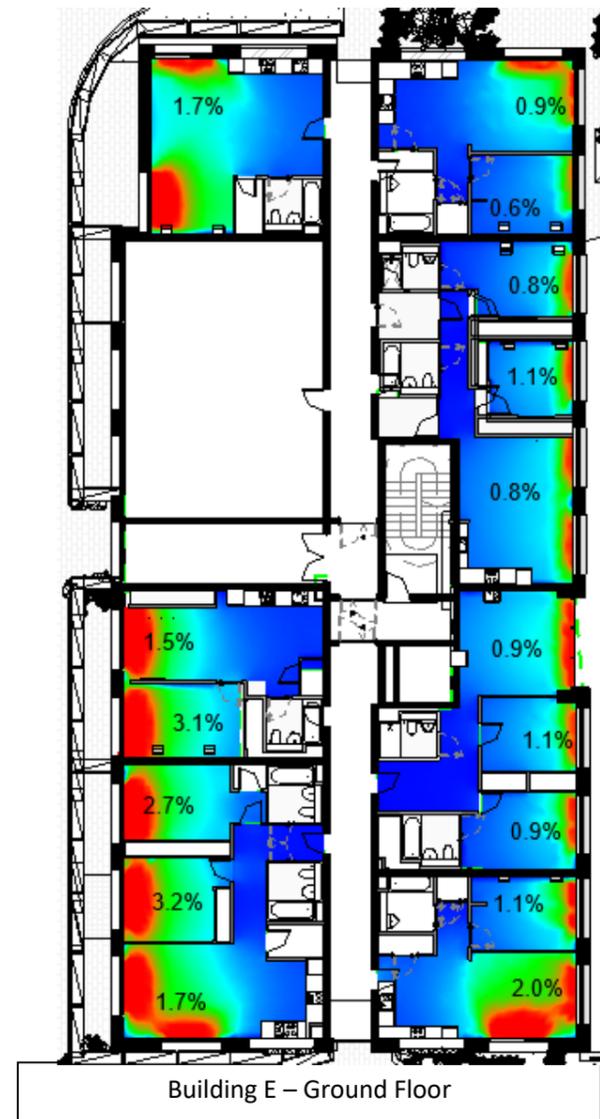
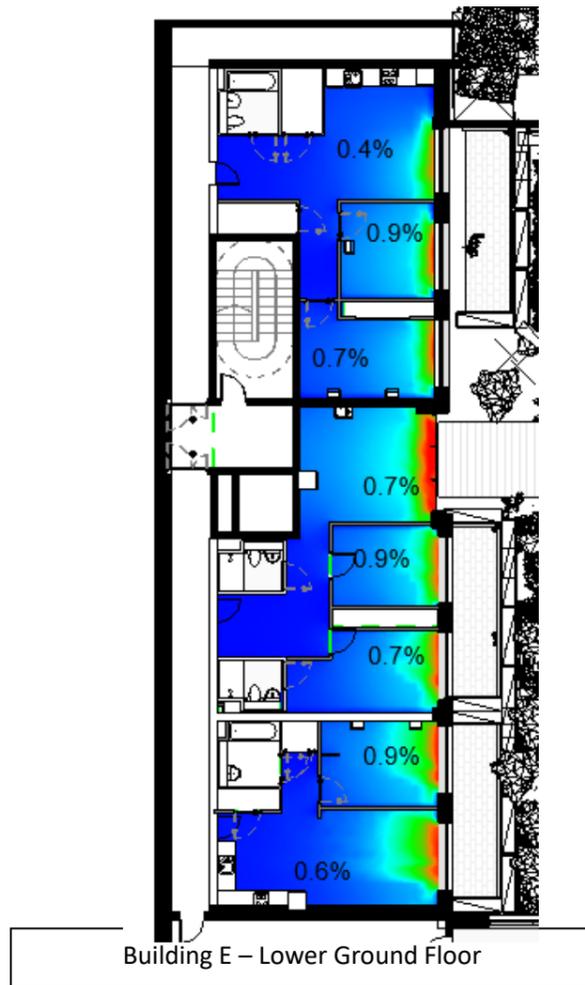
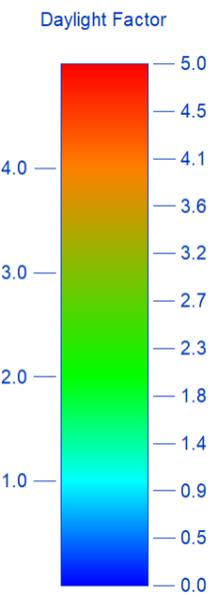
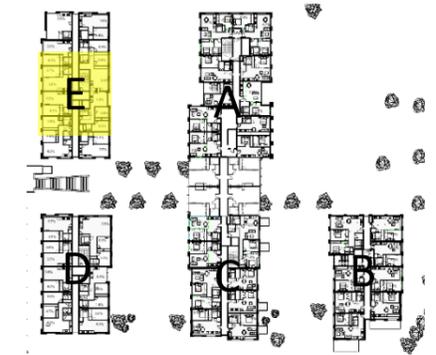
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.18 Building D



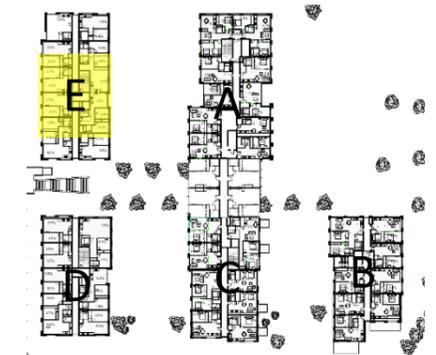
| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.19 Building E

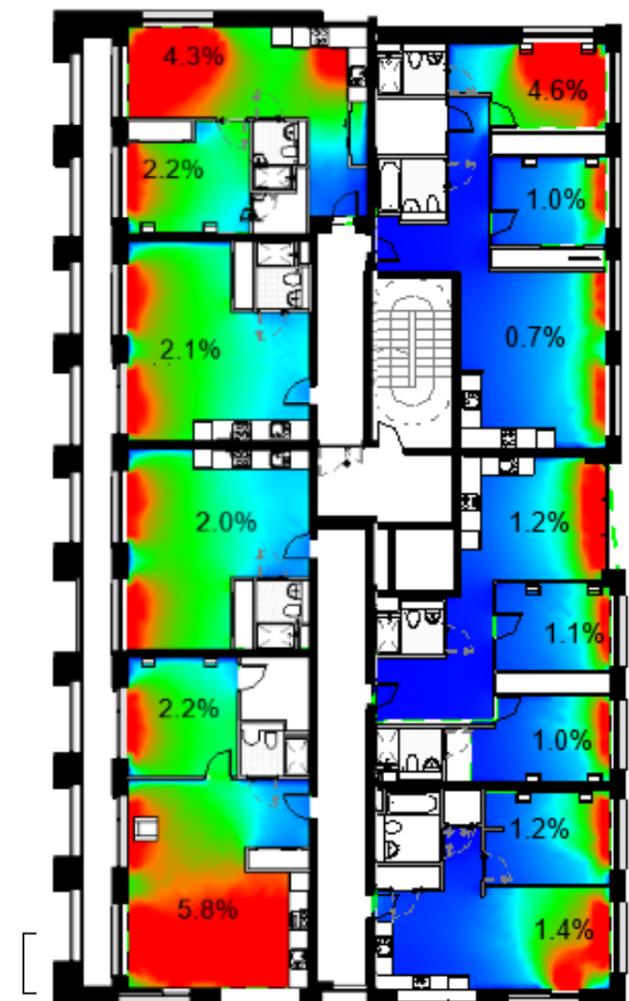
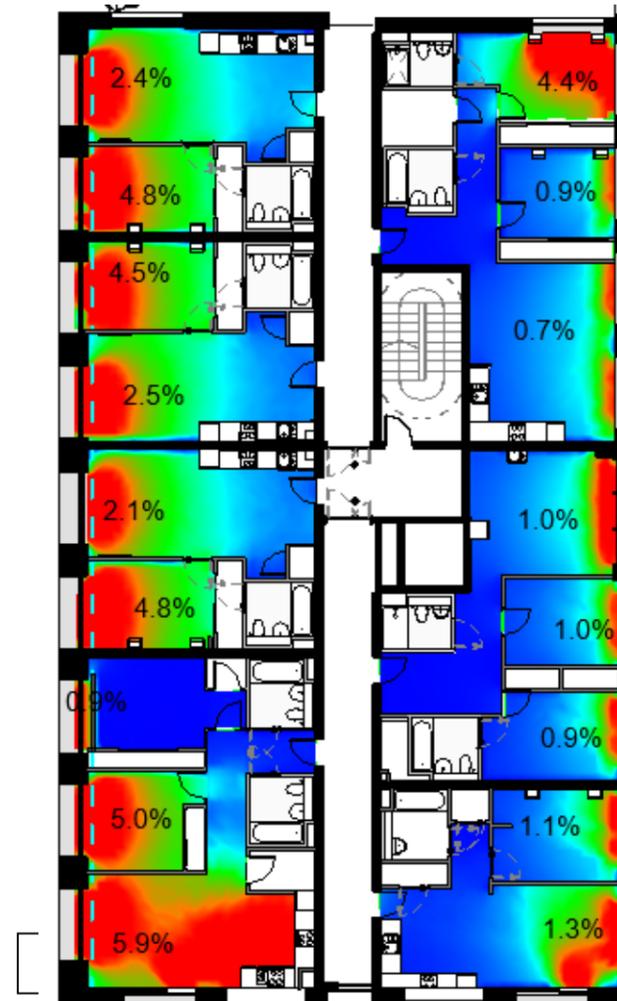
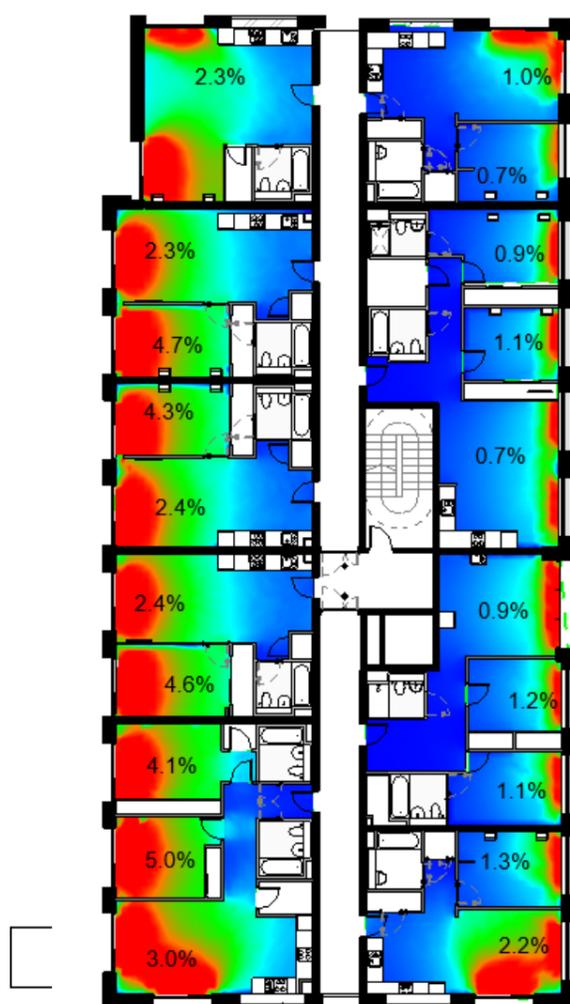
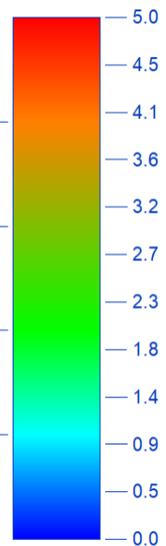


| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

6.20 Building E

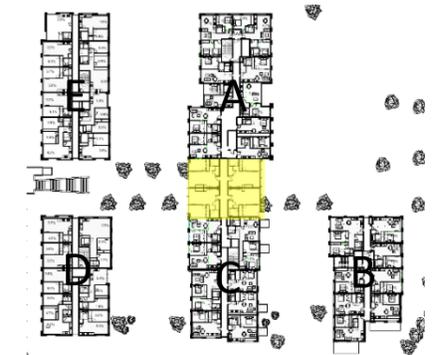


Daylight Factor

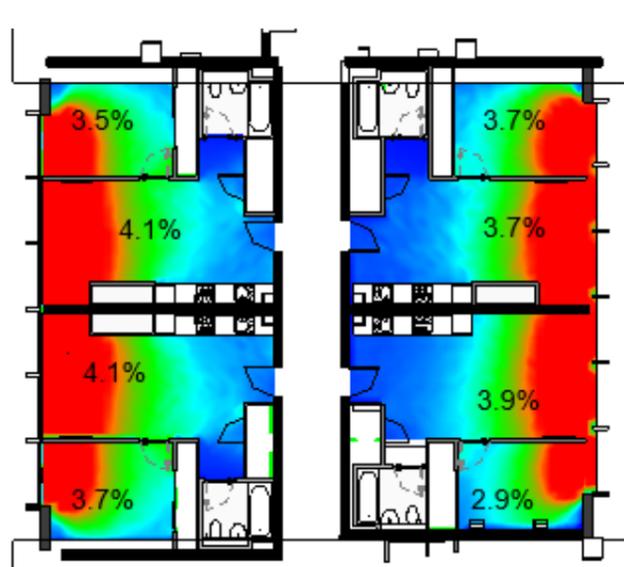
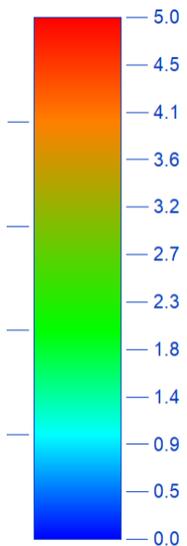


| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

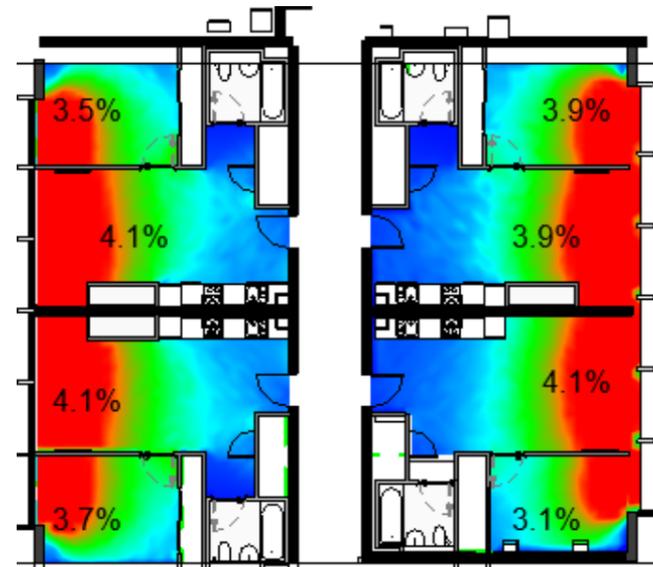
6.21 Bridge



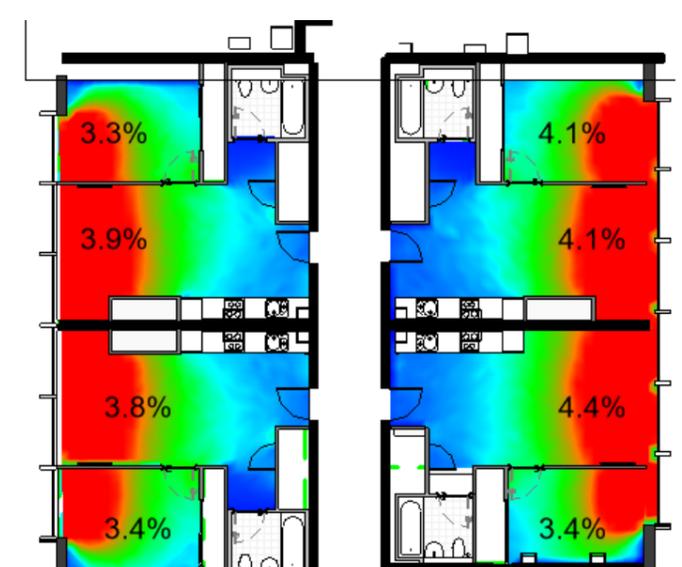
Daylight Factor



Bridge – Level 09



Bridge – Level 10



Bridge – Level 11

| Space   | Pass  |
|---------|-------|
| Bedroom | >1%   |
| KLD     | >2.0% |

## 7.0 Compensatory Measures

Irish planning policy advises that in instances where it is not possible to demonstrate full compliance with advisory minimums consent-authorities are entitled to accept departures where other planning objective are found to countervail.

Specific guidance on this matter is provided within Section 4.5 the National Planning Framework (Section 4.5), which state as follows:

***“To enable brownfield development, planning policies and standards need to be flexible, focusing on design led and performance-based outcomes, rather than specifying absolute requirements in all cases. Although sometimes necessary to safeguard against poor quality design, planning standards should be flexibly applied in response to well-designed development proposals that can achieve urban infill and brownfield development objectives in settlements of all sizes. This is in recognition of the fact that many current urban planning standards were devised for application to greenfield development sites and cannot account for the evolved layers of complexity in existing built-up areas.”*** [Emphasis added]

The NPF goes further and introduces the need for tolerances and alternative solutions as a National Policy Objective. National Policy Objective 13 of the NPF states as follows:

***“In urban areas, planning and related standards, including in particular building height and car parking will be based on performance criteria that seek to achieve well-designed high-quality outcomes in order to achieve targeted growth. These standards will be subject to a range of tolerance that enables alternative solutions to be proposed to achieve stated outcomes, provided public safety is not compromised and the environment is suitably protected.”*** [Emphasis added]

On the basis that the above guidance is applicable to daylight standards it is reasonable to conclude that a strong basis exists for consenting authorities accept shortfalls from advisory minimums / standards in instances where a countervailing planning objective exists.

Such an approach is also consistent with the Urban Design Manual published by the Department of Energy Heritage and Local Government, 2009. On page 43 of this manual the following guidance is provided:

***“Where design standards are to be used (such as the UK document Site Layout Planning for Daylight and Sunlight, published by the BRE), it should be acknowledged that for higher density proposals in urban areas it may not be possible to achieve the specified criteria, and standards may need to be adjusted locally to recognise the need for appropriate heights or street widths.”*** [Emphasis added]

The need for tolerance and flexibility to be exercised when interpreting the significance of daylight results is reflected in the wording which has been adopted in recent building height guidelines<sup>1</sup>. Specific guidance is provided within Section 3.2 of the guidelines:

*“At the scale of the site/building*

- *The form, massing and height of proposed developments should be carefully modulated so as to maximise access to natural daylight, ventilation and views and minimise overshadowing and loss of light.*
- *Appropriate and reasonable regard should be taken of quantitative performance approaches to daylight provision outlined in guides like the Building Research Establishment’s ‘Site Layout Planning for Daylight and Sunlight’ (2nd edition) or BS 8206-2: 2008 – ‘Lighting for Buildings – Part 2: Code of Practice for Daylighting’.*
- *Where a proposal may not be able to fully meet all 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, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints 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.”* [Emphasis added]

In this regard it is submitted that the proposed height, massing and form of development will ensure the completion or build out of a large scale regeneration site of significant strategic importance within the city. The proposed development provides a responsive and high quality design that will compliment the completed parts of the HSQ precinct whilst ensuring the comprehensive regeneration of the wider site which has laid dormant for many years.

<sup>1</sup> Urban Development and Building Heights - Guidelines for Planning Authorities, 2018  
Rev 04

In addition to the urban design and regenerative benefits identified above, the proposed development provides a generous quantum of communal open space at podium level together with the rooftop amenity spaces (1,179 sq.m) and the communal courtyard areas (960 sq.m) to provide a total combined communal amenity space provision of c. 3,809 sq.m.

However, sub-section 4.1 of this report clarifies that a total of 94 sq.m of the proposed communal courtyard space for Blocks C and D should be discounted from the quantitative calculation in order to achieve the BRE sunlight penetration / exposure standard of 50% for this space. Accordingly, only 866 sq.m of the proposed 960 sq.m of communal courtyard space is counted towards the communal open space provision, resulting in an adjusted / revised total community open space provision of 3,715 sq.m, which still significantly exceeds the minimum required level of provision (2,142 sq m). This generous level of communal amenity space provision will ensure a high level of amenity for future residents within the scheme.

## APPENDIX A – Site Shading Diagrams

Equinox March 21<sup>st</sup>

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

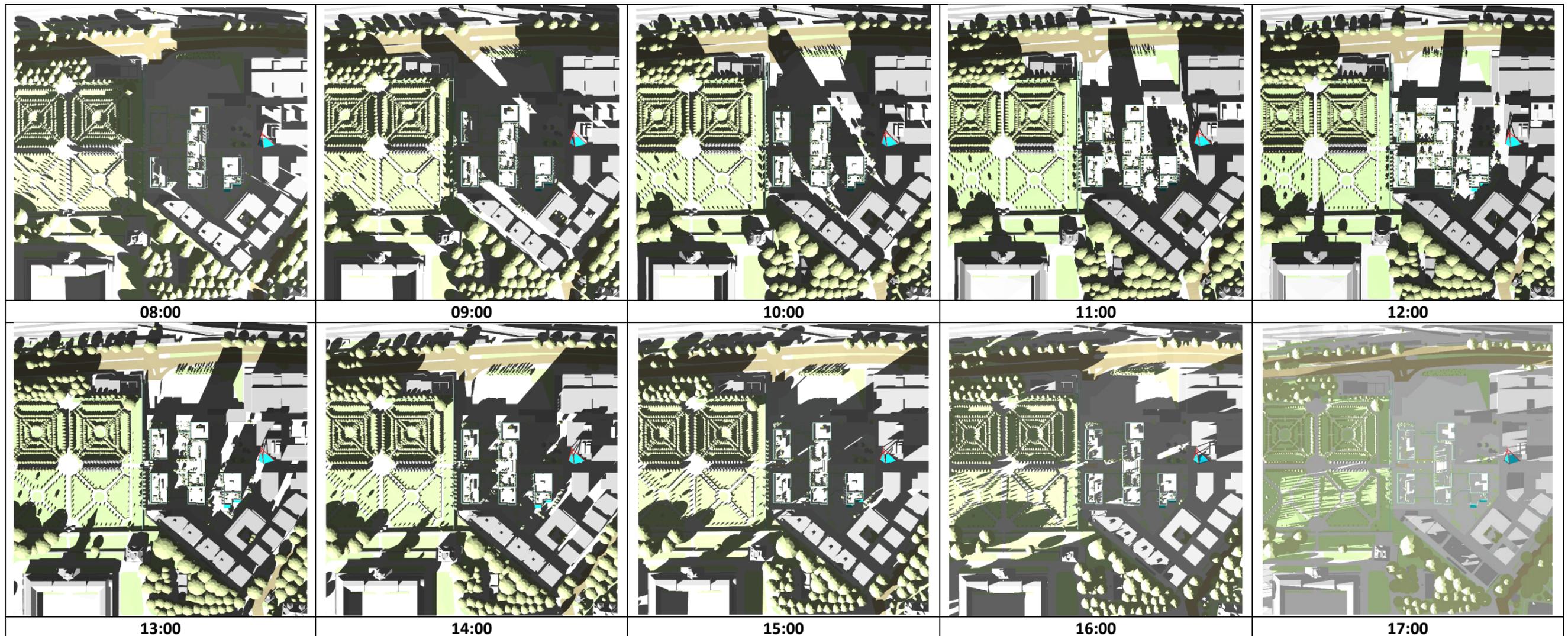


Fig A1: Sunlight and Site Shading Diagrams - Equinox (March 21st): 08:00-17:00 hrs

Summer Solstice June 21<sup>st</sup>

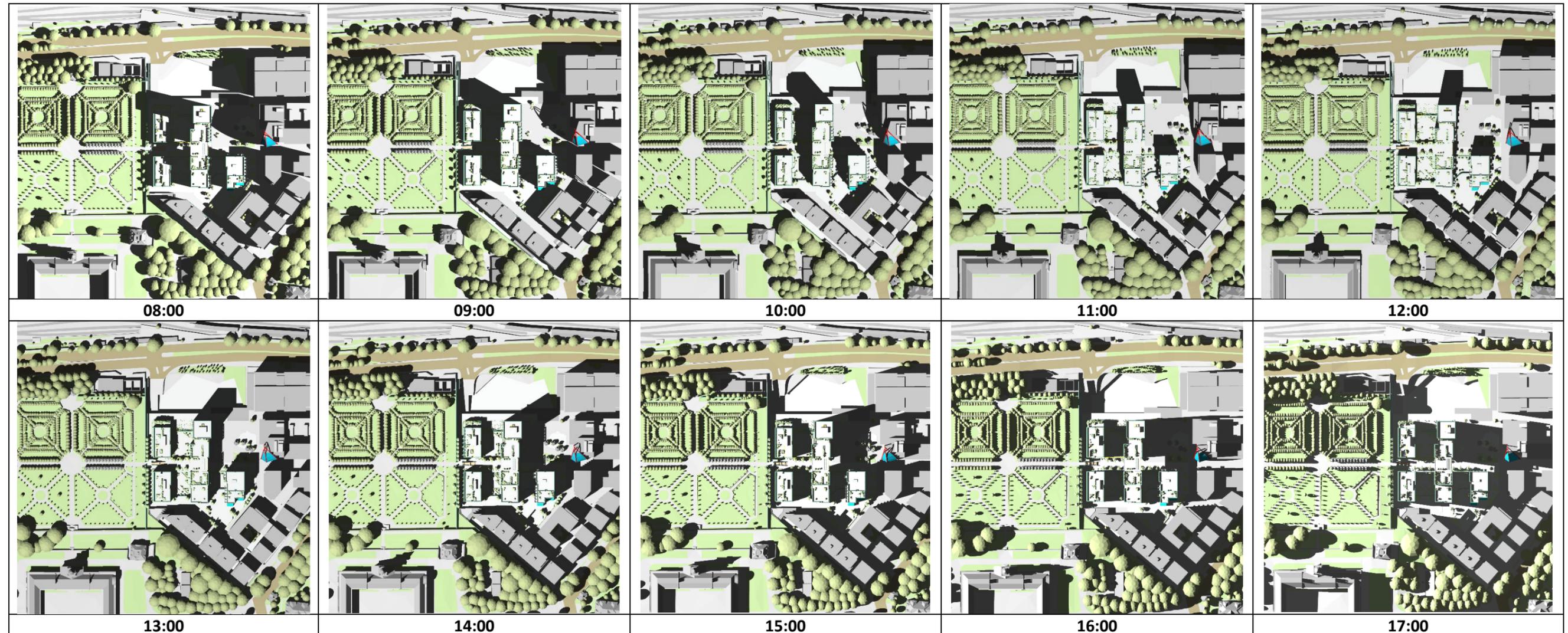


Fig A2: Sunlight and Site Shading Diagrams - Summer Solstice (June 21st): 08:00-17:00 hrs

Whilst both winter and summer solstices have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight out 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 21<sup>st</sup>

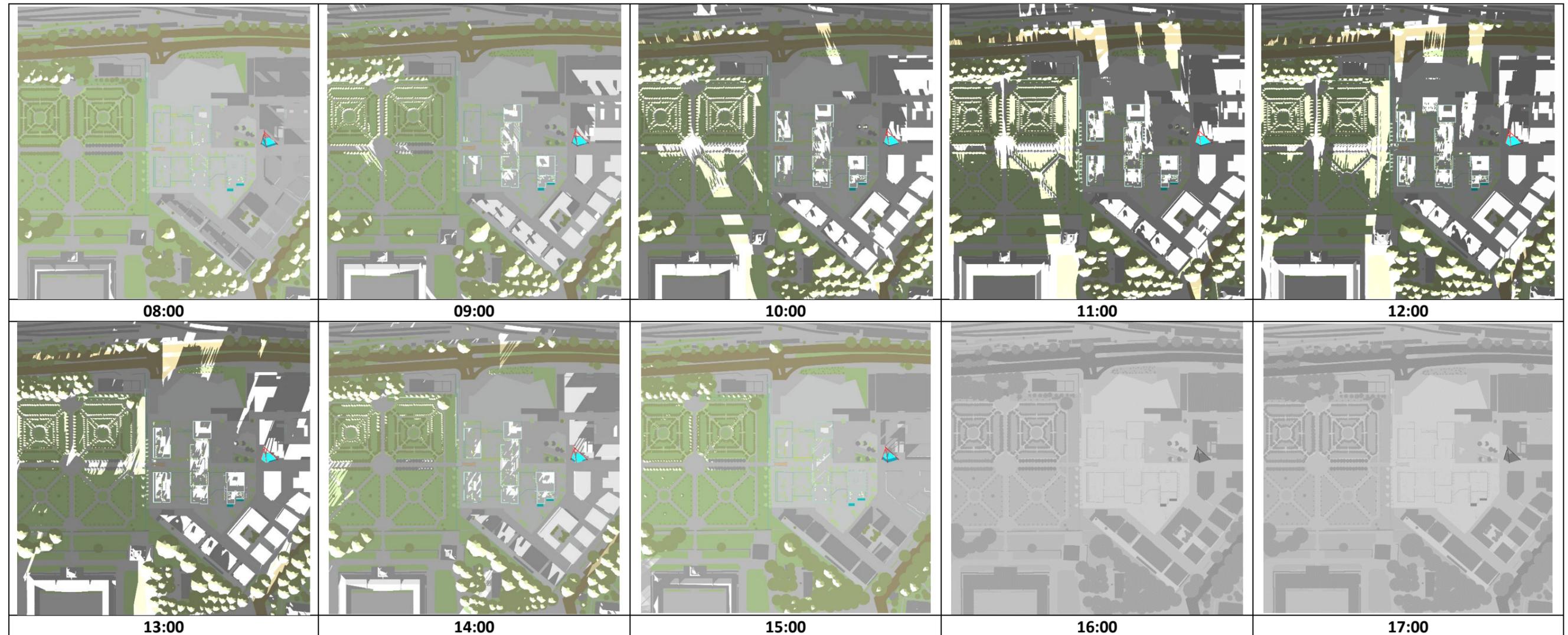


Fig A3: Sunlight and Site Shading Diagrams - Winter Solstice (December 21st): 08:00-17:00 hrs

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 out 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.

## APPENDIX B – EN Daylight Standards

The Daylight Analysis section of the report assesses the Average Daylight Factors in accordance with the BRE 209 guide ‘Site Layout Planning for Daylight and Sunlight’ (2nd edition). This guide is specifically referenced within Section 6.6 of The Department of Housing, Planning and Local Government document – Sustainable Urban Housing: Design Standards for New Apartments (2018) which advises that:

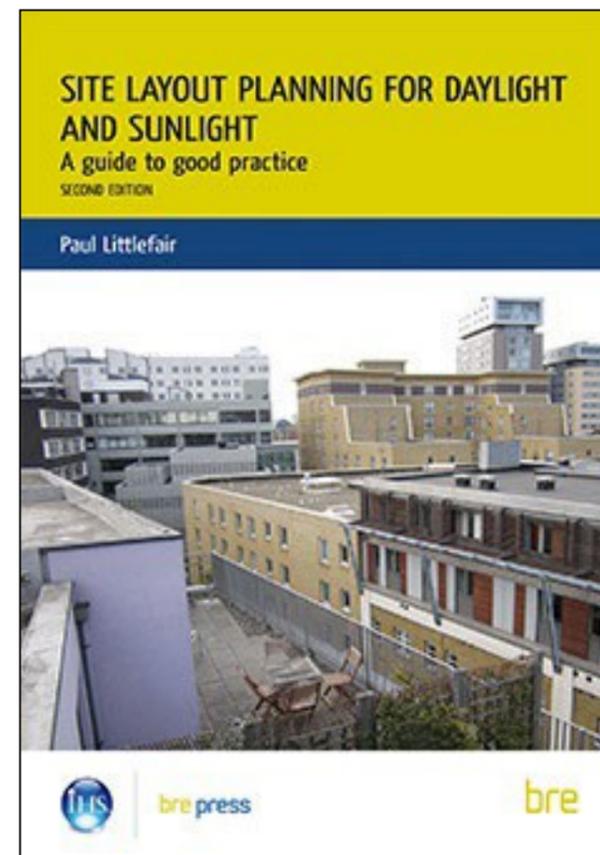
*Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide ‘Site Layout Planning for Daylight and Sunlight’ (2nd edition) or BS 8206-2: 2008 – ‘Lighting for Buildings – Part 2: Code of Practice for Daylighting’ when undertaken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

Subsequent to this guidance, a new European Standard for Daylight in Buildings (EN 17037) was released in 2018 and adopted as IS EN 17037 in January 2019. This standard does not fall under any *mandatory* directive of the EU or any Irish Statutory Instrument and therefore remains *advisory*.

On release of the EN standard within the UK, the BRE confirmed their intention to provide a National Annex, which will subsequently inform an updated and revised BRE 209 document. The rationale for this Annex was that the Median Daylight Factor methodology applied within EN 17037 do not differentiate between residential and non-residential applications, with the standard stipulating a minimum target illuminance of 300 lux for all Building Applications. However, it is recognised by BRE that Dwellings have lower natural light requirements compared to non-domestic buildings (i.e. BS. 8602-2 has Average Daylight Factors of 1.0-2.0% for dwellings, as opposed to Average Daylight Factors of 2.0-5.0% for non-residential). Furthermore, providing higher daylight level in residential applications may in some instances be counter-productive in that excessive glazing provision may promote overheating.

This Annex, which was included in the British Standard version of EN 17037 identifies the target illuminances for dwellings that should be exceeded for over at least 50% of a room, and for at least half of annual daylight hours (i.e. Median). Utilising the Median External Illuminance of 14,900 Lux for Dublin (EN 17037 Table A.3) the following Median Daylight Factors may therefore be applied, adopting the methodology used in BS.EN 17037 Annex NA:

| Room type   | Target illuminance<br>$E_T$ (lx) | Median Daylight Factors |
|-------------|----------------------------------|-------------------------|
| Bedroom     | 100                              | 0.7%                    |
| Living room | 150                              | 1.0%                    |



|  |                                      |
|--|--------------------------------------|
|  | Irish Standard<br>I.S. EN 17037:2018 |
|  | Daylight in buildings                |
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A compliance comparison for a sample of rooms from Block E and Block A was then made for the Living/ Dining Rooms between the existing B.S.8206-2008 (as referenced within BRE.209, DoHPLG Planning Guidelines and used for analysis within this report) and the BS EN.17037:2018 Annex NA (as understood to be introduced in forthcoming BRE.209 Guidelines).

Figure B.2 compares for the KLD spaces for block A.

Average Daylight Factor (ADF) as per BS.8206-2 (horizontal axis), with rooms deemed compliant where ADF exceeds 1.5%

Extent of room where Daylight Factor exceeds BS.EN.17037 Annex NA target of 1.0% (vertical axis), with rooms deemed compliant where extent exceeds 50% (i.e. Median Daylight Factor or MDF).

This graph illustrates that the results are generally aligned under both methodologies, with rooms where compliance in accordance with B.S.8206-2 within this report has been confirmed were also generally found to be compliant to BS.EN.17037 Annex NA (green markers) and the converse non-compliances also true (red markers). All were found compliant to BS.8206-2 and to the EN.17037 methodology assessed.

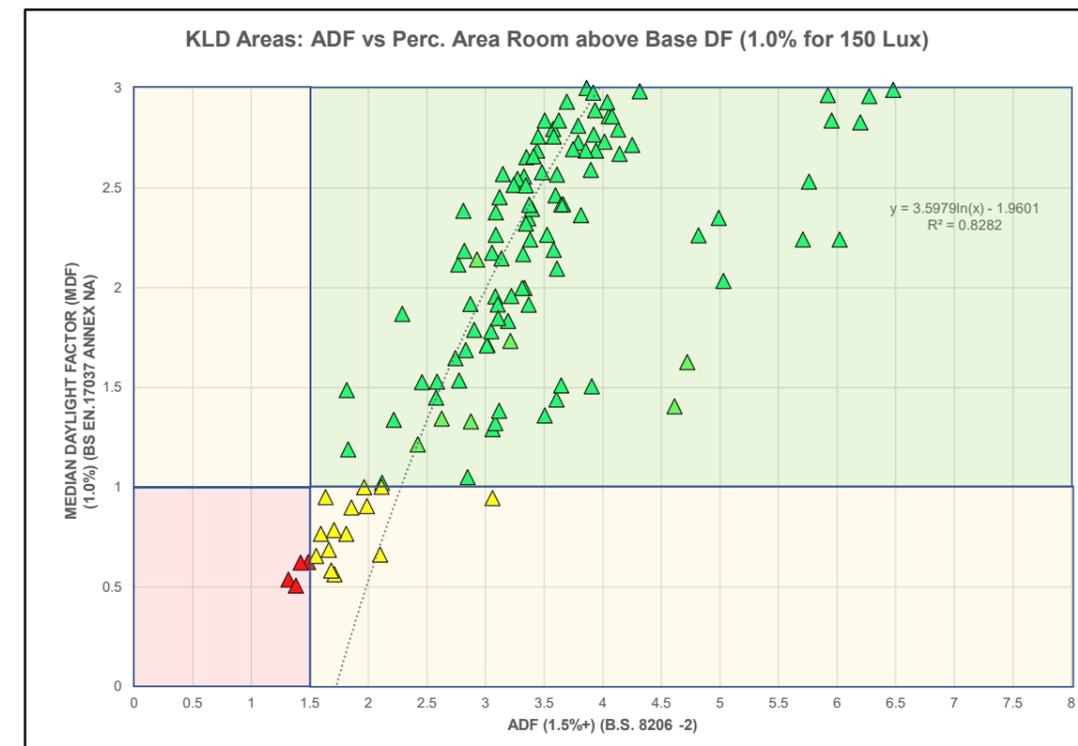


Fig B.2: Compliance Comparison: ADF-v-MDF

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## APPENDIX C – VSC Results for Existing Vs Proposed

The following results were determined for the vertical sky component (VSC) impact on neighbouring buildings as per the methodology as set out in section 5.0.

These values are for the Existing Buildings Vs the Proposed Buildings. It should be noted that the BRE Guidance recommends implementation of alternative benchmark values for underdeveloped site such as this and thus these results are only for information and do not represent an impact on the existing development.



| Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results | Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results | Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results |
|--------------|------------------|------------------|-------------------|---------|--------------|------------------|------------------|-------------------|---------|--------------|------------------|------------------|-------------------|---------|
| Block A 01 1 | 29.88            | 12.48            | 42%               | Fail    | Block A 04 1 | 30.44            | 15.62            | 51%               | Fail    | Block B 01 1 | 24.63            | 14.12            | 57%               | Fail    |
| Block A 01 2 | 36.54            | 14.78            | 40%               | Fail    | Block A 04 2 | 38.16            | 20.01            | 52%               | Fail    | Block B 01 1 | 24.27            | 15.19            | 63%               | Fail    |
| Block A 01 2 | 36.26            | 13.61            | 38%               | Fail    | Block A 04 2 | 38.05            | 19.22            | 51%               | Fail    | Block B 01 1 | 24.2             | 15.35            | 63%               | Fail    |
| Block A 01 3 | 35.91            | 13.29            | 37%               | Fail    | Block A 04 3 | 37.89            | 19.63            | 52%               | Fail    | Block B 01 1 | 24.15            | 16.29            | 67%               | Fail    |
| Block A 01 3 | 35.45            | 13.98            | 39%               | Fail    | Block A 04 3 | 37.84            | 20.6             | 54%               | Fail    | Block B 01 2 | 23.92            | 18.11            | 76%               | Fail    |
| Block A 01 4 | 25.86            | 19.22            | 74%               | Fail    | Block A 04 4 | 34.14            | 29.44            | 86%               | Pass    | Block B 01 2 | 23.88            | 18.33            | 77%               | Fail    |
| Block A 01 4 | 35.16            | 13.98            | 40%               | Fail    | Block A 04 4 | 37.64            | 21.78            | 58%               | Fail    | Block B 01 2 | 23.73            | 18.62            | 78%               | Fail    |
| Block A 01 5 | 20.97            | 18.51            | 88%               | Pass    | Block A 04 5 | 32.99            | 30.11            | 91%               | Pass    | Block B 01 2 | 23.65            | 19.28            | 82%               | Pass    |
| Block A 01 5 | 23.72            | 19.08            | 80%               | Pass    | Block A 04 5 | 31.15            | 30.08            | 97%               | Pass    | Block B 01 2 | 23.48            | 19.59            | 83%               | Pass    |
| Block B 00 1 | 31.09            | 12.43            | 40%               | Fail    | Block A 05 1 | 30.61            | 17.03            | 56%               | Fail    | Block B 01 2 | 23.32            | 19.68            | 84%               | Pass    |
| Block B 00 1 | 30.5             | 12.81            | 42%               | Fail    | Block A 05 2 | 38.55            | 22.31            | 58%               | Fail    | Block B 01 3 | 23               | 20.72            | 90%               | Pass    |
| Block B 00 1 | 30.24            | 13.53            | 45%               | Fail    | Block A 05 2 | 38.52            | 21.52            | 56%               | Fail    | Block B 01 3 | 22.68            | 21.08            | 93%               | Pass    |
| Block B 00 1 | 30.21            | 14.09            | 47%               | Fail    | Block A 05 3 | 38.44            | 22.38            | 58%               | Fail    | Block B 01 3 | 22.17            | 21.31            | 96%               | Pass    |
| Block B 00 2 | 29.85            | 15.28            | 51%               | Fail    | Block A 05 3 | 38.4             | 23.35            | 61%               | Fail    | Block B 01 3 | 21.94            | 21.22            | 97%               | Pass    |
| Block B 00 2 | 29.85            | 16.15            | 54%               | Fail    | Block A 05 4 | 36.94            | 33.18            | 90%               | Pass    | Block B 01 3 | 21.55            | 21.23            | 98%               | Pass    |
| Block B 00 2 | 29.65            | 15.99            | 54%               | Fail    | Block A 05 4 | 38.52            | 24.68            | 64%               | Fail    | Block B 01 4 | 20.92            | 20.08            | 96%               | Pass    |
| Block B 00 2 | 29.59            | 16.31            | 55%               | Fail    | Block A 05 5 | 36.22            | 34.21            | 94%               | Pass    | Block B 01 4 | 20.32            | 19.71            | 97%               | Pass    |
| Block B 00 2 | 29.28            | 16.8             | 57%               | Fail    | Block A 05 5 | 35.15            | 34.54            | 98%               | Pass    | Block b 02 1 | 25.06            | 15.96            | 64%               | Fail    |
| Block B 00 2 | 28.95            | 16.92            | 58%               | Fail    | Block A 06 1 | 30.84            | 18.83            | 61%               | Fail    | Block b 02 1 | 24.64            | 16.64            | 68%               | Fail    |
| Block B 00 3 | 28.61            | 17.88            | 62%               | Fail    | Block A 06 2 | 38.67            | 24.21            | 63%               | Fail    | Block b 02 1 | 24.54            | 17.2             | 70%               | Fail    |
| Block B 00 3 | 28.31            | 17.98            | 63%               | Fail    | Block A 06 2 | 38.63            | 23.89            | 62%               | Fail    | Block b 02 1 | 24.61            | 18.05            | 73%               | Fail    |
| Block B 00 3 | 27.49            | 18.16            | 66%               | Fail    | Block A 06 3 | 38.6             | 24.96            | 65%               | Fail    | Block b 02 2 | 24.31            | 20.1             | 83%               | Pass    |
| Block B 00 3 | 27.22            | 18.28            | 67%               | Fail    | Block A 06 3 | 38.6             | 26.04            | 67%               | Fail    | Block b 02 2 | 24.25            | 20.44            | 84%               | Pass    |
| Block B 00 3 | 26.6             | 18.28            | 69%               | Fail    | Block A 06 4 | 38.19            | 35.64            | 93%               | Pass    | Block b 02 2 | 24.24            | 20.92            | 86%               | Pass    |
| Block B 00 4 | 25.74            | 18.11            | 70%               | Fail    | Block A 06 4 | 38.74            | 27.54            | 71%               | Pass    | Block b 02 2 | 24.21            | 20.75            | 86%               | Pass    |
| Block B 00 4 | 25.06            | 17.89            | 71%               | Fail    | Block A 06 5 | 37.8             | 36.57            | 97%               | Pass    | Block b 02 2 | 23.93            | 21.63            | 90%               | Pass    |
| Block A 02 1 | 30.09            | 13.55            | 45%               | Fail    | Block A 06 5 | 37.35            | 36.95            | 99%               | Pass    | Block b 02 2 | 23.85            | 21.84            | 92%               | Pass    |
| Block A 02 2 | 37.45            | 16.43            | 44%               | Fail    | Block A 07 1 | 31.45            | 21.42            | 68%               | Fail    | Block b 02 3 | 23.59            | 22.88            | 97%               | Pass    |
| Block A 02 2 | 37.17            | 15.25            | 41%               | Fail    | Block A 07 2 | 38.7             | 26.31            | 68%               | Fail    | Block b 02 3 | 23.29            | 22.82            | 98%               | Pass    |
| Block A 02 3 | 36.65            | 15.56            | 42%               | Fail    | Block A 07 2 | 38.63            | 26.11            | 68%               | Fail    | Block b 02 3 | 22.87            | 22.87            | 100%              | Pass    |
| Block A 02 3 | 36.27            | 16.07            | 44%               | Fail    | Block A 07 3 | 38.61            | 27.07            | 70%               | Pass    | Block b 02 3 | 22.76            | 22.08            | 97%               | Pass    |
| Block A 02 4 | 28.56            | 22.55            | 79%               | Fail    | Block A 07 3 | 38.61            | 28.16            | 73%               | Pass    | Block b 02 3 | 22.39            | 21.94            | 98%               | Pass    |
| Block A 02 4 | 36.02            | 16.63            | 46%               | Fail    | Block A 07 4 | 38.56            | 36.63            | 95%               | Pass    | Block b 02 4 | 21.65            | 21.00            | 97%               | Pass    |
| Block A 02 5 | 26.91            | 22.67            | 84%               | Pass    | Block A 07 4 | 38.76            | 29.47            | 76%               | Pass    | Block b 02 4 | 21.25            | 20.83            | 98%               | Pass    |
| Block A 02 5 | 24.52            | 22.42            | 91%               | Pass    | Block A 07 5 | 38.4             | 37.22            | 97%               | Pass    | Block B 03 1 | 25.53            | 17.75            | 70%               | Fail    |
| Block A 03 1 | 30.18            | 14.57            | 48%               | Fail    | Block A 07 5 | 38.15            | 37.69            | 99%               | Pass    | Block B 03 1 | 24.93            | 18.41            | 74%               | Fail    |
| Block A 03 2 | 37.74            | 18.2             | 48%               | Fail    | Block A 08 1 | 38.38            | 29.82            | 78%               | Pass    | Block B 03 1 | 24.91            | 19.5             | 78%               | Fail    |
| Block A 03 2 | 37.62            | 17.22            | 46%               | Fail    | Block A 08 1 | 38.46            | 29.69            | 77%               | Pass    | Block B 03 1 | 24.96            | 20.1             | 81%               | Pass    |
| Block A 03 3 | 37.39            | 17.37            | 46%               | Fail    | Block A 08 2 | 38.69            | 29.28            | 76%               | Pass    | Block B 03 2 | 24.88            | 22.25            | 89%               | Pass    |
| Block A 03 3 | 37.09            | 18.18            | 49%               | Fail    | Block A 08 2 | 38.73            | 30.22            | 78%               | Pass    | Block B 03 2 | 24.88            | 22.45            | 90%               | Pass    |
| Block A 03 4 | 31.43            | 25.68            | 82%               | Pass    | Block A 08 3 | 38.67            | 37.34            | 97%               | Pass    | Block B 03 2 | 24.75            | 22.86            | 92%               | Pass    |
| Block A 03 4 | 36.94            | 18.83            | 51%               | Fail    | Block A 08 3 | 38.72            | 31.09            | 80%               | Pass    | Block B 03 2 | 24.63            | 22.88            | 93%               | Pass    |
| Block A 03 5 | 29.96            | 26.34            | 88%               | Pass    | Block A 08 3 | 38.74            | 32.22            | 83%               | Pass    | Block B 03 2 | 24.48            | 23.85            | 97%               | Pass    |
| Block A 03 5 | 27.78            | 26.05            | 94%               | Pass    | Block A 08 4 | 38.67            | 37.99            | 98%               | Pass    | Block B 03 2 | 24.33            | 24.24            | 100%              | Pass    |
|              |                  |                  |                   |         | Block A 08 4 | 38.61            | 37.67            | 98%               | Pass    |              |                  |                  |                   |         |



| Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results | Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results | Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results |
|--------------|------------------|------------------|-------------------|---------|--------------|------------------|------------------|-------------------|---------|--------------|------------------|------------------|-------------------|---------|
| Block B 03 3 | 24.21            | 23.73            | 98%               | Pass    | Block B 06 1 | 25.9             | 25.64            | 99%               | Pass    | Block D 01 5 | 26.86            | 20.1             | 75%               | Fail    |
| Block B 03 3 | 24.06            | 23.82            | 99%               | Pass    | Block B 06 2 | 26.08            | 25.82            | 99%               | Pass    | Block D 01 5 | 25.06            | 19.2             | 77%               | Fail    |
| Block B 03 3 | 23.76            | 23.76            | 100%              | Pass    | Block B 06 2 | 26.08            | 25.04            | 96%               | Pass    | Block D 01 6 | 24.05            | 18.68            | 78%               | Fail    |
| Block B 03 3 | 23.39            | 22.69            | 97%               | Pass    | Block B 06 2 | 26.08            | 25.56            | 98%               | Pass    | Block D 01 6 | 21.99            | 17.47            | 79%               | Fail    |
| Block B 03 3 | 23.12            | 22.89            | 99%               | Pass    | Block B 06 2 | 26.04            | 25.52            | 98%               | Pass    | Block D 01 6 | 18.69            | 15.46            | 83%               | Pass    |
| Block B 03 4 | 22.56            | 22.11            | 98%               | Pass    | Block B 06 2 | 25.99            | 25.21            | 97%               | Pass    | Block D 01 7 | 15.15            | 13.31            | 88%               | Pass    |
| Block B 03 4 | 22.43            | 21.98            | 98%               | Pass    | Block B 06 2 | 26.01            | 25.75            | 99%               | Pass    | Block D 01 7 | 12.97            | 12.71            | 98%               | Pass    |
| Block B 04 1 | 25.99            | 20.17            | 78%               | Fail    | Block B 06 3 | 26.17            | 25.91            | 99%               | Pass    | Block D 01 7 | 11.88            | 11.52            | 97%               | Pass    |
| Block B 04 1 | 25.2             | 20.77            | 82%               | Pass    | Block B 06 3 | 26.1             | 25.06            | 96%               | Pass    | Block D 01 8 | 11.05            | 10.94            | 99%               | Pass    |
| Block B 04 1 | 25.12            | 21.59            | 86%               | Pass    | Block B 06 3 | 26.16            | 25.64            | 98%               | Pass    | Block D 01 8 | 12.26            | 12.14            | 99%               | Pass    |
| Block B 04 1 | 25.27            | 22.57            | 89%               | Pass    | Block B 06 3 | 26.2             | 26.20            | 100%              | Pass    | Block D 02 1 | 16.61            | 10.46            | 63%               | Fail    |
| Block B 04 2 | 25.15            | 24.16            | 96%               | Pass    | Block B 06 3 | 26.16            | 26.16            | 100%              | Pass    | Block D 02 1 | 29.88            | 18.23            | 61%               | Fail    |
| Block B 04 2 | 25.15            | 24.96            | 99%               | Pass    | Block B 06 4 | 26.4             | 26.40            | 100%              | Pass    | Block D 02 1 | 36.69            | 24.22            | 66%               | Fail    |
| Block B 04 2 | 25.11            | 25.08            | 100%              | Pass    | Block B 06 4 | 26.81            | 26.81            | 100%              | Pass    | Block D 02 2 | 36.66            | 24.20            | 66%               | Fail    |
| Block B 04 2 | 25.09            | 24.09            | 96%               | Pass    | Block D 00 1 | 25.8             | 13.88            | 54%               | Fail    | Block D 02 2 | 33.68            | 20.54            | 61%               | Fail    |
| Block B 04 2 | 25.04            | 24.54            | 98%               | Pass    | Block D 00 2 | 34.27            | 17.31            | 51%               | Fail    | Block D 02 3 | 33.47            | 22.09            | 66%               | Fail    |
| Block B 04 2 | 25.05            | 24.55            | 98%               | Pass    | Block D 00 2 | 31.68            | 16.56            | 52%               | Fail    | Block D 02 3 | 33.1             | 21.85            | 66%               | Fail    |
| Block B 04 3 | 24.81            | 24.07            | 97%               | Pass    | Block D 00 3 | 31.38            | 17.4             | 55%               | Fail    | Block D 02 3 | 32.81            | 21.65            | 66%               | Fail    |
| Block B 04 3 | 24.75            | 24.50            | 99%               | Pass    | Block D 00 3 | 30.71            | 17.09            | 56%               | Fail    | Block D 02 4 | 32.41            | 22.69            | 70%               | Fail    |
| Block B 04 3 | 24.52            | 24.27            | 99%               | Pass    | Block D 00 3 | 30.22            | 16.58            | 55%               | Fail    | Block D 02 4 | 32.08            | 23.42            | 73%               | Fail    |
| Block B 04 3 | 24.46            | 24.46            | 100%              | Pass    | Block D 00 4 | 29.65            | 17.68            | 60%               | Fail    | Block D 02 4 | 31.12            | 23.34            | 75%               | Fail    |
| Block B 04 3 | 24.21            | 24.21            | 100%              | Pass    | Block D 00 4 | 29.13            | 18.14            | 62%               | Fail    | Block D 02 5 | 28.88            | 22.82            | 79%               | Fail    |
| Block B 04 4 | 23.82            | 23.82            | 100%              | Pass    | Block D 00 4 | 28.02            | 18.06            | 64%               | Fail    | Block D 02 5 | 27.53            | 22.30            | 81%               | Pass    |
| Block B 04 4 | 23.86            | 23.62            | 99%               | Pass    | Block D 00 5 | 25.55            | 17.76            | 70%               | Fail    | Block D 02 6 | 25.71            | 21.60            | 84%               | Pass    |
| Block B 05 1 | 26.31            | 22.75            | 86%               | Pass    | Block D 00 5 | 23.63            | 16.85            | 71%               | Fail    | Block D 02 6 | 24.05            | 20.20            | 84%               | Pass    |
| Block B 05 1 | 25.51            | 23.37            | 92%               | Pass    | Block D 00 6 | 21.97            | 16.07            | 73%               | Fail    | Block D 02 6 | 21.06            | 17.90            | 85%               | Pass    |
| Block B 05 1 | 25.53            | 24.5             | 96%               | Pass    | Block D 00 6 | 20.48            | 15.45            | 75%               | Fail    | Block D 02 7 | 17.79            | 16.01            | 90%               | Pass    |
| Block B 05 1 | 25.62            | 25.02            | 98%               | Pass    | Block D 00 6 | 17.11            | 13.18            | 77%               | Fail    | Block D 02 7 | 15.53            | 15.22            | 98%               | Pass    |
| Block B 05 2 | 25.69            | 24.66            | 96%               | Pass    | Block D 00 7 | 13.7             | 11.64            | 85%               | Pass    | Block D 02 7 | 14.29            | 13.86            | 97%               | Pass    |
| Block B 05 2 | 25.71            | 25.20            | 98%               | Pass    | Block D 00 7 | 11.47            | 11.83            | 98%               | Pass    | Block D 02 8 | 14.1             | 13.96            | 99%               | Pass    |
| Block B 05 2 | 25.77            | 25.25            | 98%               | Pass    | Block D 00 7 | 10.34            | 12.52            | 97%               | Pass    | Block D 02 8 | 15.32            | 15.17            | 99%               | Pass    |
| Block B 05 2 | 25.71            | 24.94            | 97%               | Pass    | Block D 00 8 | 9.93             | 14.69            | 99%               | Pass    | Block D 03 1 | 16.63            | 13.30            | 80%               | Pass    |
| Block B 05 2 | 25.69            | 25.43            | 99%               | Pass    | Block D 00 8 | 10.99            | 17.16            | 99%               | Pass    | Block D 03 1 | 30.05            | 21.64            | 72%               | Fail    |
| Block B 05 2 | 25.68            | 25.42            | 99%               | Pass    | Block D 01 1 | 20.73            | 11.1             | 54%               | Fail    | Block D 03 1 | 37.08            | 27.81            | 75%               | Pass    |
| Block B 05 3 | 25.62            | 24.60            | 96%               | Pass    | Block D 01 1 | 32.46            | 16.44            | 51%               | Fail    | Block D 03 2 | 37.05            | 27.05            | 73%               | Pass    |
| Block B 05 3 | 25.58            | 25.07            | 98%               | Pass    | Block D 01 1 | 36.34            | 20.53            | 56%               | Fail    | Block D 03 2 | 34.77            | 23.30            | 67%               | Fail    |
| Block B 05 3 | 25.49            | 24.98            | 98%               | Pass    | Block D 01 2 | 36.4             | 21.15            | 58%               | Fail    | Block D 03 3 | 34.42            | 24.09            | 70%               | Fail    |
| Block B 05 3 | 25.39            | 24.63            | 97%               | Pass    | Block D 01 2 | 32.72            | 18.48            | 56%               | Fail    | Block D 03 3 | 34.35            | 23.70            | 69%               | Fail    |
| Block B 05 3 | 25.34            | 25.09            | 99%               | Pass    | Block D 01 3 | 32.51            | 19.53            | 60%               | Fail    | Block D 03 3 | 34.01            | 24.49            | 72%               | Fail    |
| Block B 05 4 | 25.32            | 25.07            | 99%               | Pass    | Block D 01 3 | 32.14            | 19.06            | 59%               | Fail    | Block D 03 4 | 33.63            | 25.22            | 75%               | Fail    |
| Block B 05 4 | 25.55            | 25.55            | 100%              | Pass    | Block D 01 3 | 31.41            | 19.45            | 62%               | Fail    | Block D 03 4 | 33.31            | 25.65            | 77%               | Fail    |
| Block B 06 1 | 26.73            | 26.20            | 98%               | Pass    | Block D 01 4 | 30.93            | 19.93            | 64%               | Fail    | Block D 03 4 | 32.82            | 25.60            | 78%               | Fail    |
| Block B 06 1 | 25.9             | 25.38            | 98%               | Pass    | Block D 01 4 | 30.31            | 20.37            | 67%               | Fail    | Block D 03 5 | 31               | 25.73            | 83%               | Pass    |
| Block B 06 1 | 25.83            | 25.06            | 97%               | Pass    | Block D 01 4 | 29.69            | 20.69            | 70%               | Fail    | Block D 03 5 | 29.31            | 24.91            | 85%               | Pass    |



| Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results |
|--------------|------------------|------------------|-------------------|---------|
| Block D 03 6 | 28.29            | 24.33            | 86%               | Pass    |
| Block D 03 6 | 26.92            | 23.15            | 86%               | Pass    |
| Block D 03 6 | 24.43            | 21.74            | 89%               | Pass    |
| Block D 03 7 | 21.37            | 19.66            | 92%               | Pass    |
| Block D 03 7 | 19.92            | 19.52            | 98%               | Pass    |
| Block D 03 7 | 18.85            | 18.28            | 97%               | Pass    |
| Block D 03 8 | 18.5             | 18.32            | 99%               | Pass    |
| Block D 03 8 | 19               | 18.81            | 99%               | Pass    |
| Block D 04 1 | 16.64            | 15.48            | 93%               | Pass    |
| Block D 04 1 | 30.2             | 25.37            | 84%               | Pass    |
| Block D 04 1 | 37.36            | 31.01            | 83%               | Pass    |
| Block D 04 2 | 37.37            | 29.90            | 80%               | Pass    |
| Block D 04 2 | 35.75            | 26.10            | 73%               | Fail    |
| Block D 04 3 | 35.19            | 26.74            | 76%               | Fail    |
| Block D 04 3 | 35.26            | 26.45            | 75%               | Fail    |
| Block D 04 3 | 35.2             | 26.75            | 76%               | Fail    |
| Block D 04 4 | 35.07            | 28.06            | 80%               | Pass    |
| Block D 04 4 | 34.79            | 27.83            | 80%               | Pass    |
| Block D 04 4 | 34.5             | 28.29            | 82%               | Pass    |
| Block D 04 5 | 33.27            | 28.61            | 86%               | Pass    |
| Block D 04 5 | 32.13            | 27.95            | 87%               | Pass    |
| Block D 04 6 | 31.24            | 27.49            | 88%               | Pass    |
| Block D 04 6 | 29.89            | 26.90            | 90%               | Pass    |
| Block D 04 6 | 28.16            | 25.34            | 90%               | Pass    |
| Block D 04 7 | 26.34            | 24.50            | 93%               | Pass    |
| Block D 04 7 | 25.23            | 24.98            | 99%               | Pass    |
| Block D 04 7 | 24.21            | 23.73            | 98%               | Pass    |
| Block D 04 8 | 24.15            | 23.43            | 97%               | Pass    |
| Block D 04 8 | 24.22            | 23.98            | 99%               | Pass    |
| Block D 06 1 | 35.26            | 34.91            | 99%               | Pass    |
| Block D 06 1 | 36.22            | 35.50            | 98%               | Pass    |
| Block D 06 1 | 35.92            | 33.41            | 93%               | Pass    |
| Block D 06 1 | 37.35            | 33.24            | 89%               | Pass    |
| Block D 06 1 | 36.45            | 30.62            | 84%               | Pass    |
| Block D 06 1 | 34.03            | 26.88            | 79%               | Fail    |
| Block D 06 1 | 16.89            | 16.72            | 99%               | Pass    |
| Block D 06 1 | 4.77             | 4.63             | 97%               | Pass    |
| Block D 06 1 | 17.3             | 17.30            | 100%              | Pass    |
| Block D 06 2 | 4.72             | 4.48             | 95%               | Pass    |
| Block D 06 2 | 18.01            | 15.49            | 86%               | Pass    |
| Block D 06 2 | 34.05            | 28.60            | 84%               | Pass    |
| Block D 06 2 | 25.69            | 25.18            | 98%               | Pass    |
| Block D 06 2 | 27.07            | 26.26            | 97%               | Pass    |
| Block D 06 2 | 24.46            | 24.22            | 99%               | Pass    |

| Room Ref     | VSC Existing (%) | VSC Proposed (%) | Proposed/Existing | Results |
|--------------|------------------|------------------|-------------------|---------|
| Block D 06 2 | 36.41            | 36.05            | 99%               | Pass    |
| Block D 06 3 | 25.34            | 22.05            | 87%               | Pass    |
| Block D 06 3 | 30.94            | 27.85            | 90%               | Pass    |
| Block D 06 3 | 19.69            | 19.30            | 98%               | Pass    |
| Block D 06 3 | 12.36            | 11.99            | 97%               | Pass    |
| Block D 06 3 | 19.37            | 19.18            | 99%               | Pass    |
| Block D 06 3 | 36.01            | 35.65            | 99%               | Pass    |
| Block D 06 3 | 24.76            | 24.76            | 100%              | Pass    |
| Block D 06 3 | 28.14            | 26.73            | 95%               | Pass    |
| Block D 06 4 | 12.27            | 12.15            | 99%               | Pass    |
| Block D 06 4 | 20.61            | 17.93            | 87%               | Pass    |
| Block D 06 4 | 28.56            | 27.99            | 98%               | Pass    |
| Block D 06 4 | 29.06            | 28.19            | 97%               | Pass    |
| Block D 06 4 | 36.36            | 36.00            | 99%               | Pass    |
| Block D 06 4 | 30.15            | 29.85            | 99%               | Pass    |
| Block D 06 4 | 36.28            | 36.28            | 100%              | Pass    |
| Block D 06 4 | 19.99            | 19.99            | 100%              | Pass    |

## APPENDIX D – APSH Results for Existing Vs Proposed

The following results were determined for the annual probably sunlight hours (APSH) impact on neighbouring buildings as per the methodology as set out in section 5.0.

These values are for the Existing Buildings Vs the Proposed Buildings. It should be noted that the BRE Guidance recommends implementation of alternative benchmark values for underdeveloped site such as this and thus these results are only for information and do not represent an impact on the existing development.



|              | Annual Ex (%) | Annual Pr (%) | Pr/Ex | Winter Ex (%) | Winter Pr (%) | Winter Pr/Ex | Total Potential Annual Sunny Hours | Max Allowable Ann Reduction | Actual Ann Reduction | Criterion 1<br>Ann < 25% or Win <5% | Criterion 2<br>Ann or Win <80% of Ex | Criterion 3<br>Ann reduction > 4% | OVERALL COMPLIANCE |
|--------------|---------------|---------------|-------|---------------|---------------|--------------|------------------------------------|-----------------------------|----------------------|-------------------------------------|--------------------------------------|-----------------------------------|--------------------|
| Block A 01 1 | 25            | 5             | 22%   | 3             | 0             | 0%           | 1277                               | 51                          | 255                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 01 2 | 50            | 25            | 50%   | 12            | 6             | 54%          | 1277                               | 51                          | 319                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 01 2 | 48            | 24            | 50%   | 10            | 6             | 63%          | 1277                               | 51                          | 306                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 01 3 | 46            | 27            | 59%   | 8             | 5             | 70%          | 1277                               | 51                          | 243                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 01 3 | 45            | 26            | 59%   | 7             | 5             | 71%          | 1277                               | 51                          | 243                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 01 4 | 52            | 40            | 77%   | 4             | 5             | 127%         | 1277                               | 51                          | 153                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 01 4 | 44            | 26            | 61%   | 5             | 5             | 83%          | 1277                               | 51                          | 230                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 01 5 | 41            | 38            | 94%   | 1             | 2             | 244%         | 1277                               | 51                          | 38                   | NO                                  | YES                                  | YES                               | Pass               |
| Block A 01 5 | 48            | 40            | 85%   | 2             | 4             | 155%         | 1277                               | 51                          | 102                  | NO                                  | YES                                  | NO                                | Pass               |
| Block A 02 1 | 25            | 6             | 23%   | 3             | 0             | 0%           | 1277                               | 51                          | 243                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 02 2 | 51            | 27            | 52%   | 13            | 8             | 61%          | 1277                               | 51                          | 306                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 02 2 | 50            | 28            | 56%   | 12            | 9             | 74%          | 1277                               | 51                          | 281                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 02 3 | 49            | 31            | 64%   | 11            | 8             | 73%          | 1277                               | 51                          | 230                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 02 3 | 47            | 31            | 66%   | 9             | 8             | 83%          | 1277                               | 51                          | 204                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 02 4 | 56            | 48            | 85%   | 7             | 9             | 119%         | 1277                               | 51                          | 102                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 02 4 | 46            | 34            | 73%   | 8             | 7             | 87%          | 1277                               | 51                          | 153                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 02 5 | 53            | 47            | 88%   | 6             | 7             | 125%         | 1277                               | 51                          | 77                   | YES                                 | YES                                  | NO                                | Pass               |
| Block A 02 5 | 46            | 47            | 104%  | 3             | 5             | 197%         | 1277                               | 51                          | -13                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 03 1 | 25            | 6             | 25%   | 3             | 0             | 0%           | 1277                               | 51                          | 243                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 03 2 | 54            | 30            | 55%   | 15            | 11            | 71%          | 1277                               | 51                          | 306                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 03 2 | 52            | 31            | 59%   | 14            | 11            | 77%          | 1277                               | 51                          | 268                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 03 3 | 51            | 35            | 68%   | 13            | 11            | 84%          | 1277                               | 51                          | 204                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 03 3 | 50            | 34            | 69%   | 12            | 10            | 82%          | 1277                               | 51                          | 204                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 03 4 | 62            | 54            | 88%   | 12            | 13            | 108%         | 1277                               | 51                          | 102                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 03 4 | 49            | 39            | 79%   | 11            | 10            | 90%          | 1277                               | 51                          | 128                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 03 5 | 59            | 54            | 92%   | 10            | 12            | 114%         | 1277                               | 51                          | 64                   | YES                                 | YES                                  | NO                                | Pass               |
| Block A 03 5 | 54            | 55            | 102%  | 7             | 10            | 139%         | 1277                               | 51                          | -13                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 1 | 25            | 10            | 42%   | 3             | 0             | 0%           | 1277                               | 51                          | 192                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 04 2 | 54            | 34            | 63%   | 16            | 12            | 77%          | 1277                               | 51                          | 255                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 04 2 | 54            | 36            | 66%   | 16            | 14            | 86%          | 1277                               | 51                          | 230                  | YES                                 | NO                                   | NO                                | Pass               |



|              | Annual Mirrored (%) | Annual Pr (%) | Pr/Mi | Winter Mirrored (%) | Winter Pr (%) | Winter Pr/Mi | Total Potential Annual Sunny Hours | Max Allowable Ann Reduction | Actual Ann Reduction | Criterion 1<br>Ann < 25% or Win <5% | Criterion 2<br>Ann or Win <80% of Ex | Criterion 3<br>Ann reduction > 4% | OVERALL COMPLIANCE |
|--------------|---------------------|---------------|-------|---------------------|---------------|--------------|------------------------------------|-----------------------------|----------------------|-------------------------------------|--------------------------------------|-----------------------------------|--------------------|
| Block A 04 3 | 54                  | 39            | 71%   | 16                  | 14            | 88%          | 1277                               | 51                          | 192                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 04 3 | 54                  | 41            | 76%   | 16                  | 14            | 93%          | 1277                               | 51                          | 166                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 04 4 | 69                  | 64            | 93%   | 19                  | 21            | 109%         | 1277                               | 51                          | 64                   | YES                                 | YES                                  | NO                                | Pass               |
| Block A 04 4 | 52                  | 44            | 84%   | 14                  | 14            | 98%          | 1277                               | 51                          | 102                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 04 5 | 66                  | 65            | 98%   | 16                  | 20            | 121%         | 1277                               | 51                          | 13                   | YES                                 | YES                                  | YES                               | Pass               |
| Block A 04 5 | 62                  | 63            | 101%  | 14                  | 17            | 121%         | 1277                               | 51                          | -13                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 1 | 25                  | 12            | 49%   | 3                   | 0             | 0%           | 1277                               | 51                          | 166                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 05 2 | 54                  | 38            | 69%   | 16                  | 13            | 83%          | 1277                               | 51                          | 204                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 05 2 | 54                  | 38            | 70%   | 16                  | 15            | 91%          | 1277                               | 51                          | 204                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 05 3 | 54                  | 40            | 73%   | 16                  | 15            | 94%          | 1277                               | 51                          | 179                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 05 3 | 54                  | 42            | 77%   | 16                  | 16            | 96%          | 1277                               | 51                          | 153                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 05 4 | 75                  | 71            | 95%   | 25                  | 27            | 110%         | 1277                               | 51                          | 51                   | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 4 | 54                  | 47            | 86%   | 16                  | 16            | 99%          | 1277                               | 51                          | 89                   | YES                                 | YES                                  | NO                                | Pass               |
| Block A 05 5 | 72                  | 73            | 102%  | 22                  | 26            | 117%         | 1277                               | 51                          | -13                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 05 5 | 69                  | 70            | 102%  | 19                  | 23            | 118%         | 1277                               | 51                          | -13                  | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 1 | 25                  | 17            | 68%   | 3                   | 0             | 0%           | 1277                               | 51                          | 102                  | NO                                  | NO                                   | NO                                | Fail               |
| Block A 06 2 | 54                  | 41            | 75%   | 16                  | 14            | 85%          | 1277                               | 51                          | 166                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 06 2 | 54                  | 41            | 75%   | 16                  | 16            | 97%          | 1277                               | 51                          | 166                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 06 3 | 54                  | 42            | 77%   | 16                  | 16            | 98%          | 1277                               | 51                          | 153                  | YES                                 | NO                                   | NO                                | Pass               |
| Block A 06 3 | 54                  | 44            | 81%   | 16                  | 16            | 100%         | 1277                               | 51                          | 128                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 06 4 | 77                  | 73            | 95%   | 27                  | 29            | 107%         | 1277                               | 51                          | 51                   | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 4 | 54                  | 47            | 87%   | 16                  | 16            | 100%         | 1277                               | 51                          | 89                   | YES                                 | YES                                  | NO                                | Pass               |
| Block A 06 5 | 75                  | 75            | 100%  | 25                  | 28            | 112%         | 1277                               | 51                          | 0                    | YES                                 | YES                                  | YES                               | Pass               |
| Block A 06 5 | 73                  | 73            | 101%  | 23                  | 26            | 115%         | 1277                               | 51                          | 0                    | YES                                 | YES                                  | YES                               | Pass               |
| Block A 07 1 | 31                  | 26            | 83%   | 3                   | 0             | 0%           | 1277                               | 51                          | 64                   | NO                                  | NO                                   | NO                                | Fail               |
| Block A 07 2 | 54                  | 45            | 83%   | 16                  | 14            | 85%          | 1277                               | 51                          | 115                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 07 2 | 54                  | 43            | 80%   | 16                  | 16            | 97%          | 1277                               | 51                          | 140                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 07 3 | 54                  | 44            | 81%   | 16                  | 16            | 98%          | 1277                               | 51                          | 128                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 07 3 | 54                  | 46            | 85%   | 16                  | 16            | 100%         | 1277                               | 51                          | 102                  | YES                                 | YES                                  | NO                                | Pass               |
| Block A 07 4 | 79                  | 75            | 94%   | 29                  | 30            | 103%         | 1277                               | 51                          | 51                   | YES                                 | YES                                  | YES                               | Pass               |

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## APPENDIX E – Alternative Daylight Calculations

Alternative Daylight Calculations: a second daylight assessment was carried out to determine the average daylight factor (ADF) that would be achieved for the living and dining spaces. The methodology explains why this assessment is relevant.

## Methodology (Cont'd)

In relation to daylight, the BRE Guide suggest that:

*“Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space... [The 2008 British Standard] recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In **housing** [the 2008 British Standard] also gives minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.” (emphasis added)*

These daylighting targets (as also utilised within BS.8206-2) were originally introduced in British Standards Code of Practice CP3 Chapter 1 Part 1 released in 1964 and were based on surveys undertaken of UK dwellings in preceding years.

The higher ADF target for Kitchens was in recognition of the task-based nature of lighting requirements- as opposed to environmental considerations, in particular “Opinions were recorded for the kitchen in relation to the work centres at the stove, sink and work-table”<sup>2</sup> in the surveying that informed this target, which was based on achieving an illuminance level of 200 Lux at these task based areas for an assumed 10,000 Lux sky (hence 2% ADF). It may be noted that this surveying was also undertaken at a time that artificial lighting within kitchens would have been rudimentary- i.e. predating cooker-hood lighting etc.

With reference to living and cooking areas, the BRE Guide states:

*“2.1.13 Living rooms and kitchens need more daylight than bedrooms, so where there is a choice it is best to site the living room or kitchen away from obstructions...”*

However additionally, and with specific relevance for apartments, the BRE guide states:

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

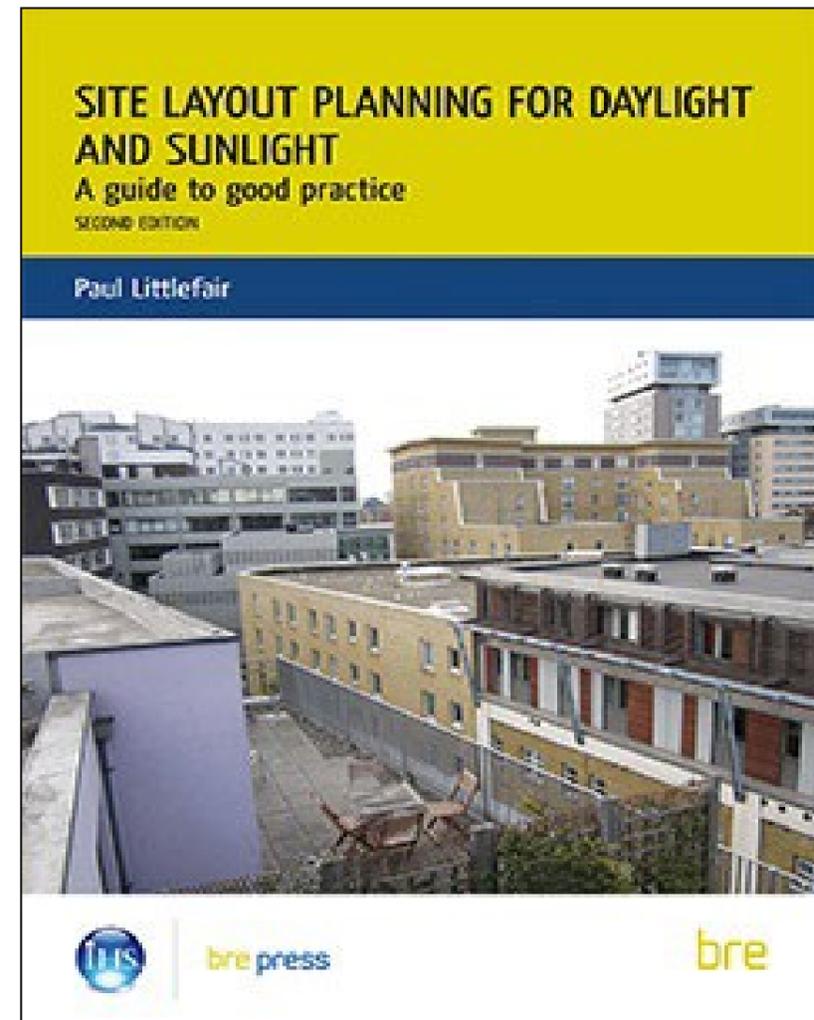


Fig E.1 The BRE Guide

<sup>2</sup> National Research Council of Canada – Performance Standards for Space and Site Planning for Residential Development- 1968

## Methodology (Cont'd)

It may be noted therefore that for the purpose of analysis, and allowing that there is no other specific guidelines within BRE 209 for **apartment** typologies ( in particular Kitchen / Living / Dining (KLD) areas), the Kitchenettes to Apartments have been excluded as these types of galley kitchens do not provide dining/sitting area.

The associated requirement within BS.8206-2 for “Kitchens” (ADF>2.0%) was developed for residential **housing** where the kitchen would be an identifiable separate room with seating and where occupants would be expected to eat and spend time as well as being generally present throughout the day.

As the daylight analysis has been undertaken to ensure good continual **environmental** performance for the apartments, analysis has been undertaken assessing the Living/Dining areas of the KLD's, excluding the kitchenette where **task-based** lighting is required on an intermittent basis. Whilst BRE 209 does not specifically reference Dining areas, these have been included within the zone of analysis allowing for the benefit of maximising daylight availability to the table space for envisaged variety of uses in addition to eating where, light would be beneficial – i.e. work from home, school / college homework, reading, writing etc..

The delineation of typical spaces for this scheme is illustrated in E.2 setting out the assessed areas (green) and excluded spaces (orange) as transient area / door ways / galley kitchen etc.. Zones of analysis can also be clearly seen in presented results of calculated contours of predicted daylight availability.

With regard to the above, the minimum values targeted for relevant spaces are:

- > 1.5% for Living/ Dining Areas
- > 1.0% for Bedrooms

Notwithstanding the above, it may be noted that these are minimum targets, and that the vast majority of spaces were determined to comfortably exceed the values, as summarised in the results section below. In addition, sub-standard daylighting performance has been avoided wherever viable and practical with the following design enhancements applied to maximise natural light availability and therefore internal environments:

- Maximise glazing,
- Minimise / offset balcony structures,
- Increase glazing / floor heights.



Fig E.2 Sample analysis space for Living \ Dining Space & Bedroom

### Results Summary

Figure E.4 indicates the overall summary of ADF's determined for the Proposed Development, at each floor level. It can be seen that **95%** of Living/ Dining and Bedrooms assessed (totalling 801 of 833 rooms) were determined to be compliant based on the following compliance, in accordance with BS.8206-2: 7

- > 1.5% for Living/ Dining Areas
- > 1.0% for Bedrooms

However, aside from meeting minimum requirements, most Living/ Dining Areas and Bedrooms were determined to receive Daylighting comfortably exceeding these ADF targets, it was determined that an average ADF of above 4% would be provided for half the spaces across the development, with 50% of the living spaces and bedrooms achieving an ADF in excess of 4%, as illustrated in Figures E.5 and E.6.

| Level           | Pass | Fail | Total |
|-----------------|------|------|-------|
| LGF             | 22   | 12   | 34    |
| GF              | 51   | 11   | 62    |
| 1               | 72   | 18   | 90    |
| 2               | 86   | 3    | 89    |
| 3               | 86   | 0    | 86    |
| 4               | 81   | 0    | 81    |
| 5               | 52   | 0    | 52    |
| 6               | 52   | 0    | 52    |
| 7               | 52   | 0    | 52    |
| 8               | 47   | 0    | 47    |
| 9               | 46   | 0    | 46    |
| 10              | 46   | 0    | 46    |
| 11              | 46   | 0    | 46    |
| 12              | 10   | 0    | 10    |
| 13              | 10   | 0    | 10    |
| 14              | 10   | 0    | 10    |
| 15              | 10   | 0    | 10    |
| 16              | 10   | 0    | 10    |
| Total           | 789  | 44   | 833   |
| Percentage Rate | 95%  | 5%   |       |

Fig E.4 – Daylight Summary – Development

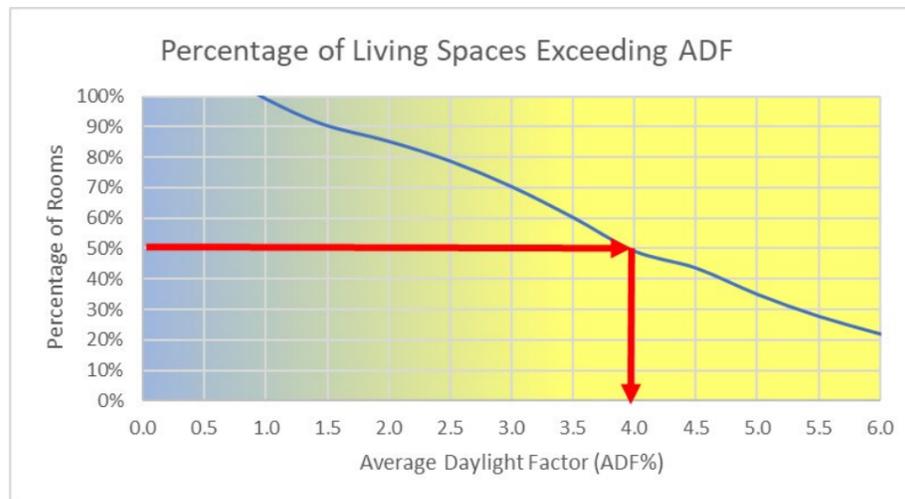


Fig E.5 Frequency Graph for Living/Dining Spaces

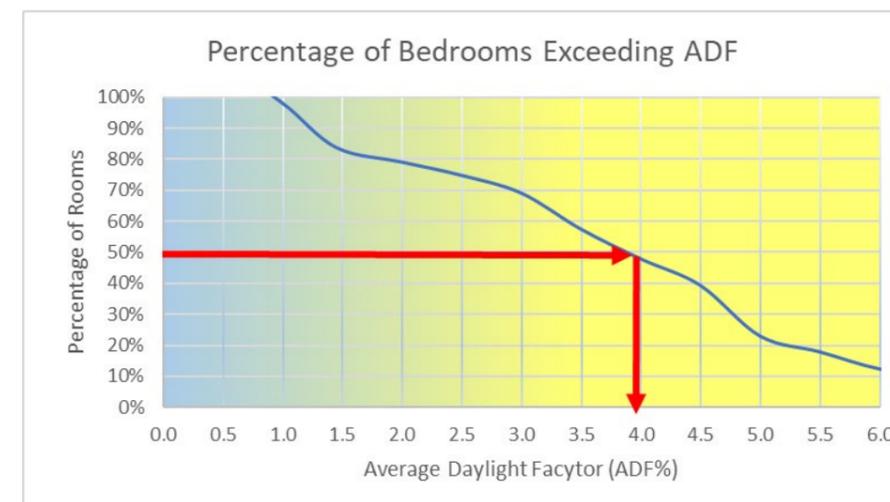
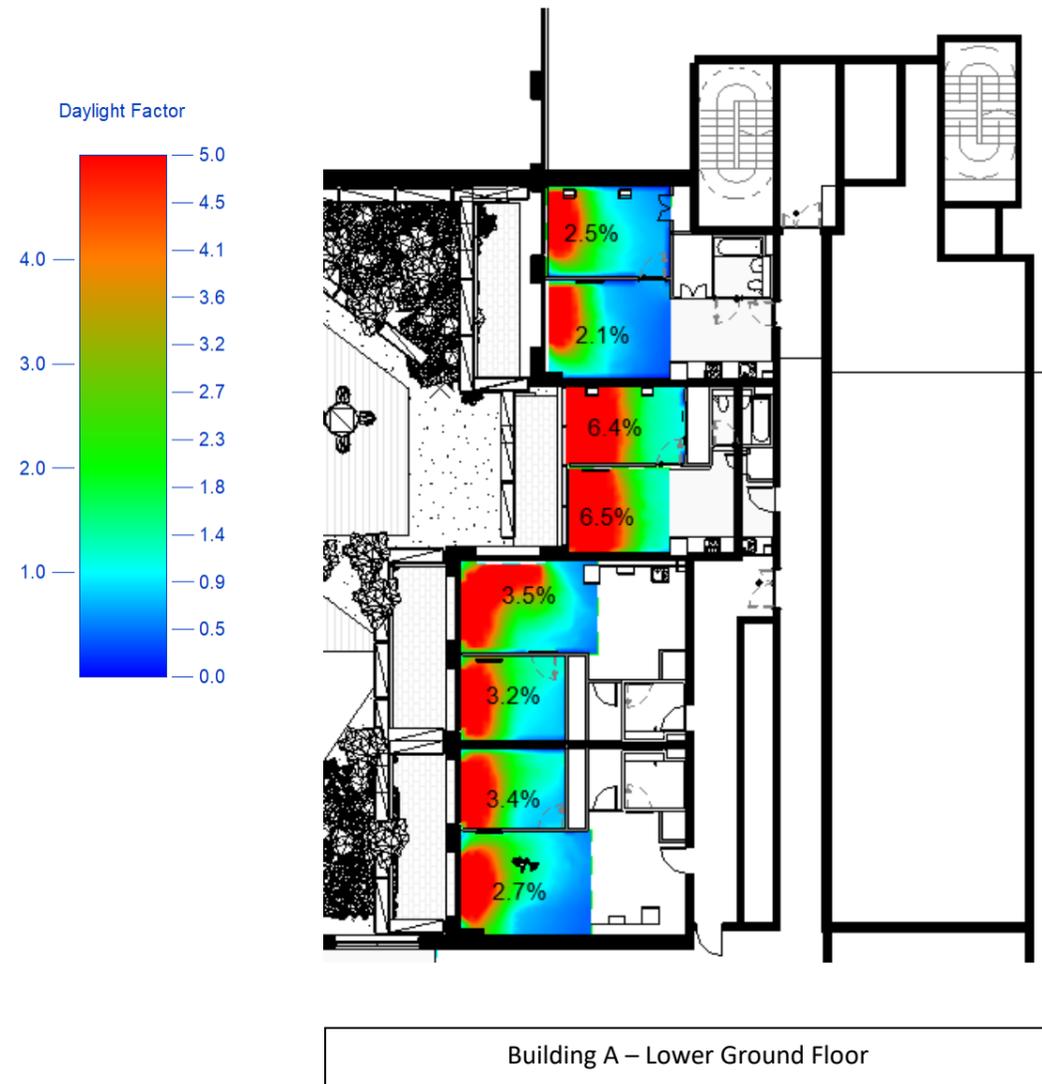
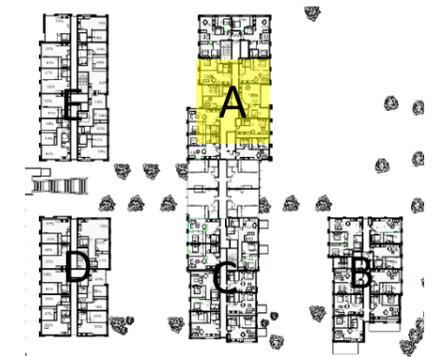


Fig E.5 Frequency Graph for Bedroom Spaces

## Internal Daylight Analysis

### Building A

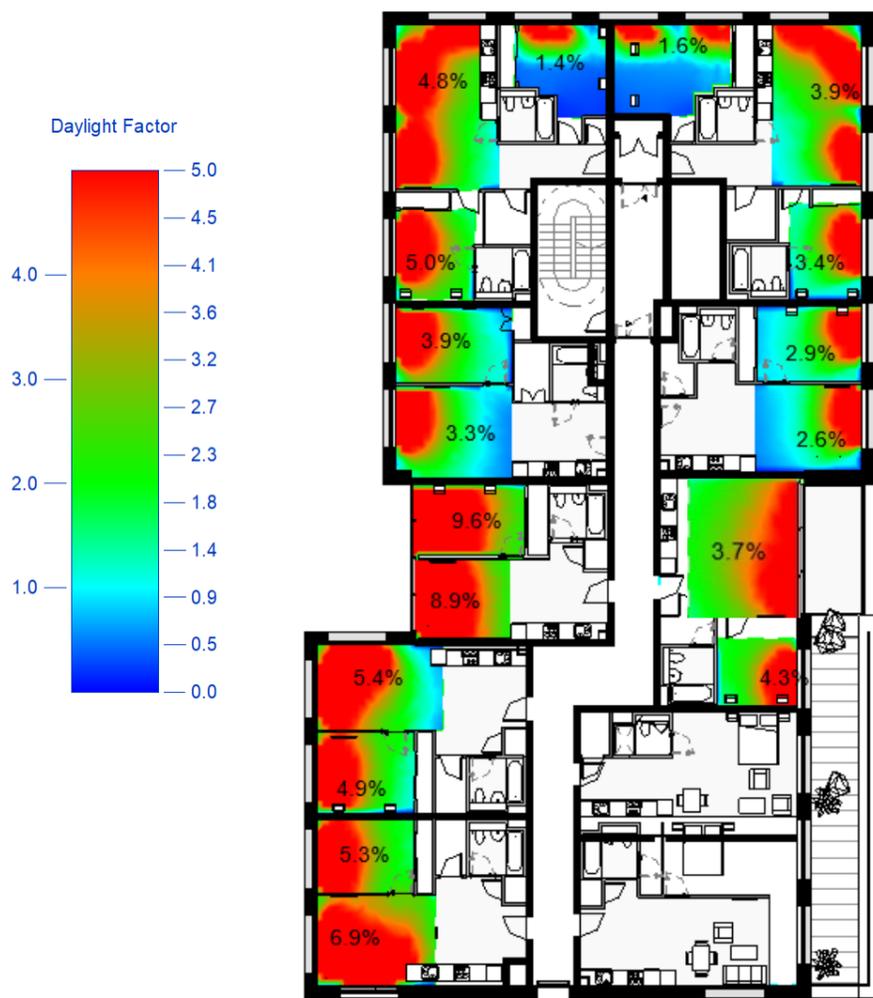
Two Bedroom spaces on the first floor are non-compliant with methodology.



| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building A

All rooms are compliant with methodology.



Building A – Second Floor



Building A – Third Floor

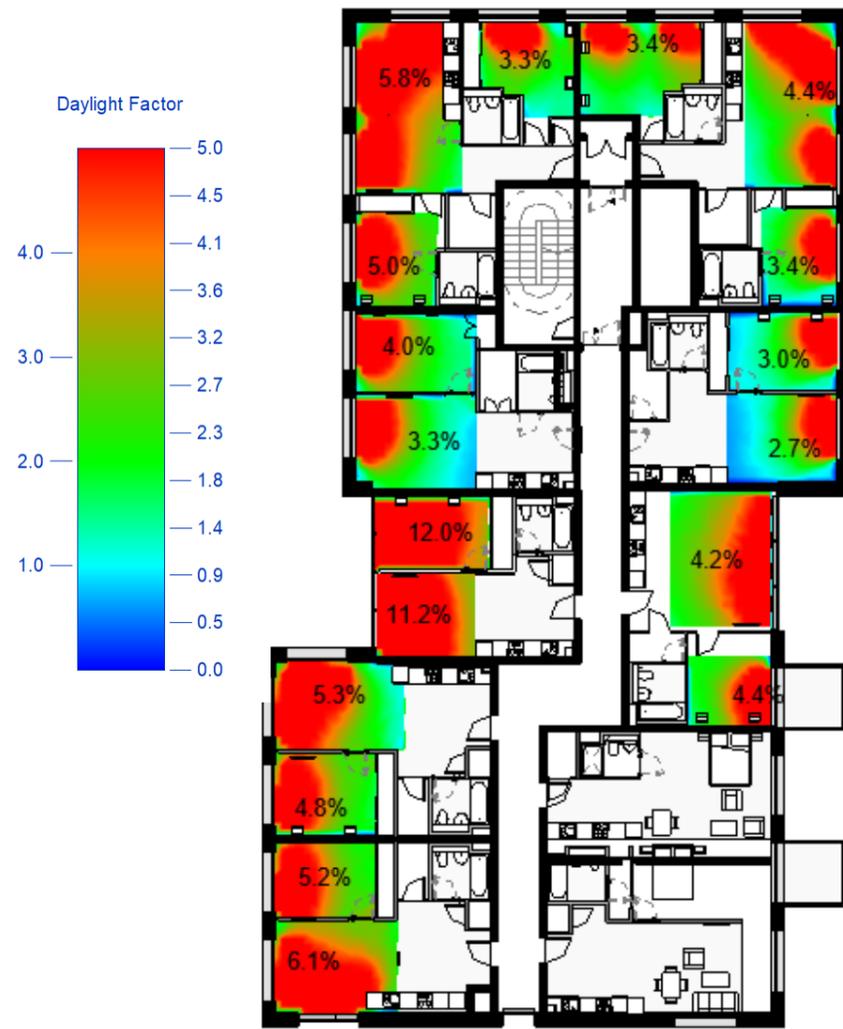
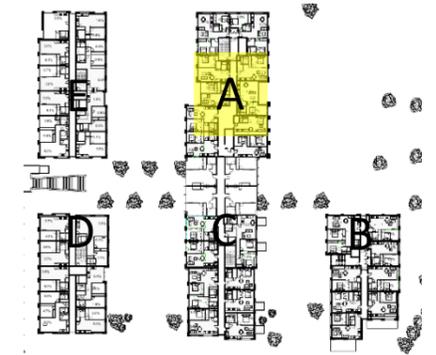


Building A – Fourth Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building A

All rooms are compliant with methodology.



Building A – Fifth Floor



Building A – Sixth Floor

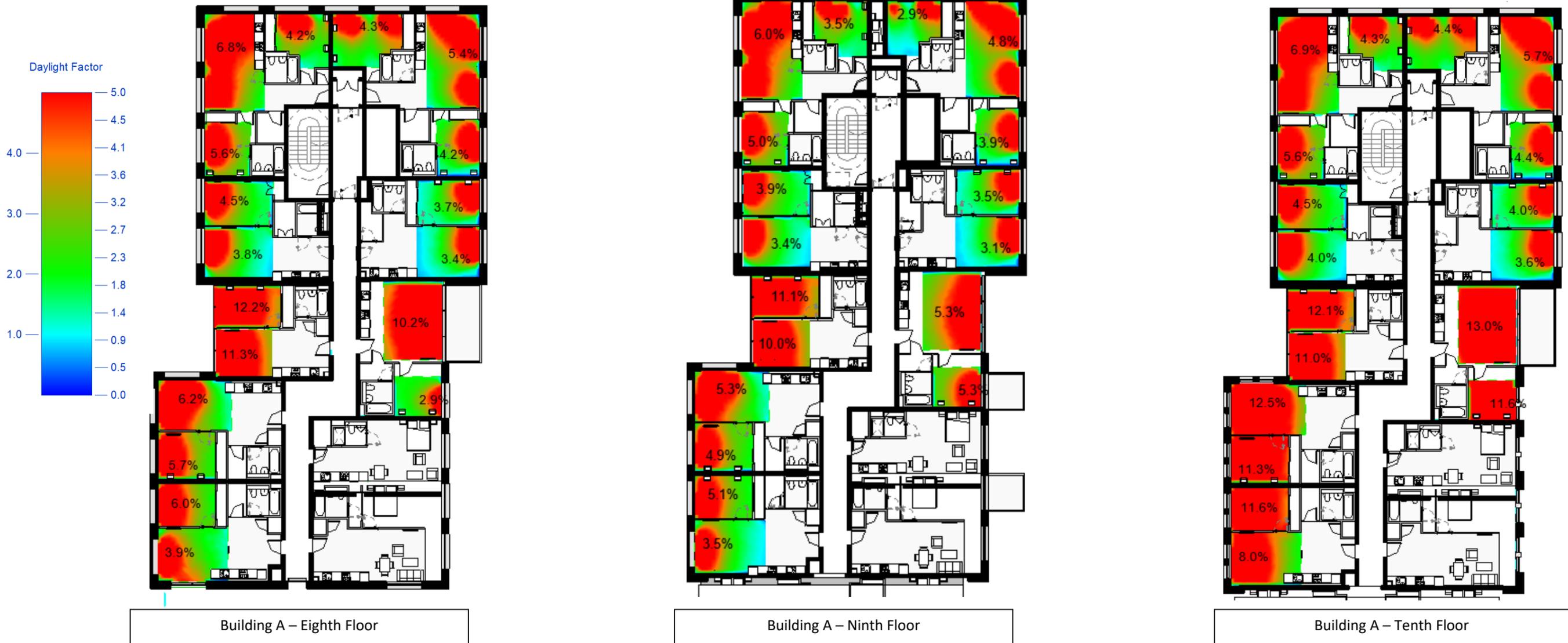
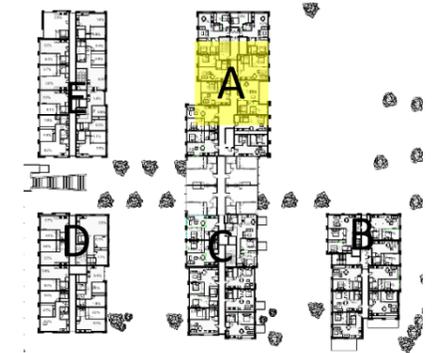


Building A – Seventh Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building A

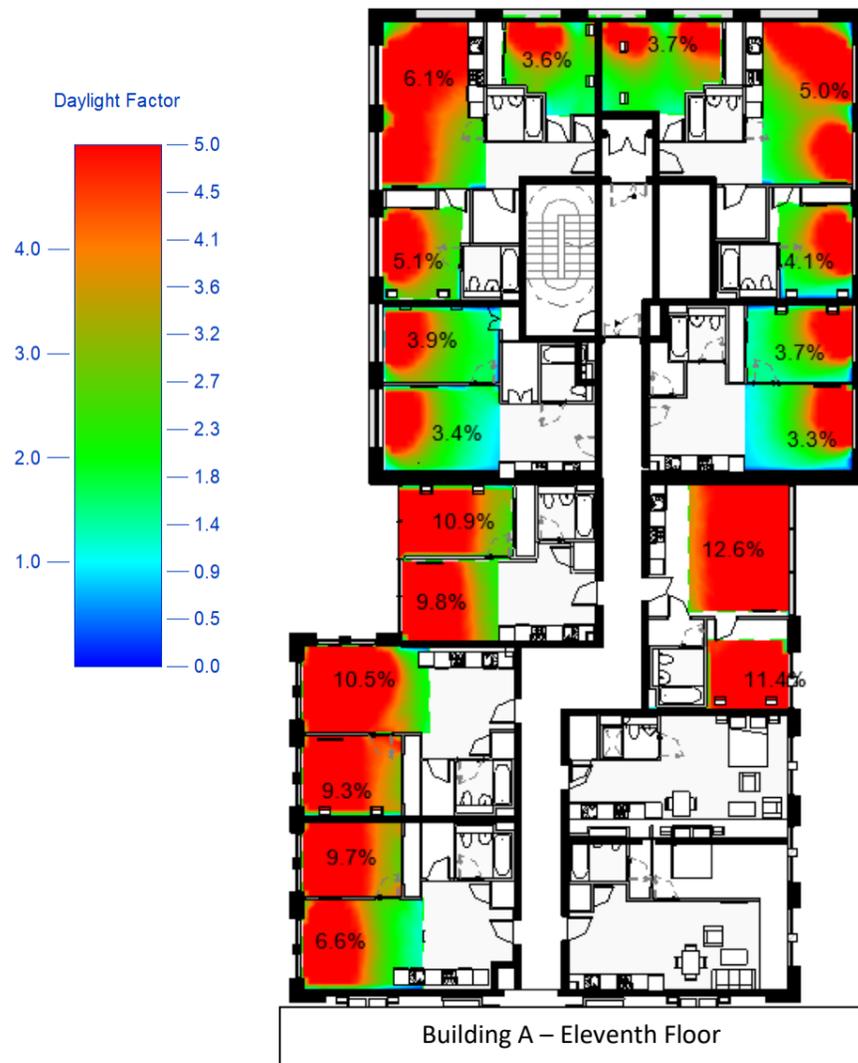
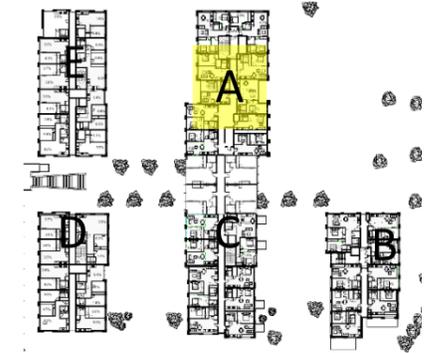
All rooms are compliant with methodology.



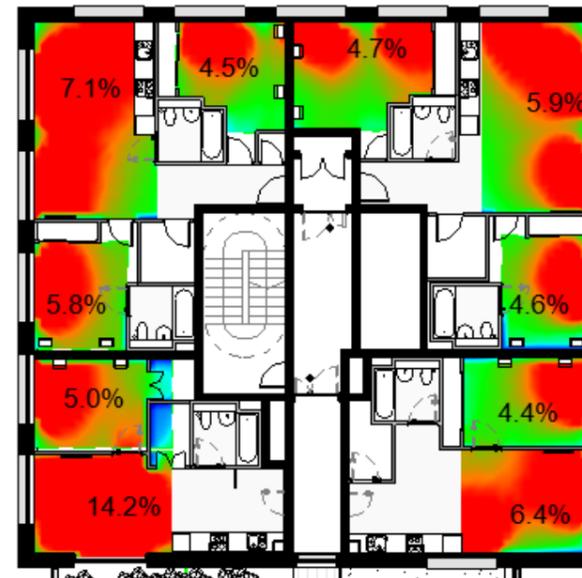
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building A

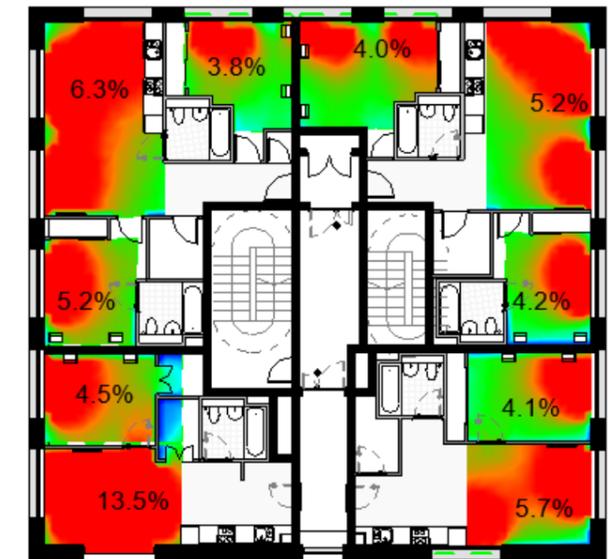
All rooms are compliant with methodology.



Building A – Eleventh Floor



Building A – Twelfth Floor

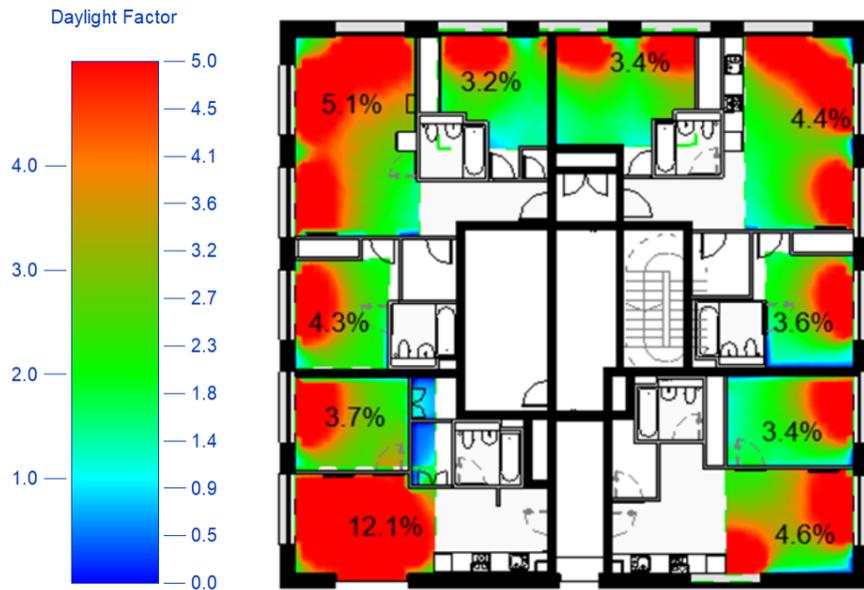
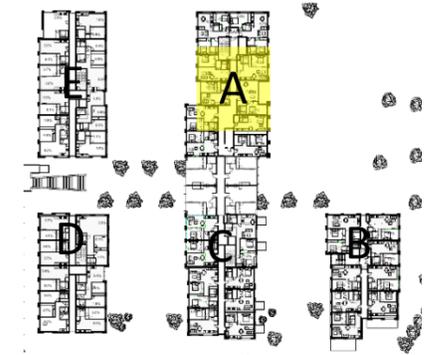


Building A – Thirteenth Floor

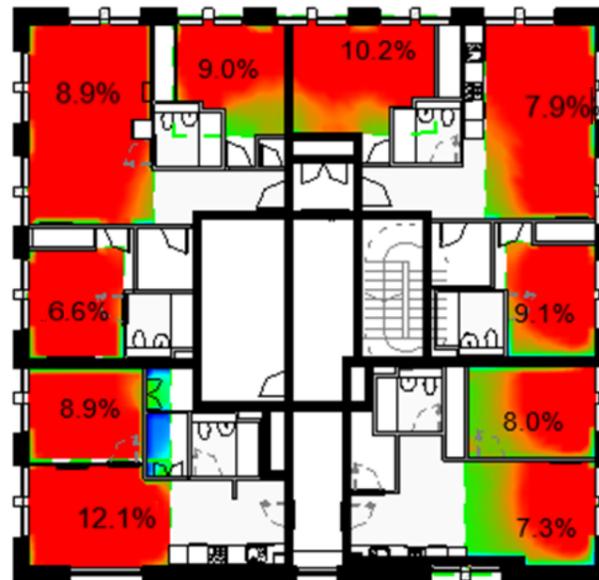
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building A

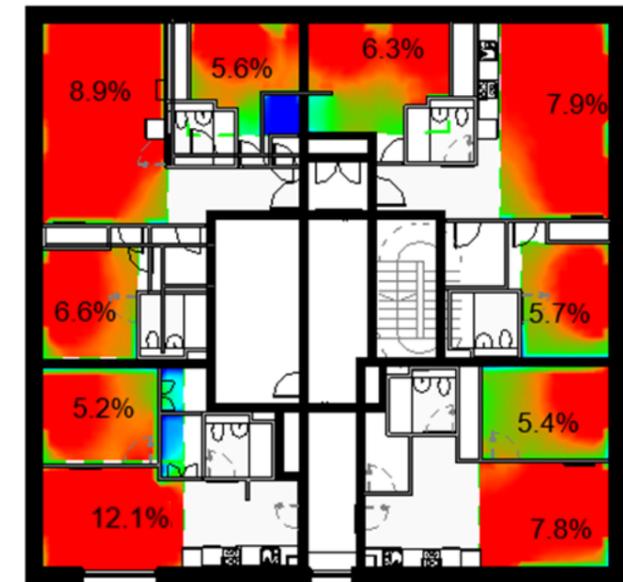
All rooms are compliant with methodology.



Building A – Fourteenth Floor



Building A – Fifteenth Floor

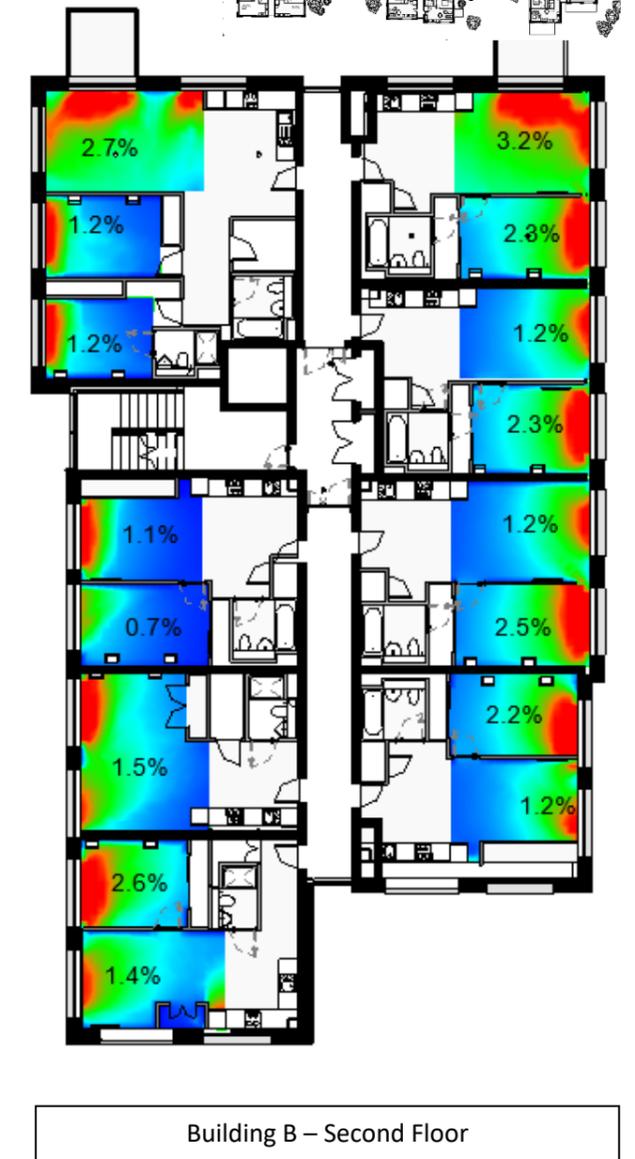
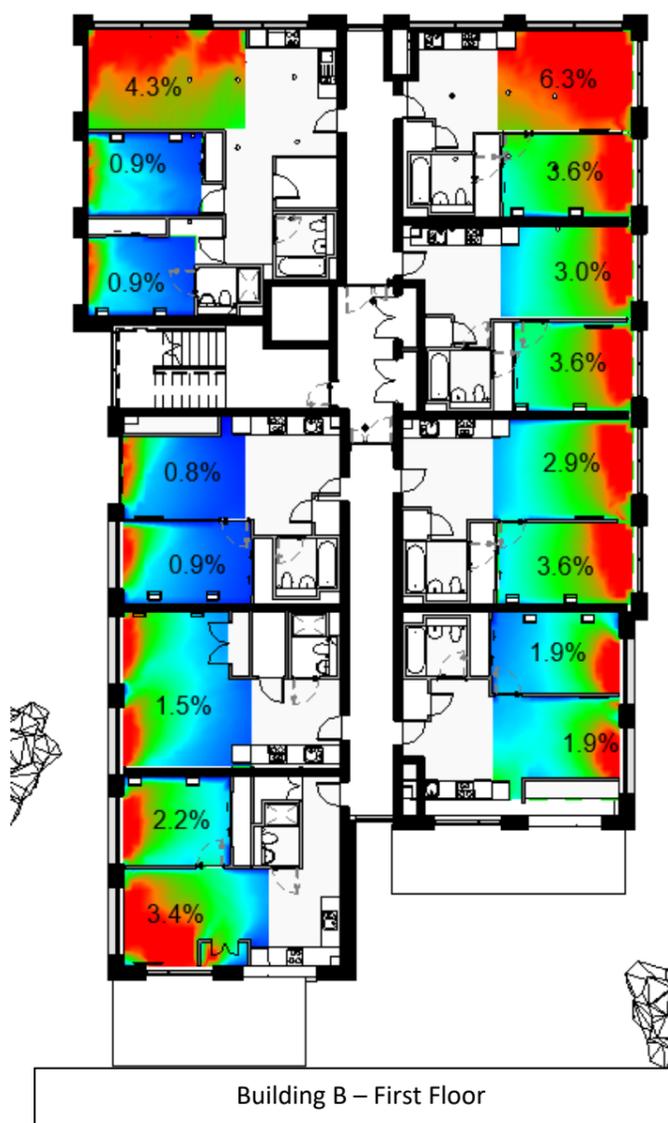
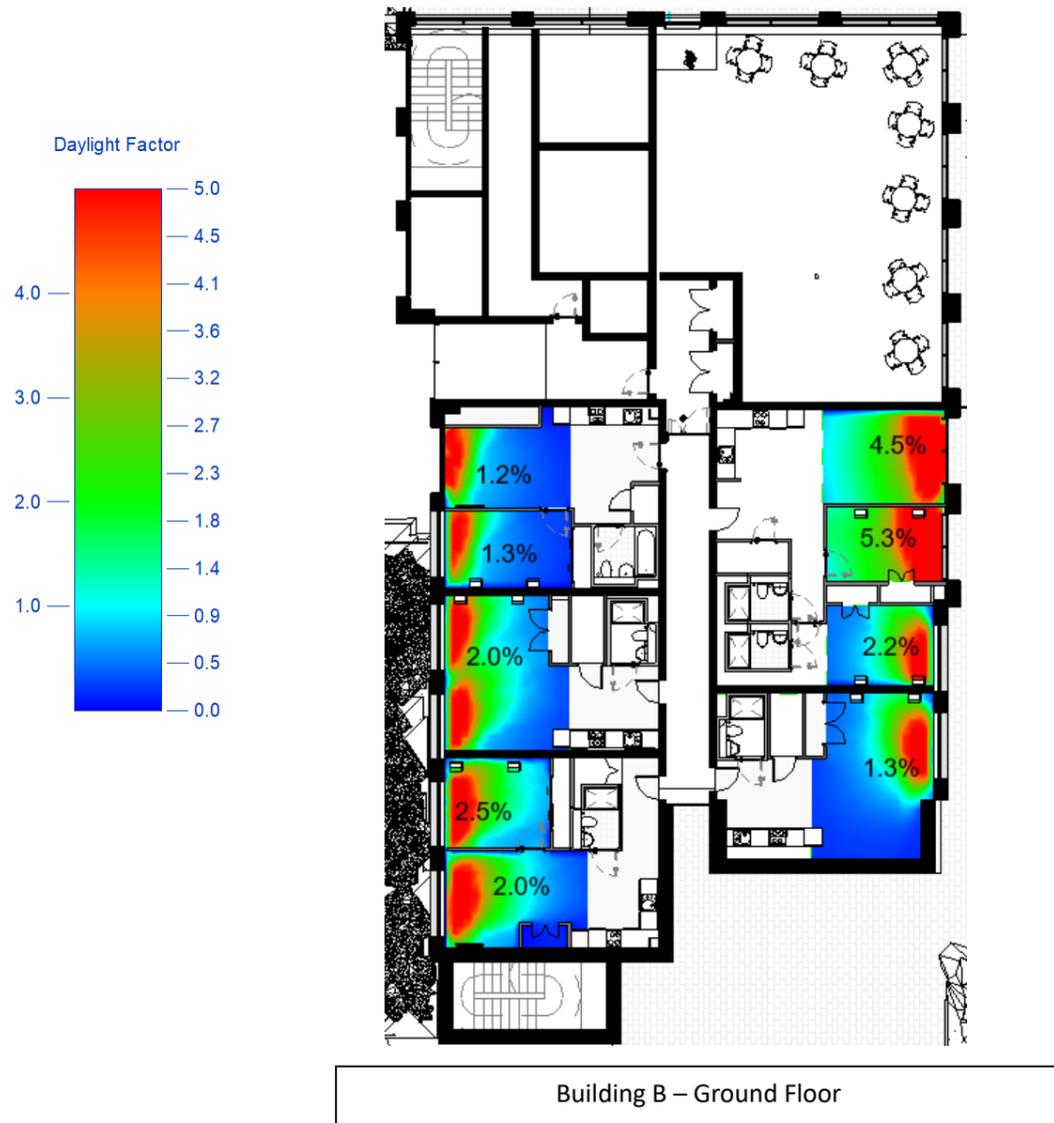
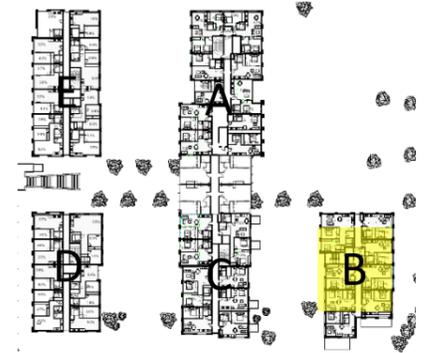


Building A – Sixteenth Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

## 7.0 Building B

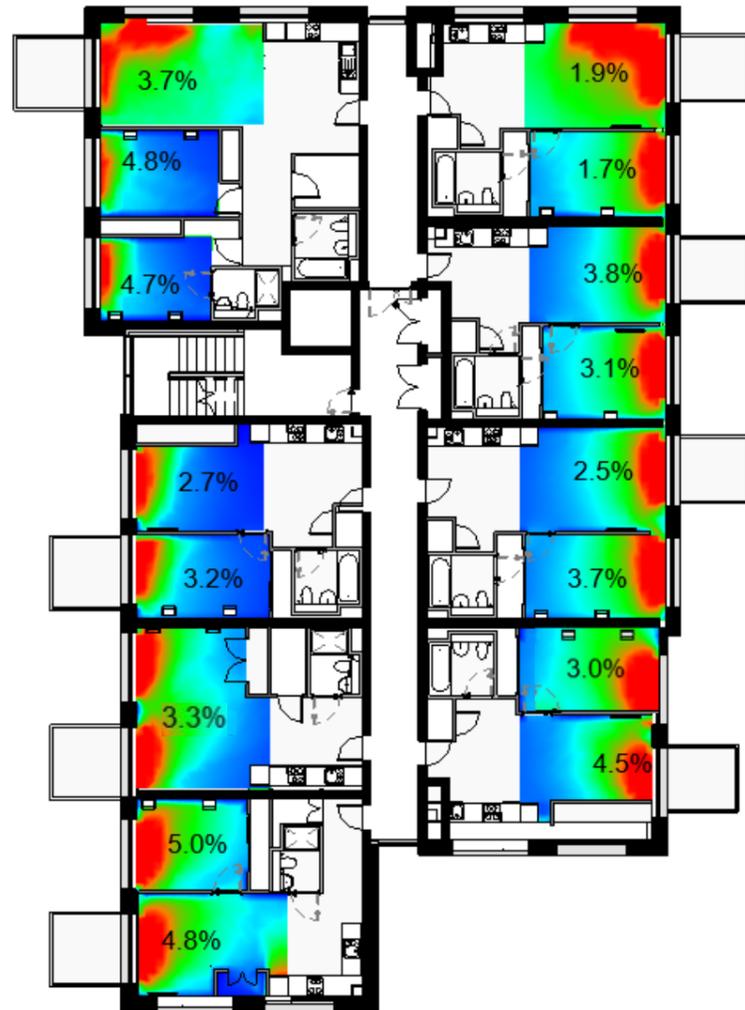
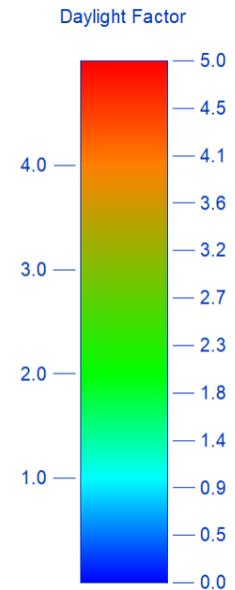
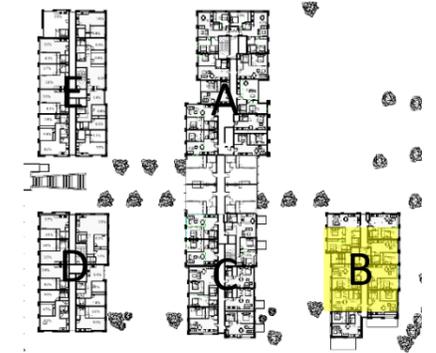
12 spaces were found to be non-compliant with methodology across the ground, first and second floors of Building B.



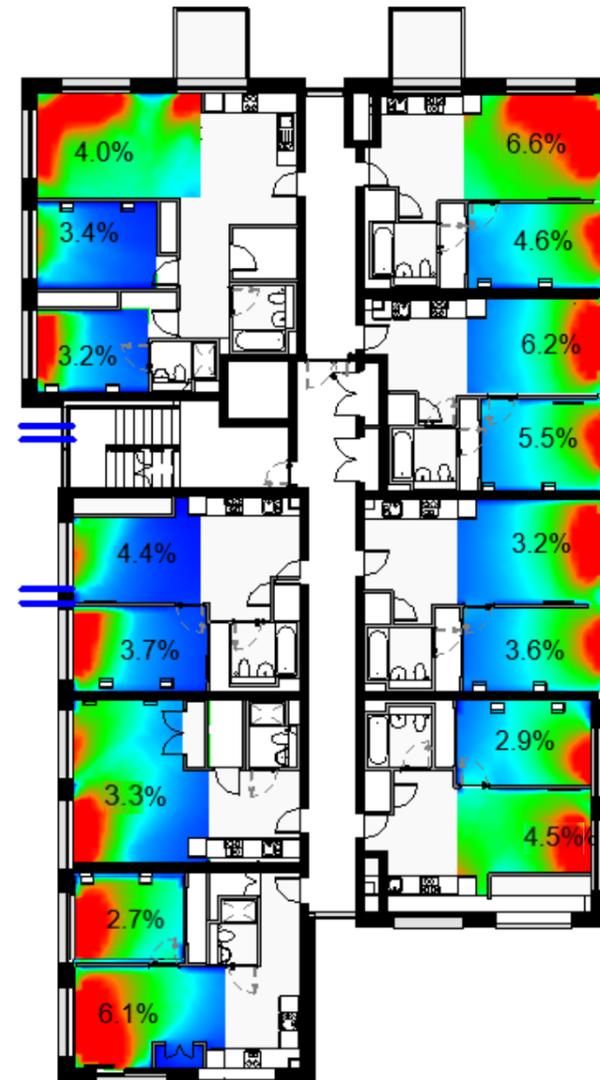
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building B

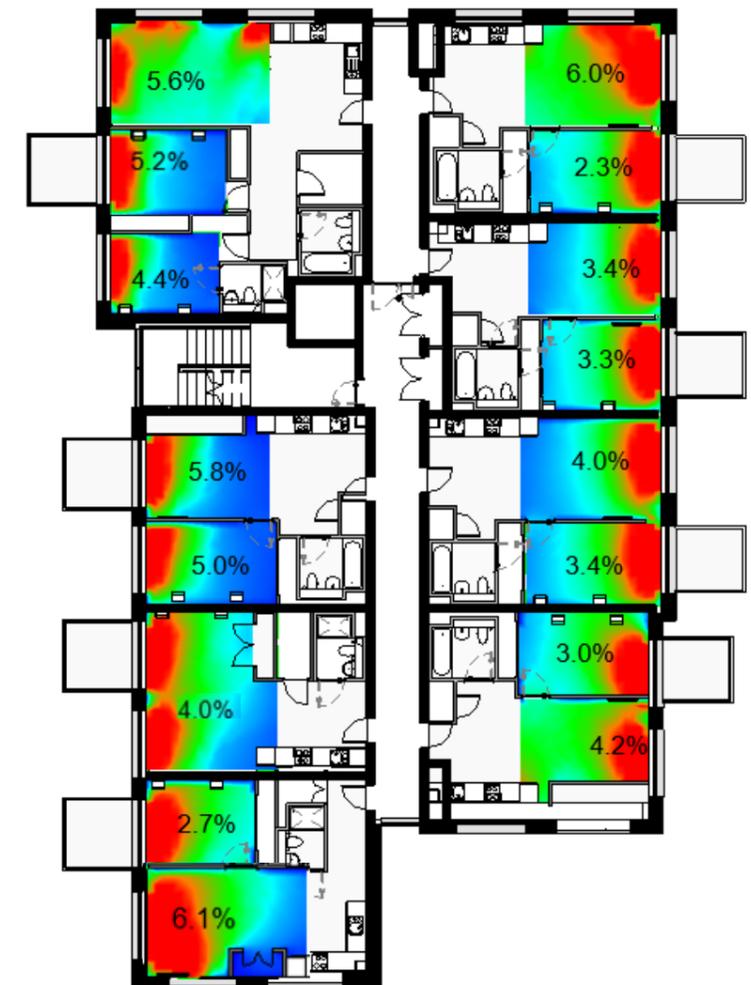
All rooms are compliant with methodology.



Building B – Third Floor



Building B – Fourth Floor

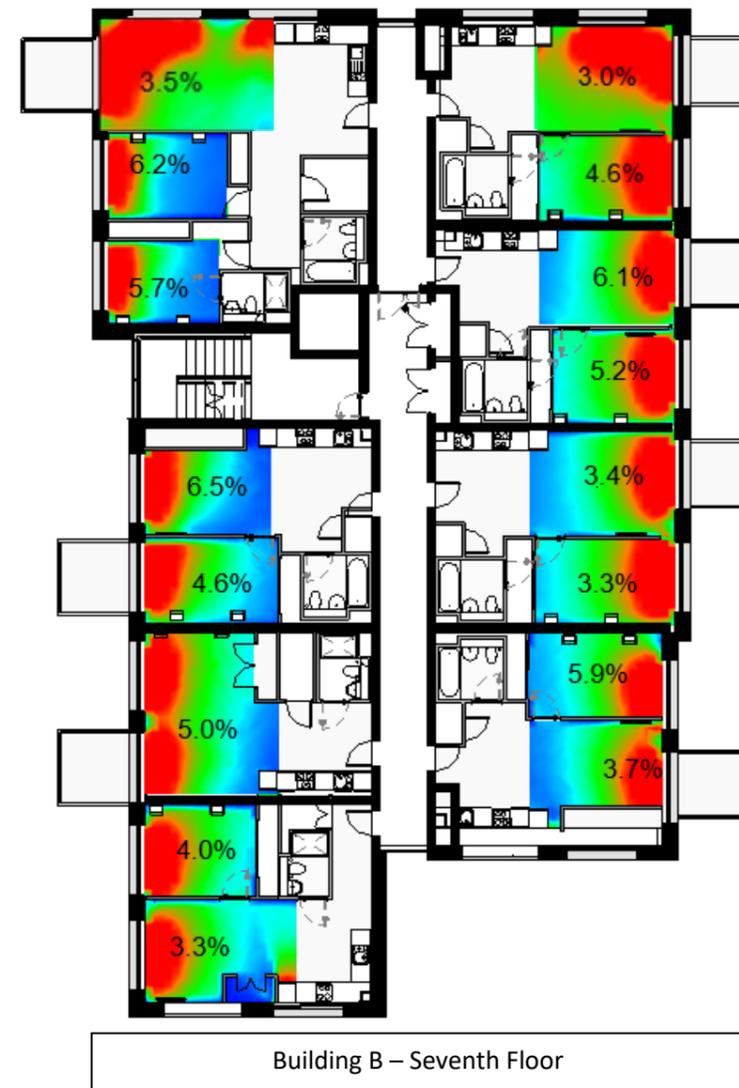
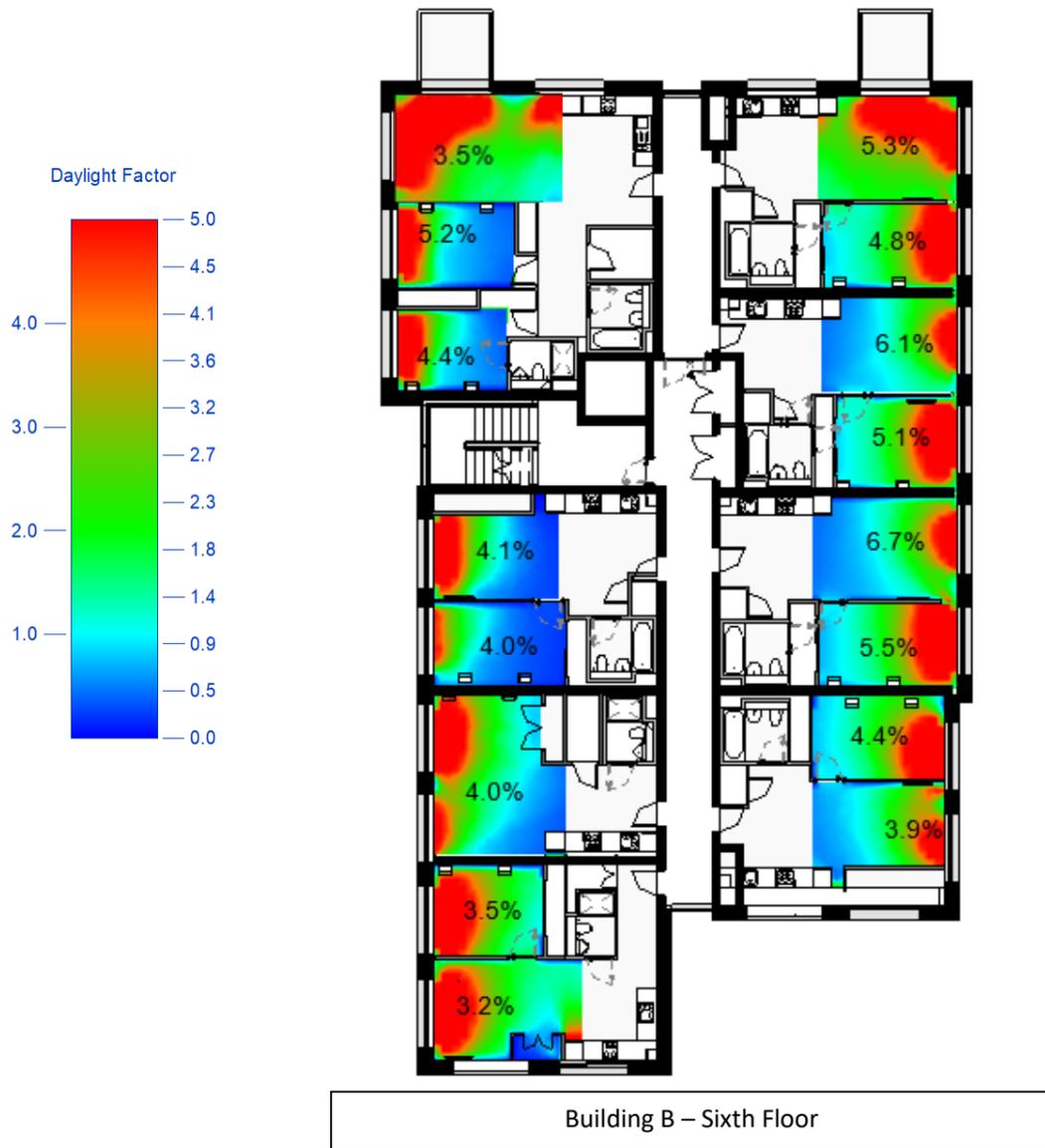
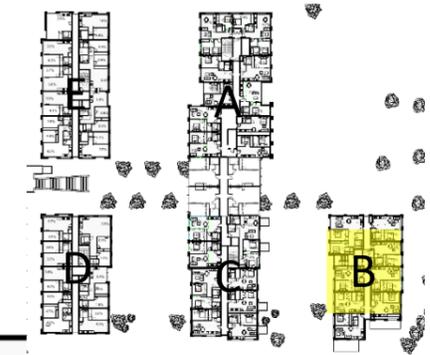


Building B – Fifth Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building B

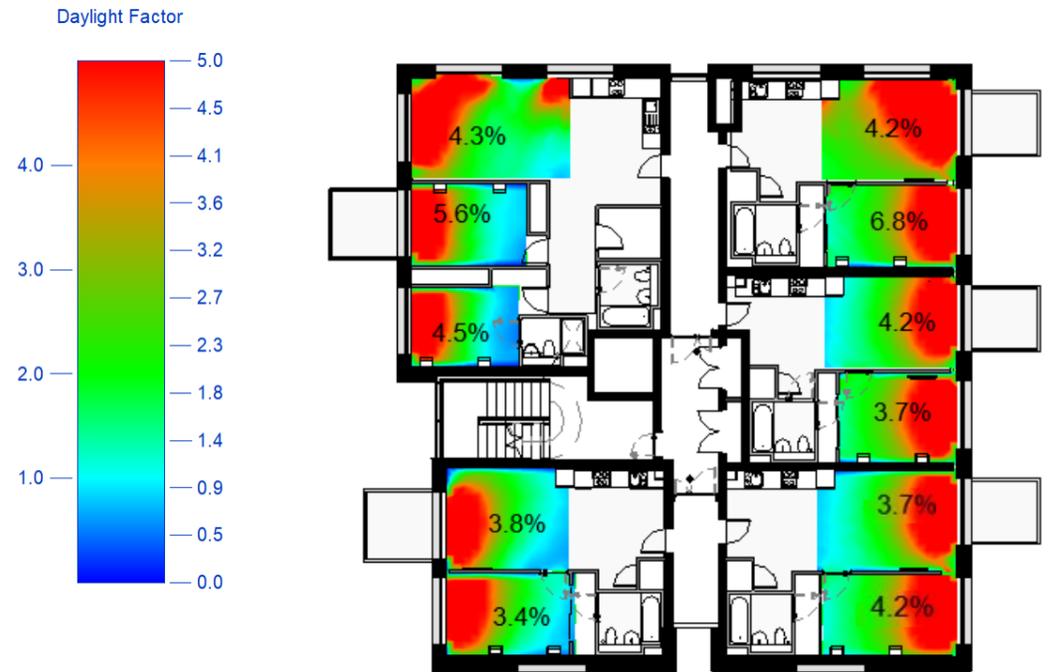
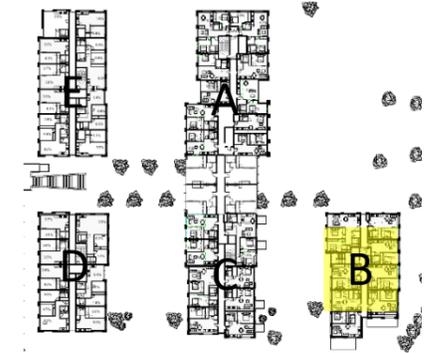
All rooms are compliant with methodology.



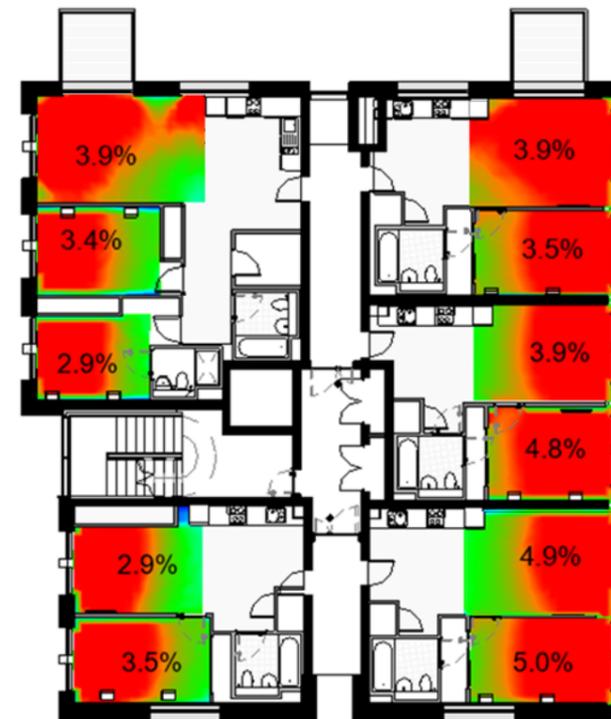
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building B

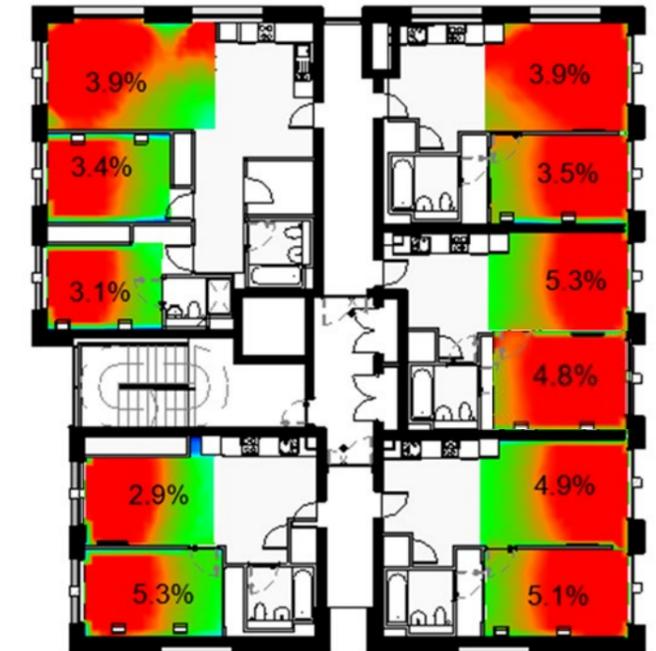
All rooms are compliant with methodology.



Building B – Ninth Floor



Building B – Tenth Floor

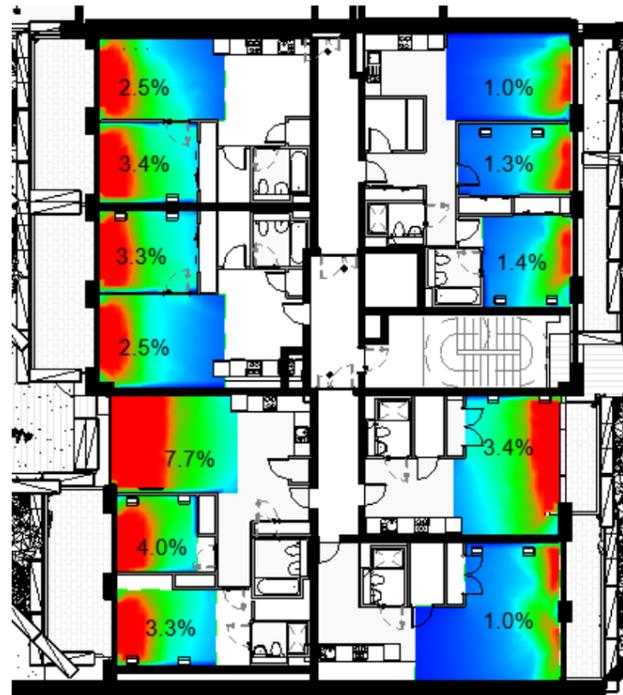
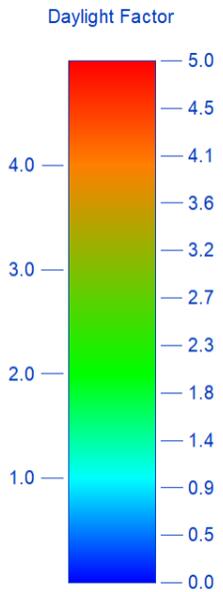
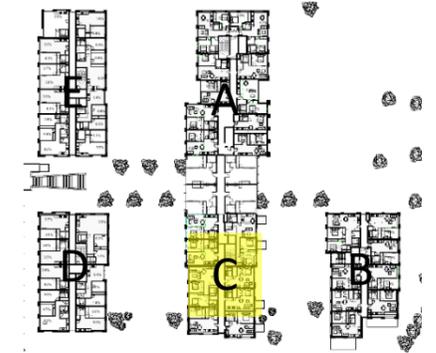


Building B – Eleventh Floor

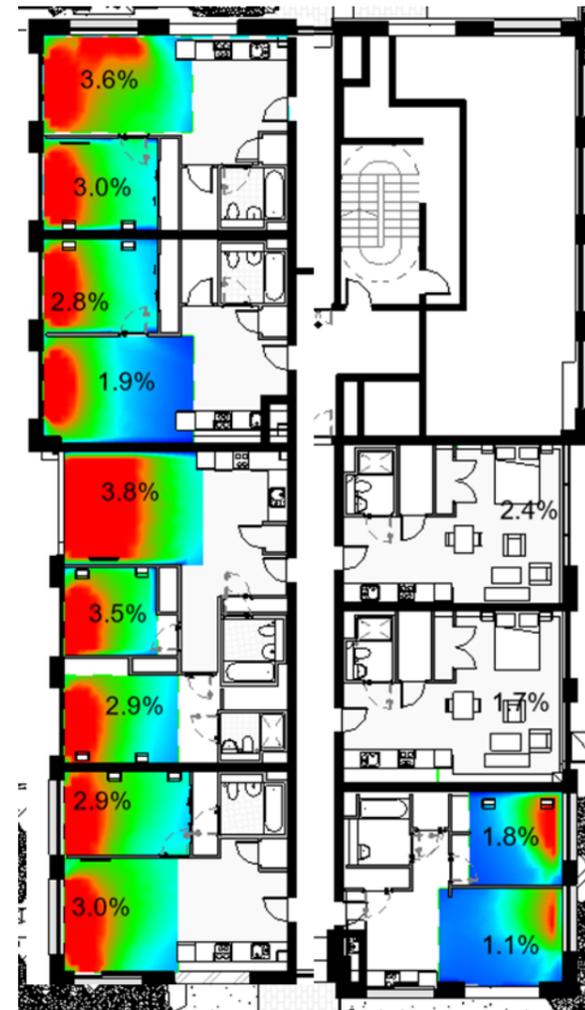
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### 7.1 Building C

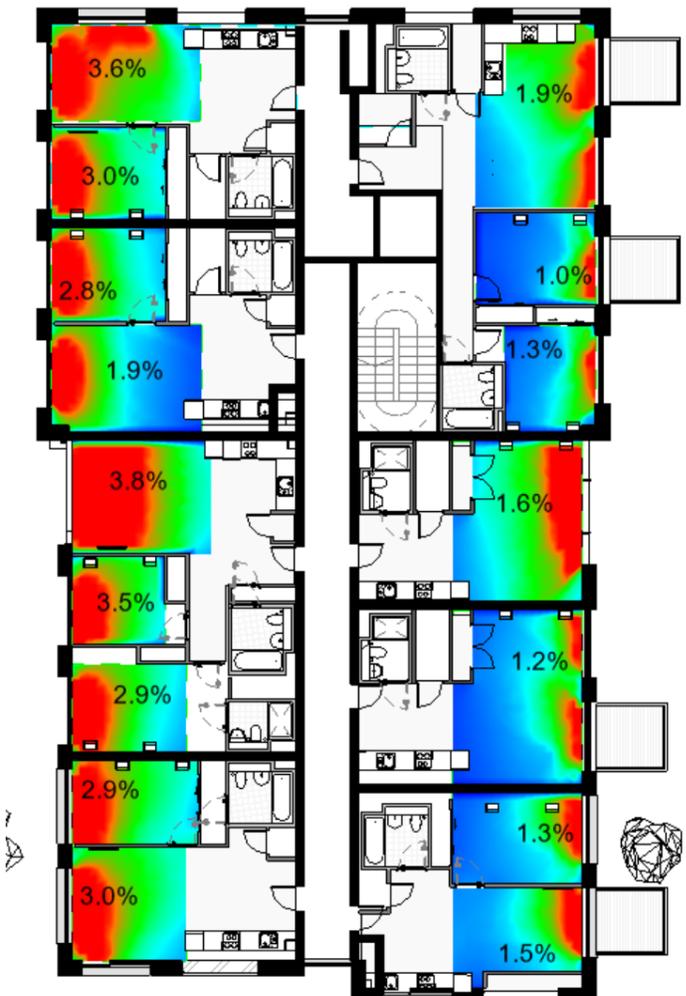
4 spaces were found to be non-compliant with the methodology across the lower ground, ground and first floors of Building C.



Building C – Lower Ground Floor



Building C – Ground Floor

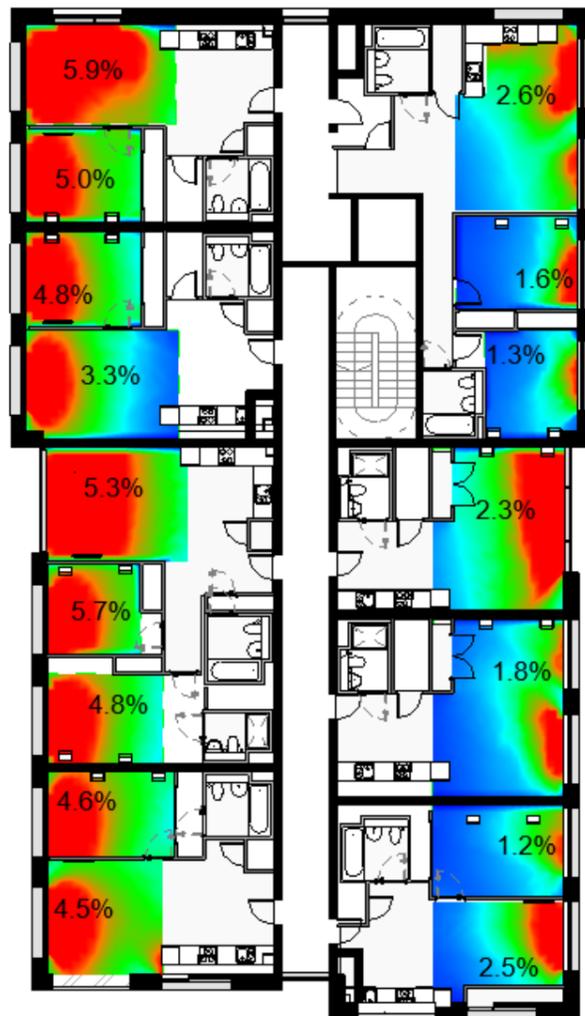
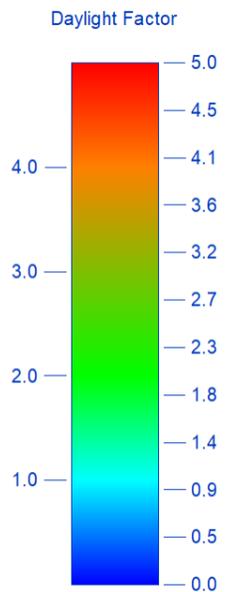
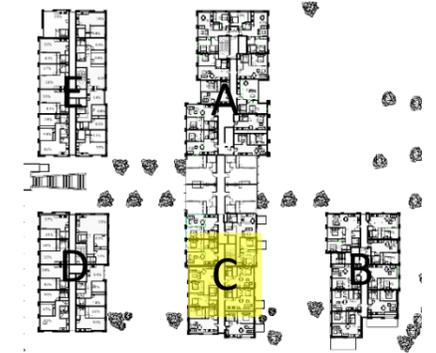


Building C – First Floor

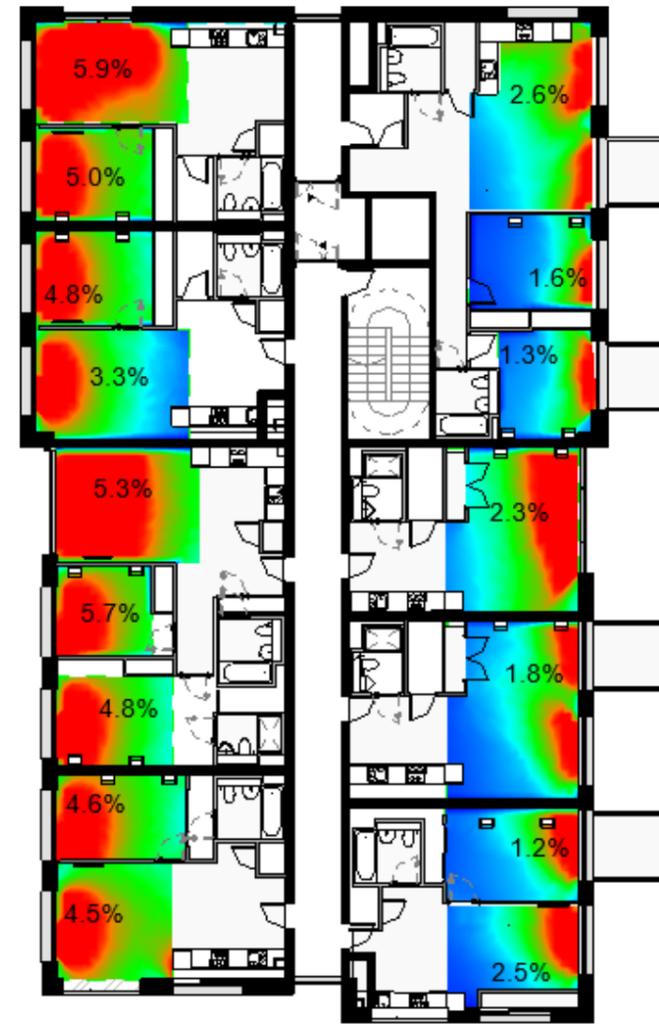
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building C

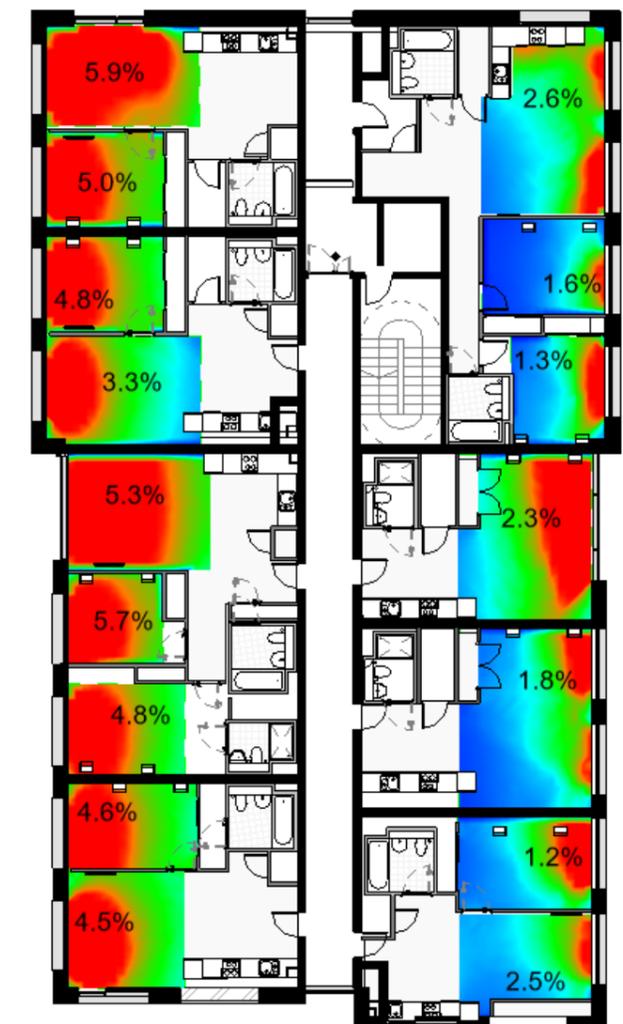
All rooms are compliant with methodology.



Building C – Second Floor



Building C – Third Floor

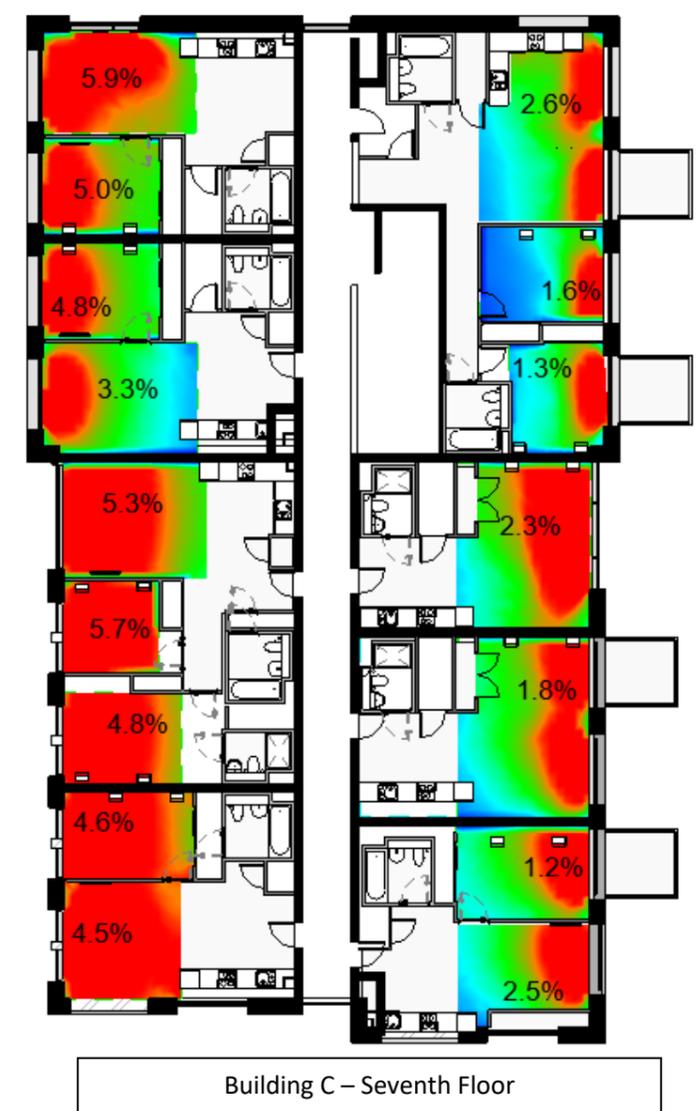
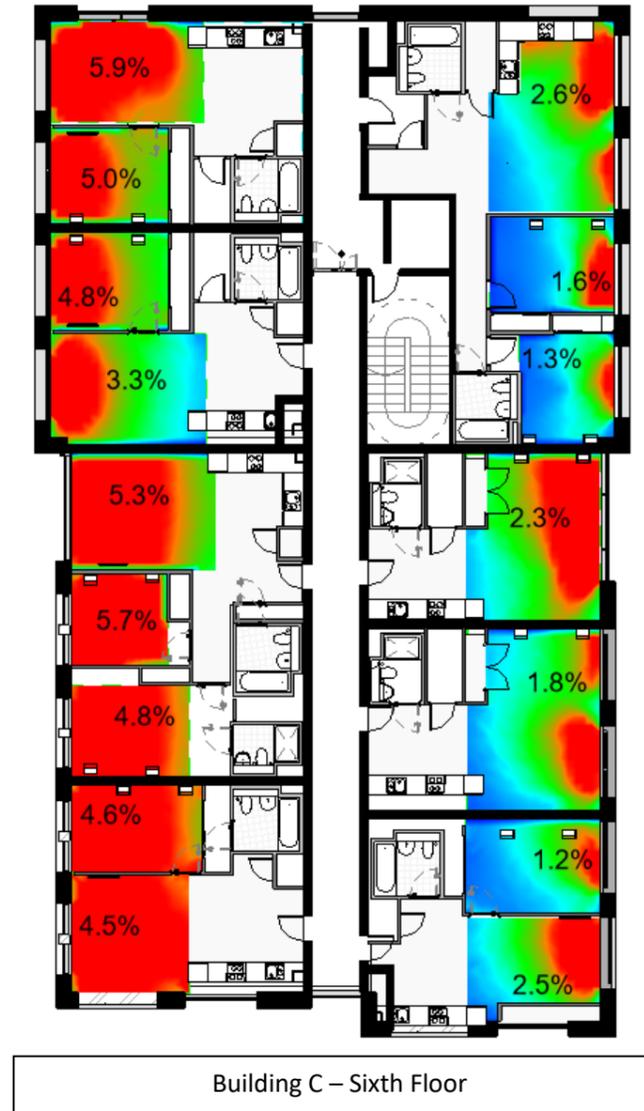
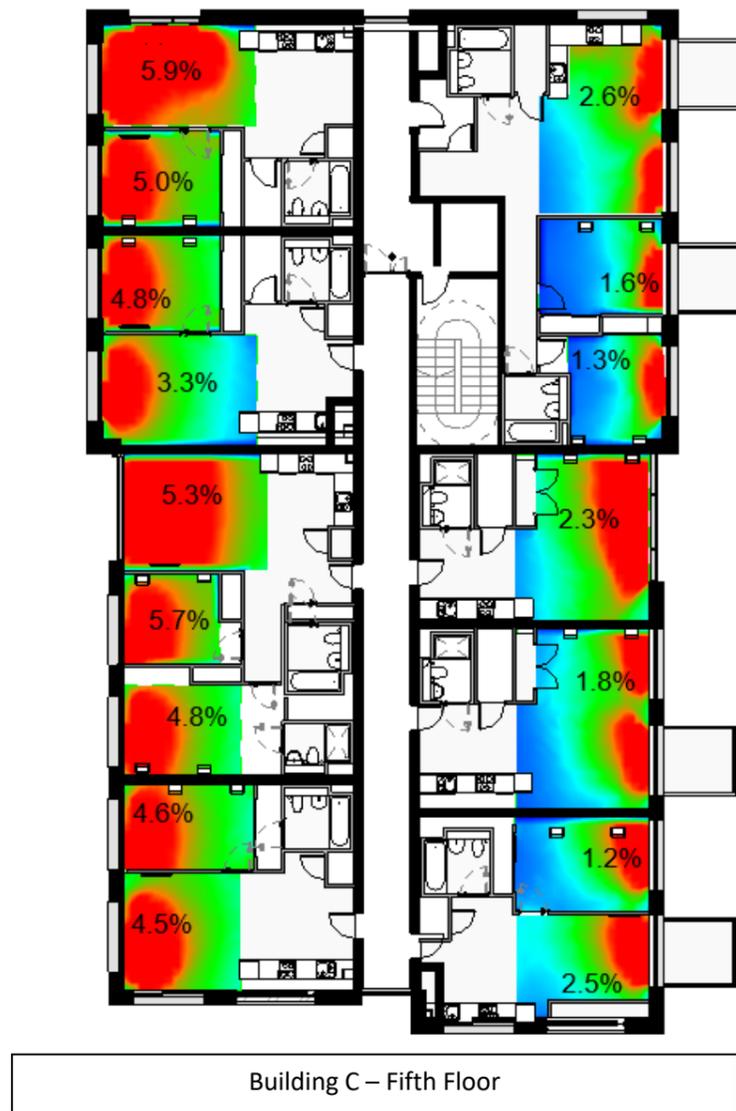
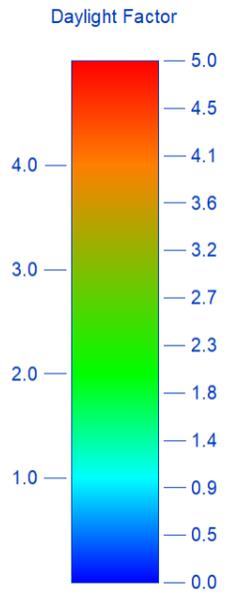
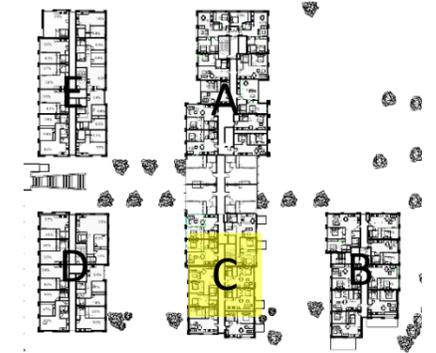


Building C – Fourth Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building C

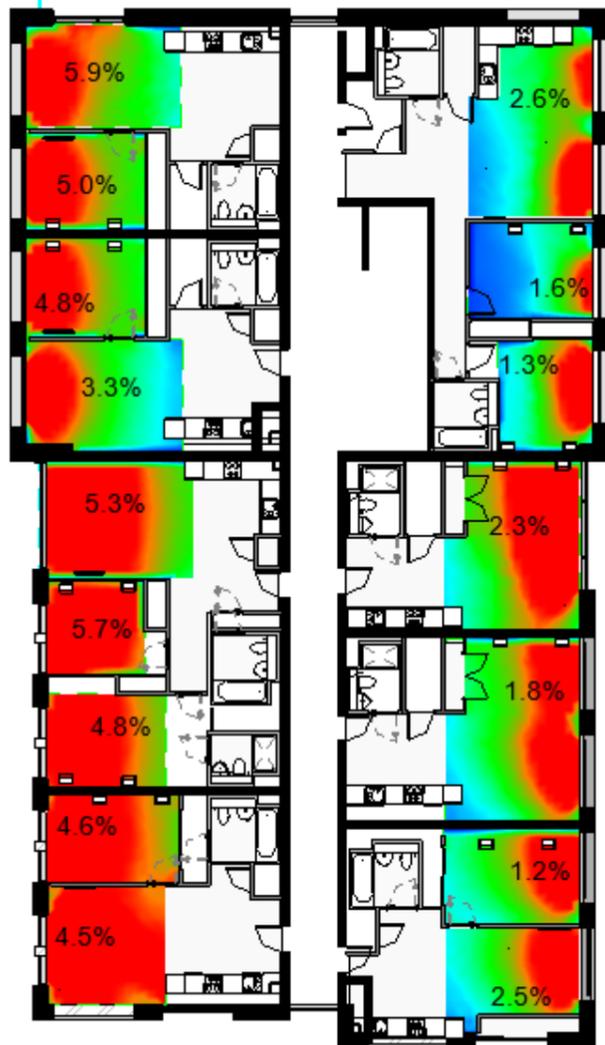
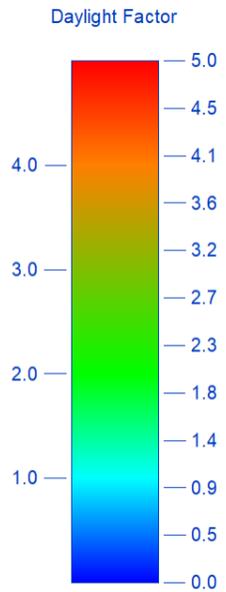
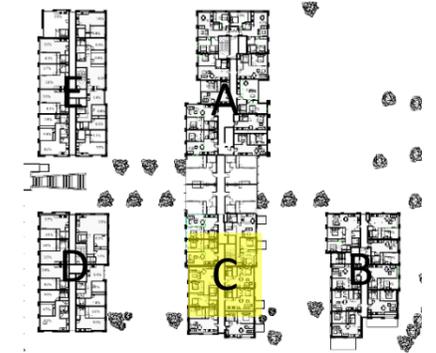
All rooms are compliant with methodology.



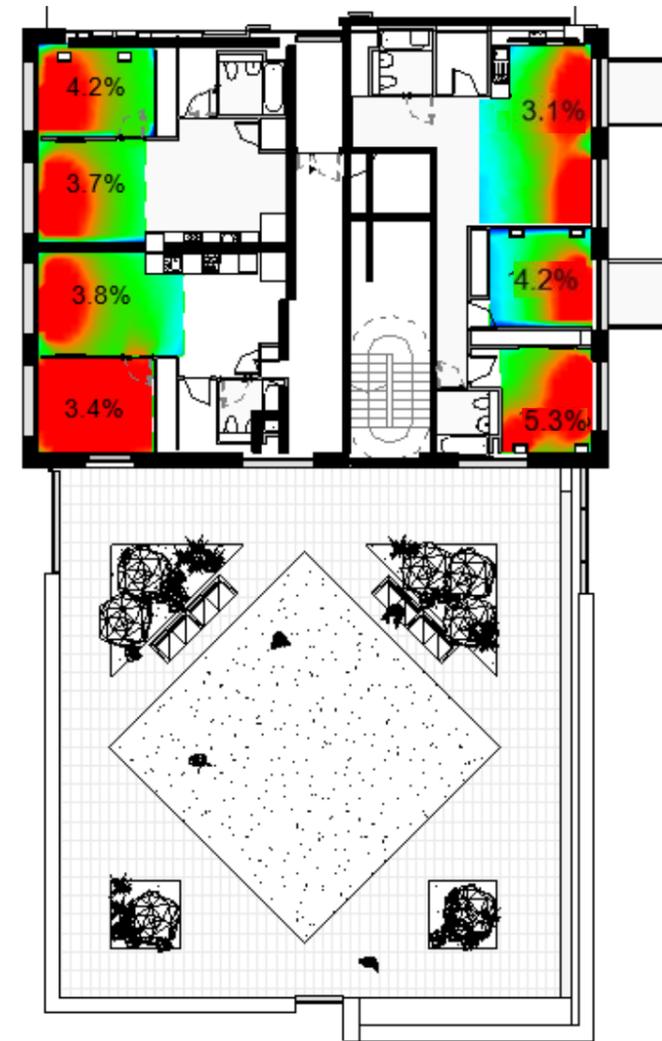
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building C

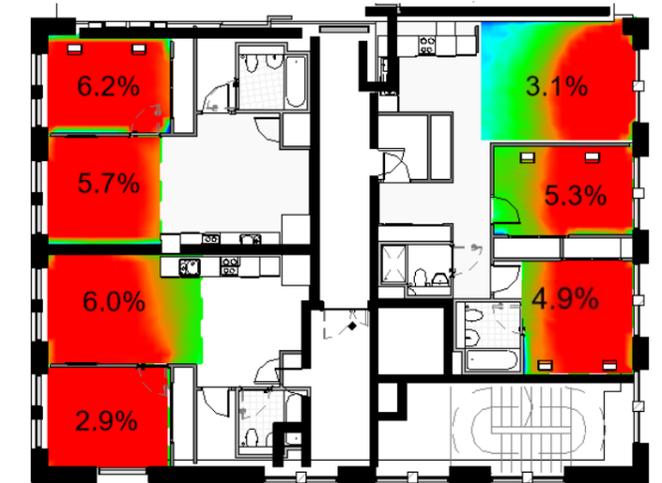
All rooms are compliant with methodology.



Building C – Eighth Floor



Building C – Ninth Floor

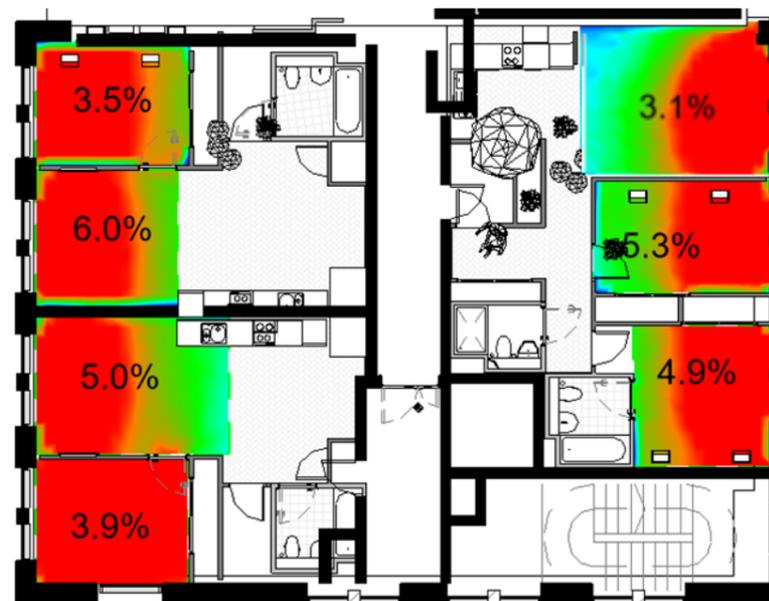
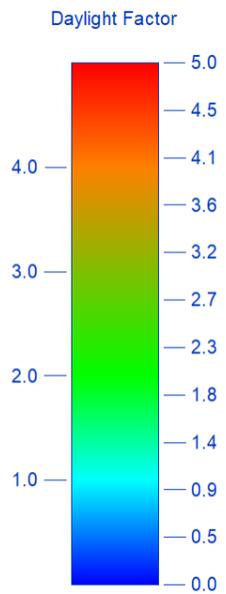
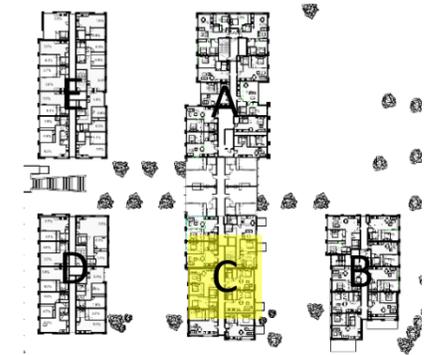


Building C – Tenth Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building C

All rooms are compliant with methodology.

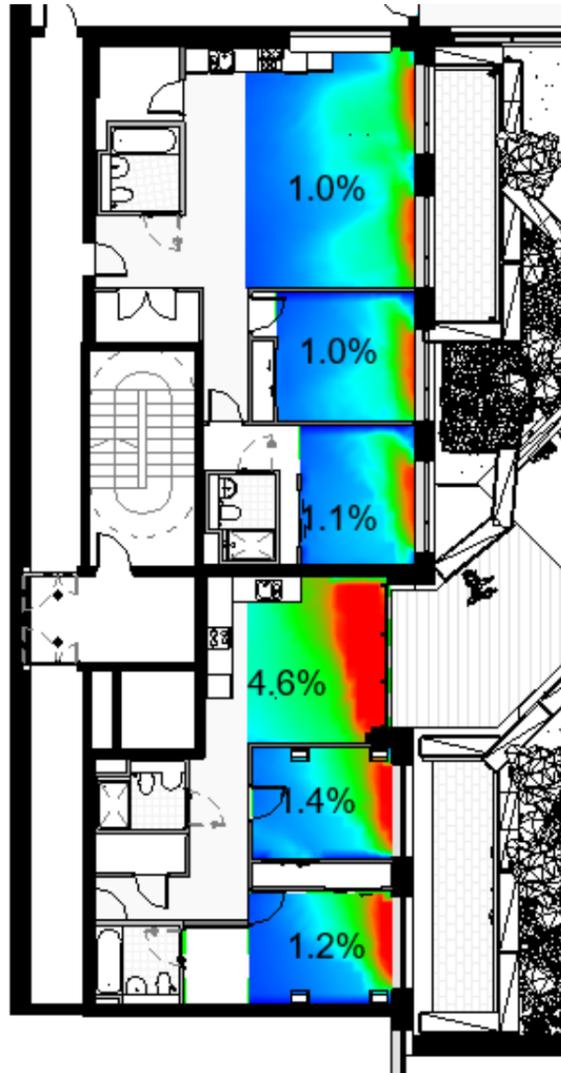
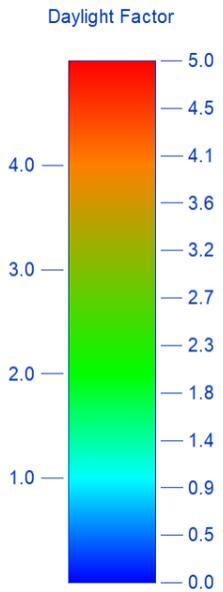
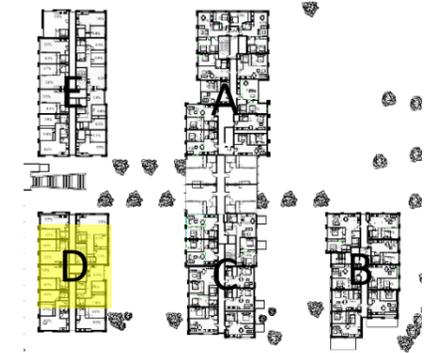


Building C – Eleventh Floor

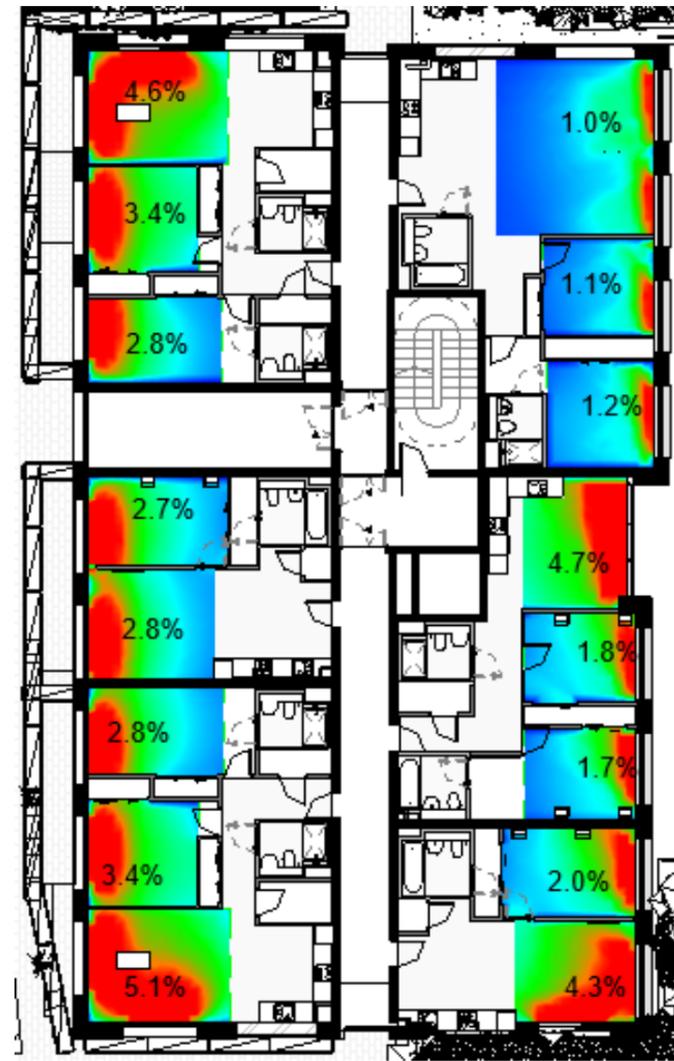
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

## 7.2 Building D

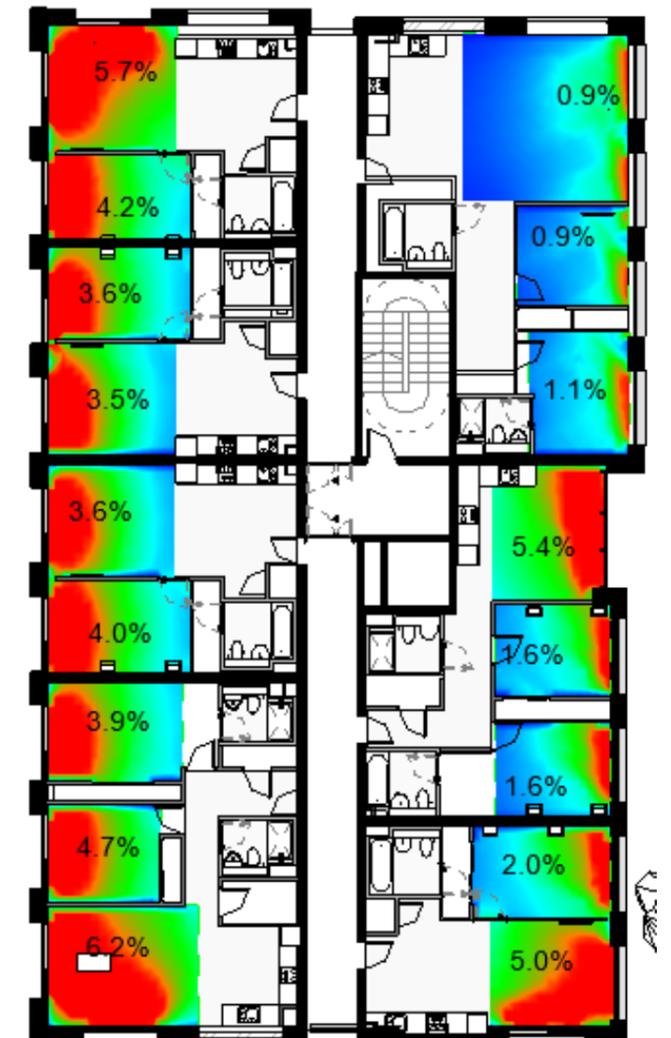
4 spaces were found to be non-compliant with the methodology across the lower ground, ground and first floors of Building D.



Building D – Lower Ground Floor



Building D – Ground Floor

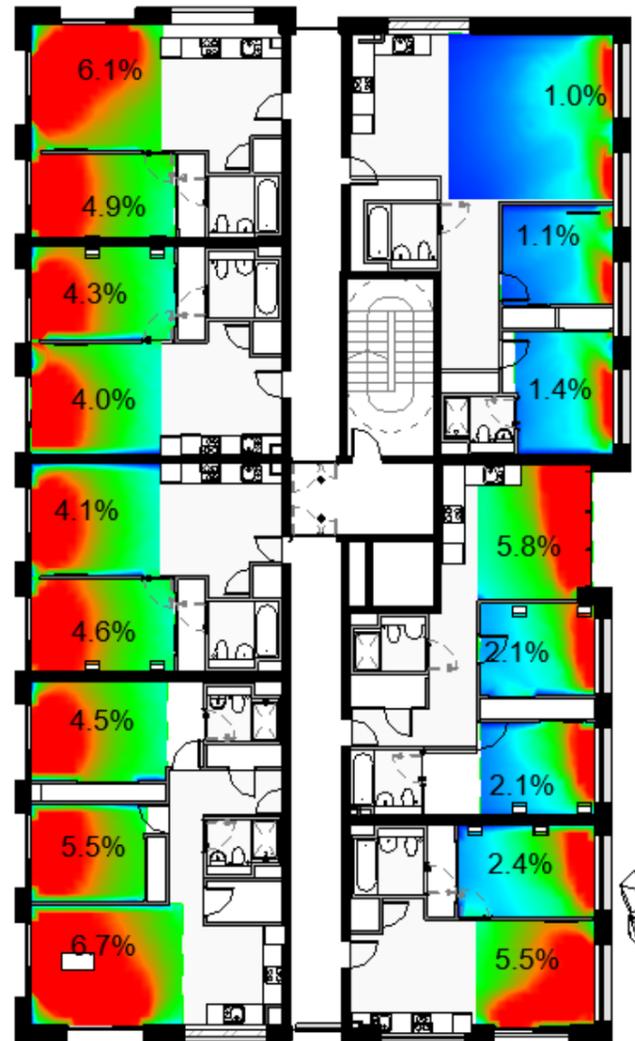
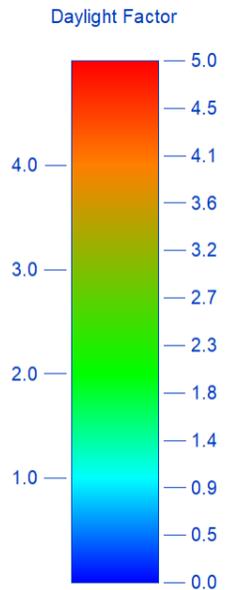
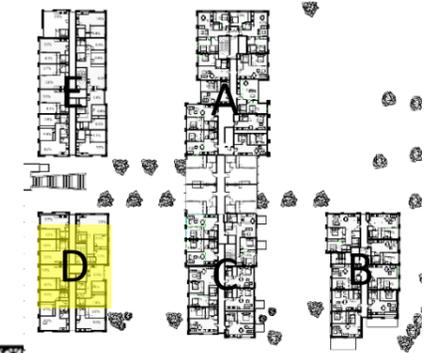


Building D – First Floor

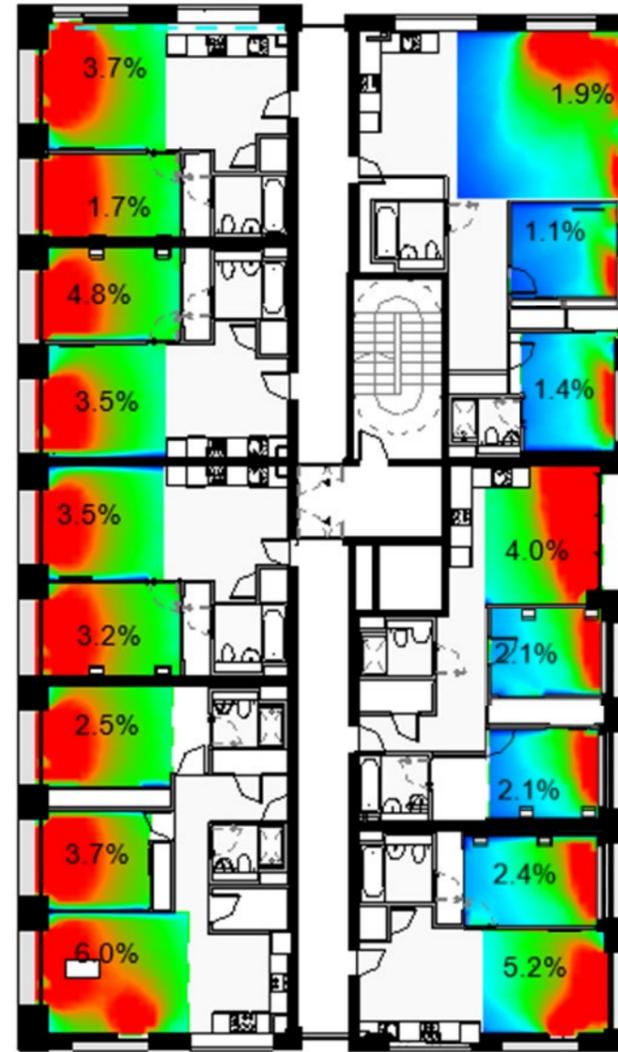
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building D

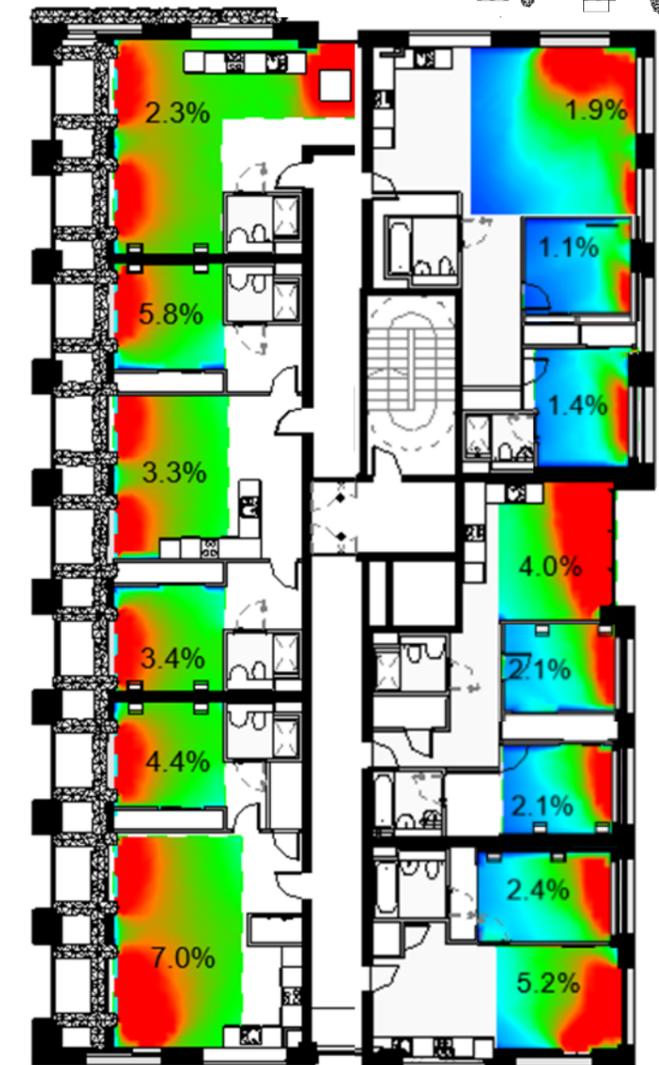
One living space was found to be non-compliant with the methodology across the second floor of building D.



Building D – Second Floor



Building D – Third Floor

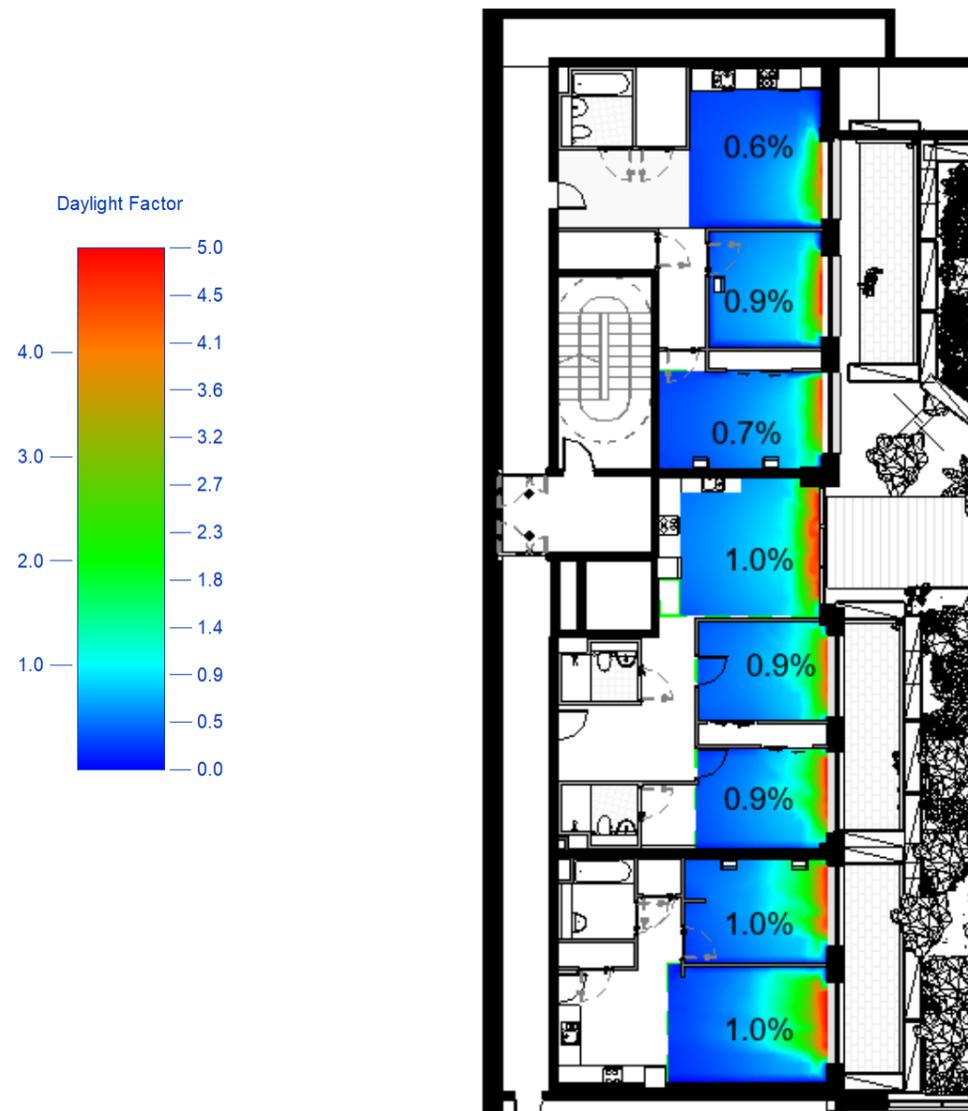
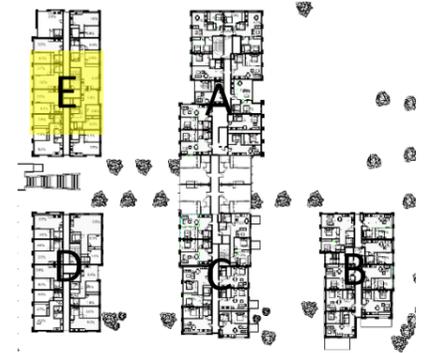


Building D – Fourth Floor

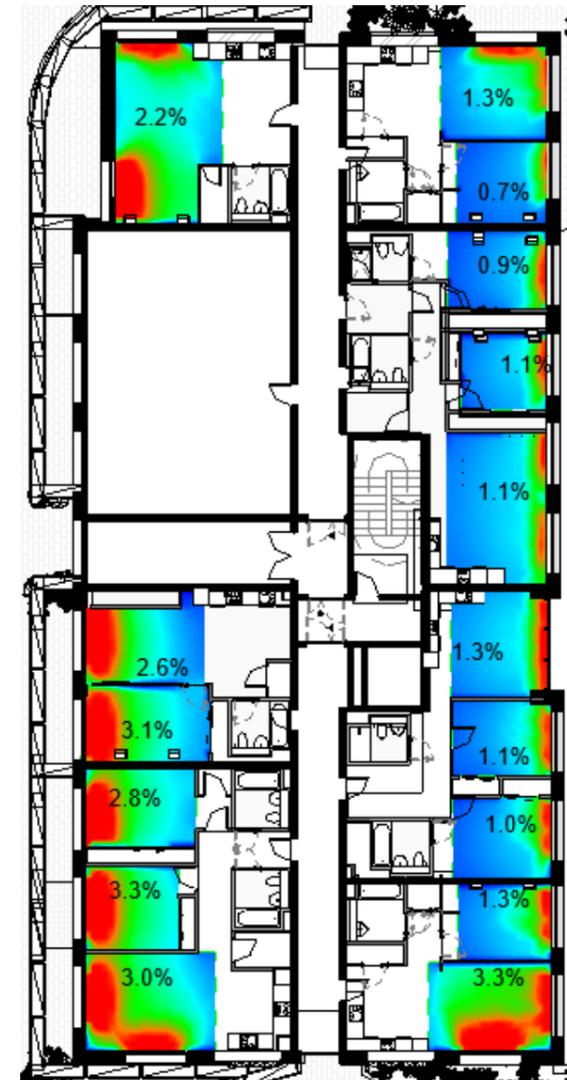
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### 7.3 Building E

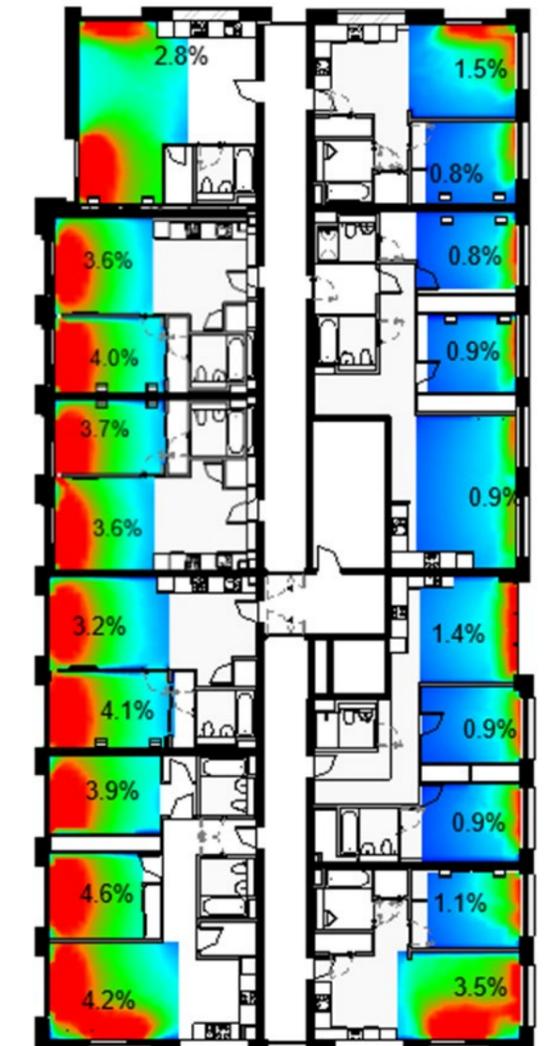
19 spaces were found to be non-compliant with the methodology across the lower ground, ground and first floors of building E.



Building E – Lower Ground Floor



Building E – Ground Floor

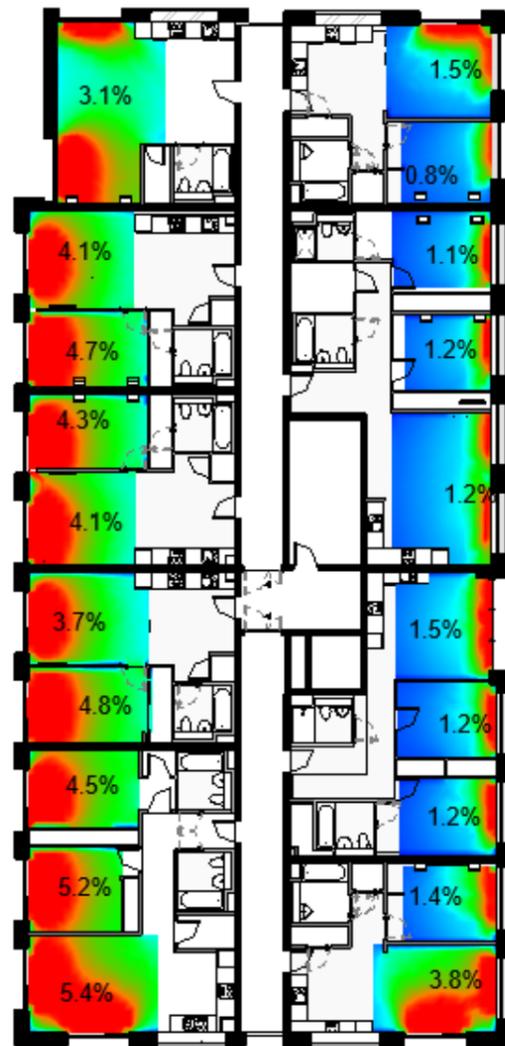
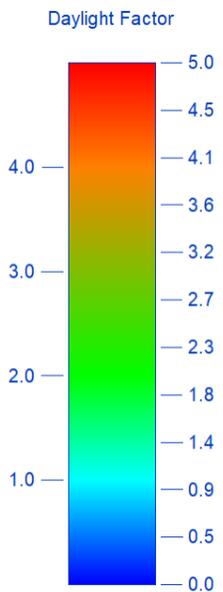
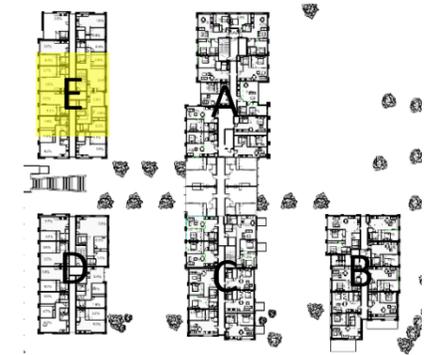


Building E – First Floor

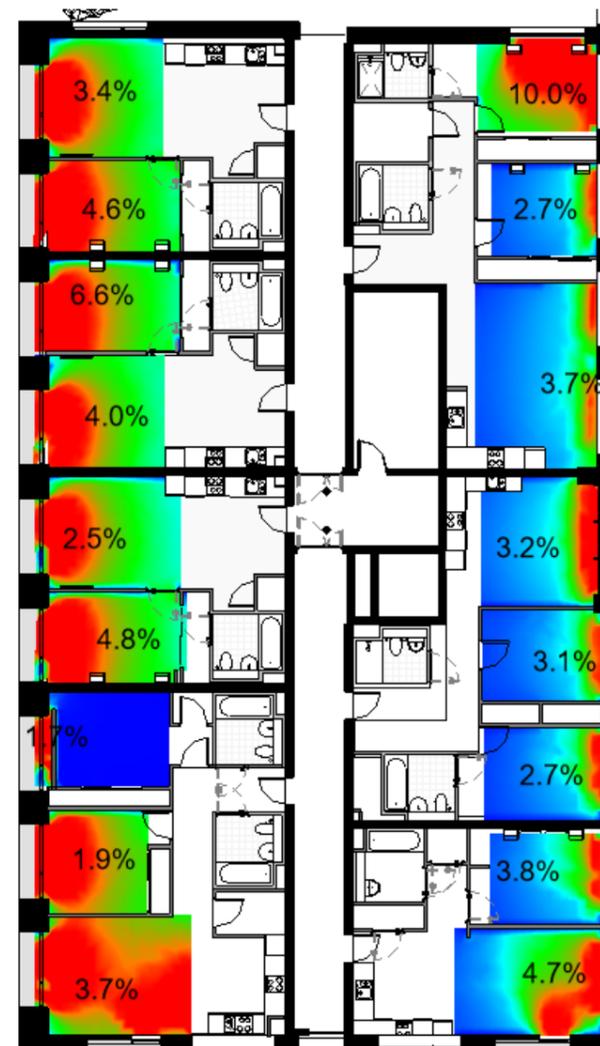
| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### Building E

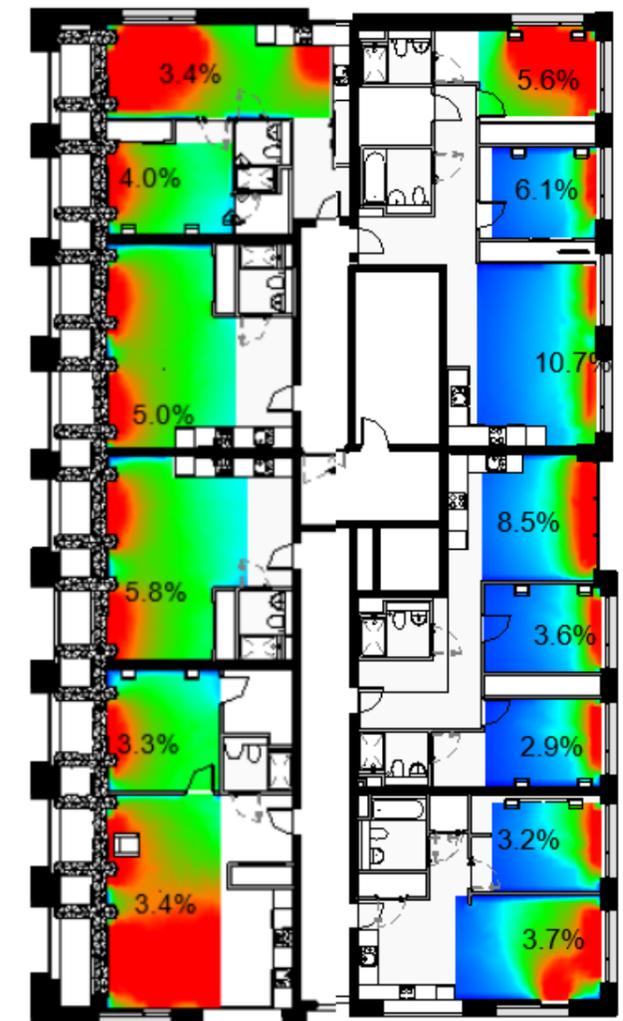
2 spaces were found to be non-compliant with the methodology on the second floor of building E.



Building E – Second Ground Floor



Building E – Third Floor

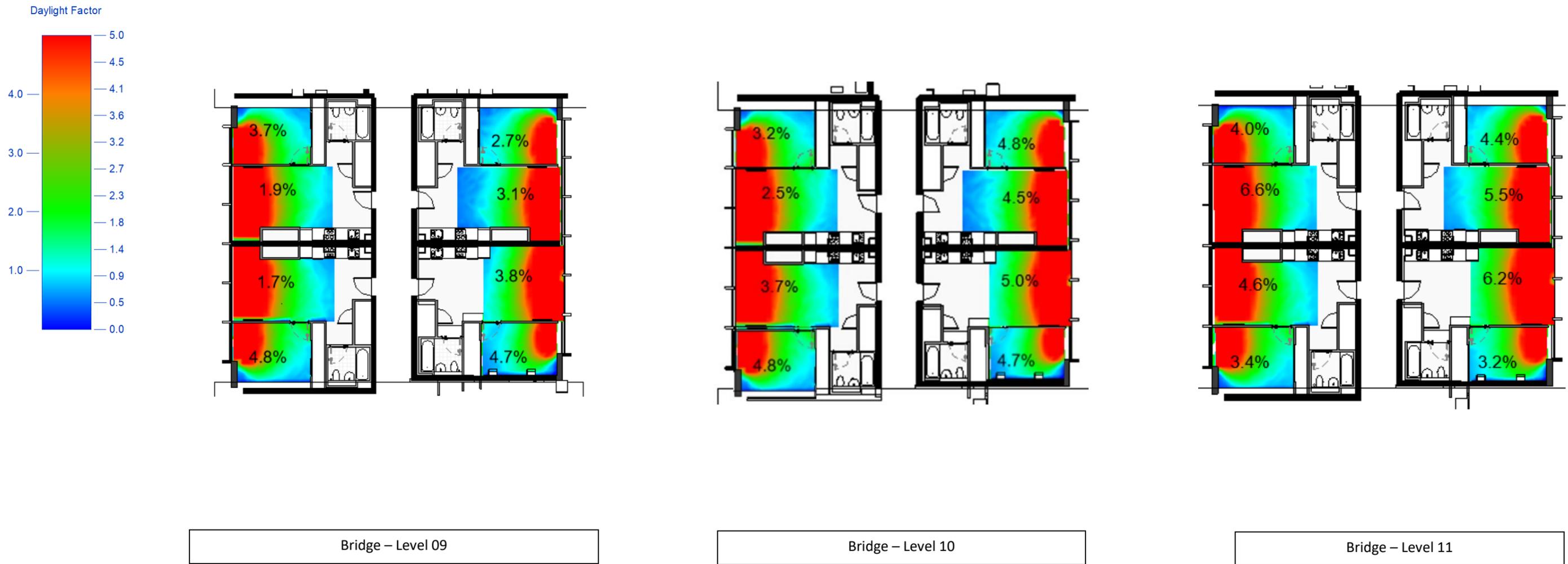
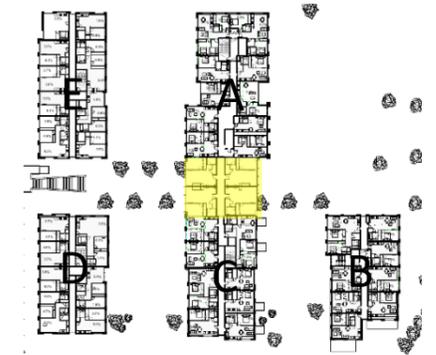


Building E – Fourth Floor

| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |

### 7.4 Bridge

All rooms are compliant with methodology.



| Space           | Pass  |
|-----------------|-------|
| Bedroom         | >1%   |
| Living \ Dining | >1.5% |