

D1861
42A Parkgate Street
Dublin 8



Daylight & Sunlight Analysis

18th December 2019

Rev08

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1.0 EXECUTIVE SUMMARY

This report summarises the results of Sunlight, Shadow Daylight assessments completed for the proposed Parkgate Street development based on drawing and 3D information as received from Reddy Architecture + Urbanism.

Sunlight Analysis

Sunlight availability to the Amenity spaces was assessed against the BRE guideline criteria target of 50% achieving 2-hours sunlight on March 21st, detailed in Section 2.0. Due to the orientation of the blocks and the openness to the south, the Parkgate Street development has 2,100m² of compliant amenity space at ground level. An assessment of the potential loss of sunlight to the neighbouring building's amenity space was also carried out. This assessment determined that the neighbouring amenity space would not be negatively impacted due to the development.

Shadow Analysis

The Shadow cast of the building was analysed through the day for the Spring Equinox and the Summer Solstice against the existing site. The analysis, detailed in Section 3.0, illustrates minimum adverse impact to the surrounding developments from the proposed building massing. Although the height of the tower cast a long shadow, the slenderness of same results in the shadow moving quickly across neighbouring buildings, and therefore having minimum impact.

Daylight Analysis

The internal Average Daylight Factors (ADF) for each of the Living areas and Bedrooms were assessed against BRE guideline targets. The assessment determined that 96% of habitable rooms exceed these minimum requirements with just 4% below target. An additional assessment was carried out to determine the impact on this development if the existing neighbouring building was to increase in height. This assessment determined that whilst there would be some reduction in daylight, the overall quantum of rooms passing for the site does not drop below 95%.

2.0 AMENITY SUNLIGHT

2.1 Methodology

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

The guidance recommends “that for it to appear adequately sunlit throughout the year, at least half (50%) of a garden or amenity area should receive at least two hours of sunlight on 21st March”. The analysis illustrates any areas that do not achieve this requirement as **dark green** (see sample image in Fig 3.1.1).

Additionally, the guidance notes “If as 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 21st March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable”.

2.2 Proposed Amenity Space: **PASS**

The amenity spaces to Parkgate Street achieve excellent Sunlight availability. The amenity areas achieve 87% sunlight availability for at least two hours on 21st March. The area of complaint amenity space is 2,100m² on the ground floor.

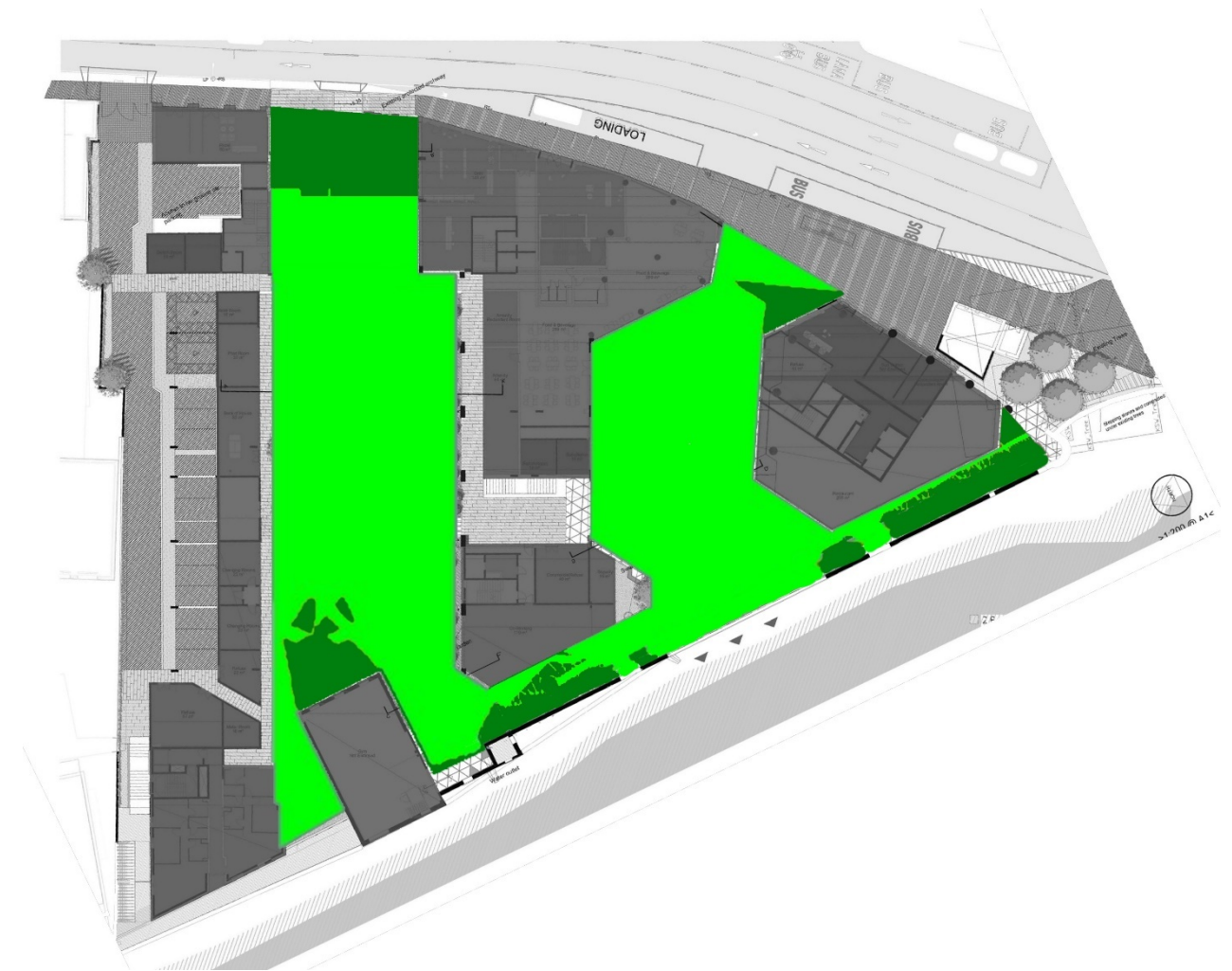


Fig 2.1.2 -Amenity Sunlight Results

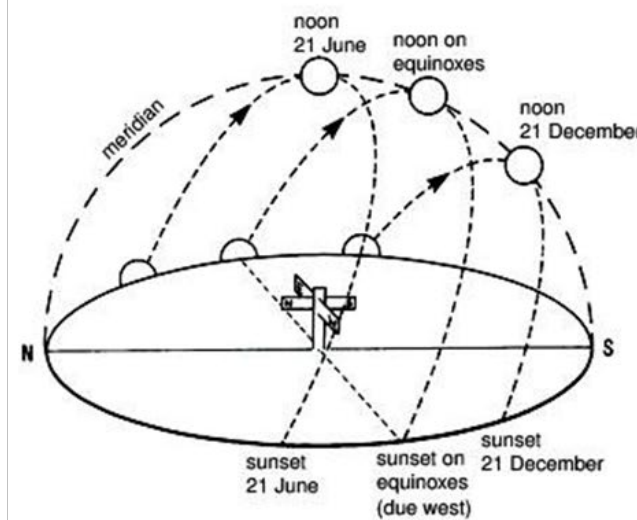


Fig 2.1.1 -Sample Sunlight Image & Sun Path Diagram

2.0 AMENITY SUNLIGHT (Cont'd)

2.3 Neighbouring Amenity Space: **PASS**

A 3D model was utilised to determine the extent of overshadowing on to the amenity space. The OSI land registry compliant map was used to define the location of the amenity space in conjunction with Google Maps aerial view.

The results, fig 2.2.1-2.2.2 illustrate that the amenity spaces adjacent to the proposed Parkgate Street development will, as result of the new proposed development, still achieve in excess of 50% of the space sun lit for at least two hours on 21st March. The proposed development will therefore not have a negative effect on the existing amenity space.

2.4 Neighbouring Daylight Availability: **PASS**

The daylight availability to the neighbouring building was assessed including for proposed development, in particular the single bedroom as identified in Fig 2.2.1 below.

The results determined that an Average Daylight Factor of 1.1% would be achieved in the bedroom. As this is above the minimum standards as assessed in section 4.0 below, it was determined that the proposed development would not have an undue negative impact on the neighbours daylight availability.

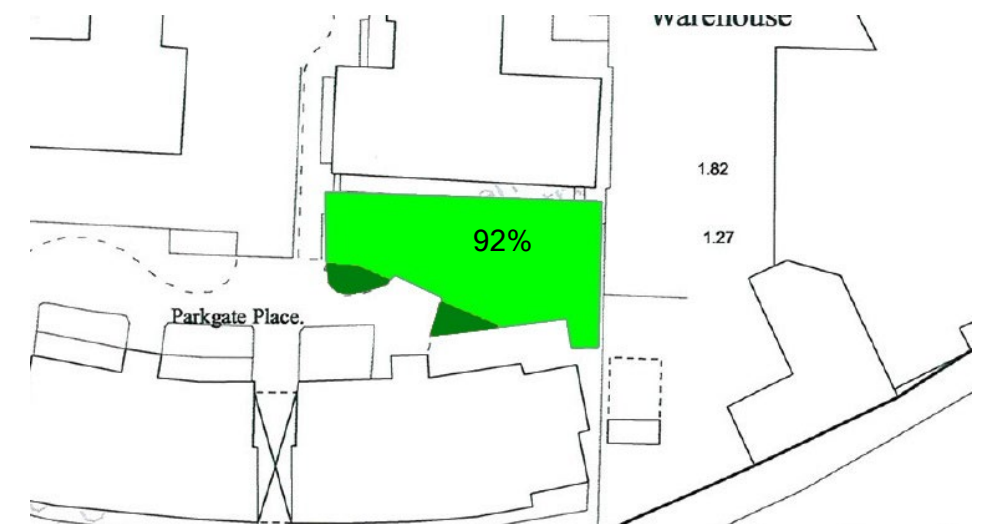


Fig 2.2.1 -Current Sunlight Results for Neighbouring Amenity Space

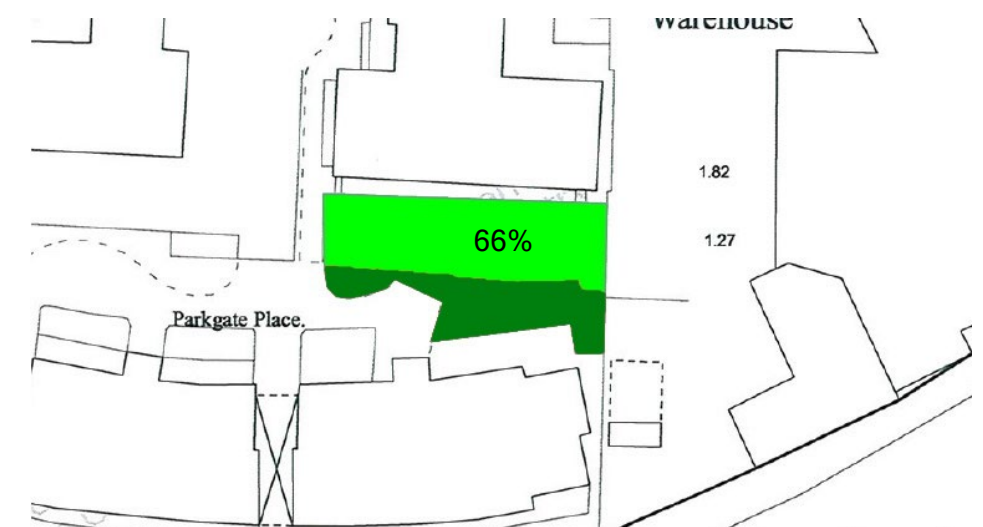


Fig 2.2.2 - Proposed Sunlight Results for Neighbouring Amenity Space

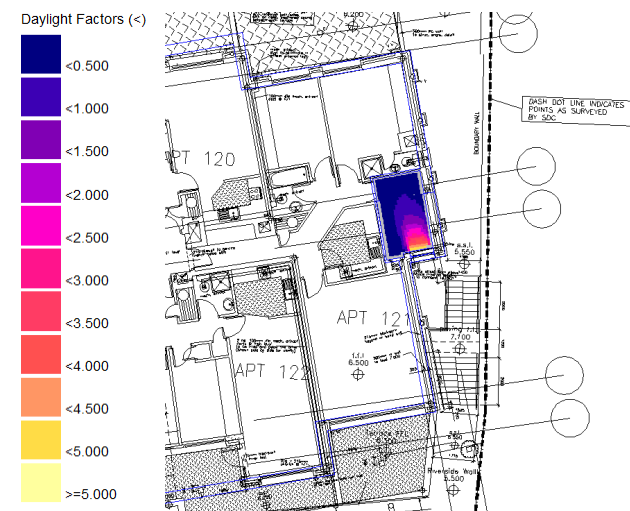


Fig 2.3.1 -Daylight Availability to Neighbouring Building

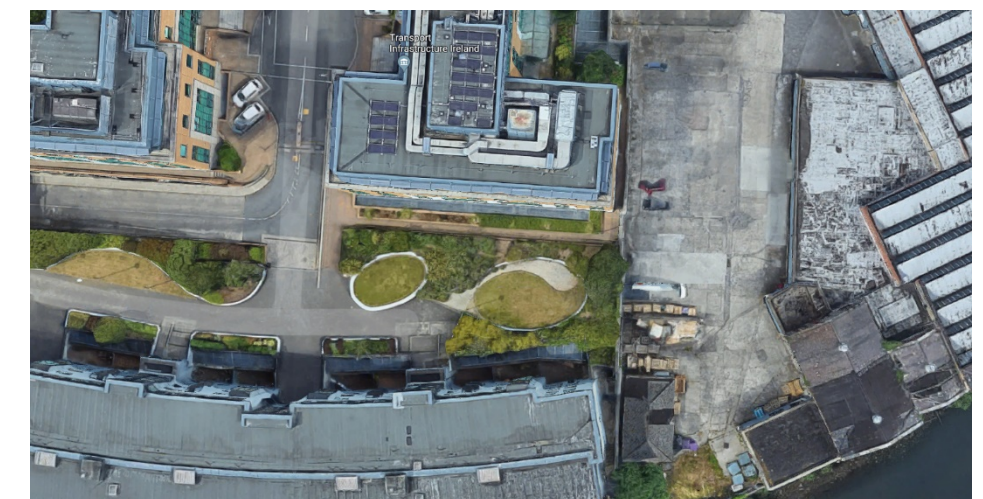


Fig 2.2.3 -Amenity Space as viewed from Google Maps

3.0 SHADOW ANALYSIS

3.1 Methodology

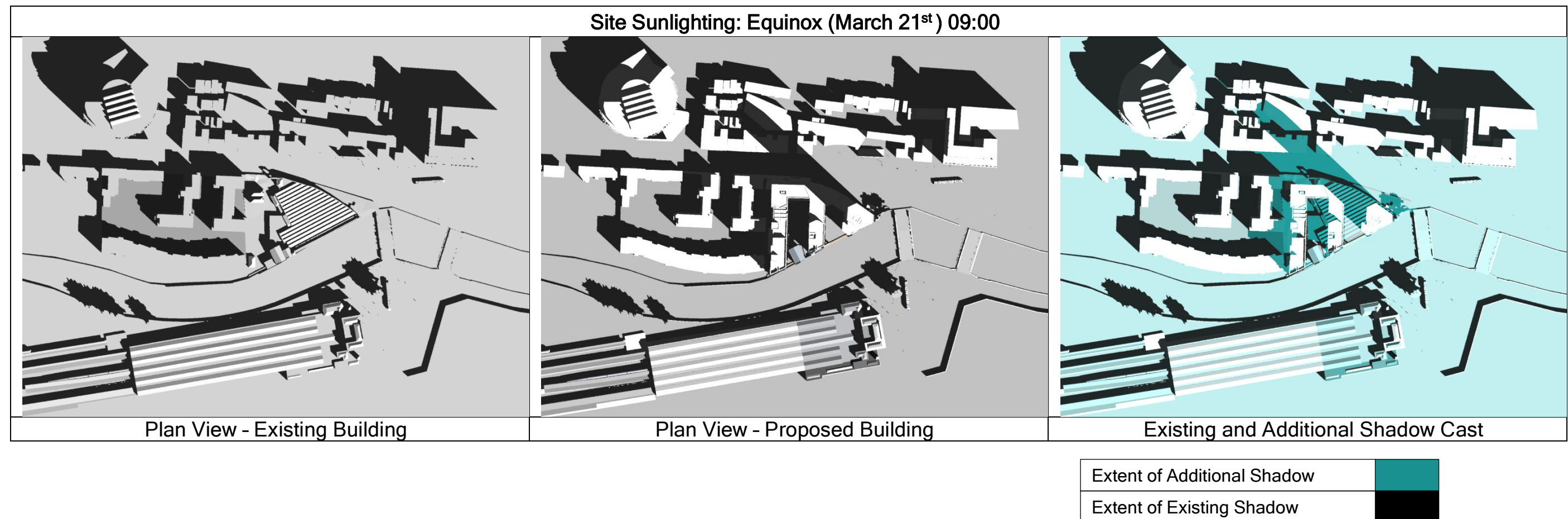
The shadowing effects of the proposed development were assessed against the current pre-development condition to determine the extent of the shadowing from the proposed building massing throughout the day on the Spring Equinox and Summer Solstice.

3.2 Results

The results indicate no significant shadowing of surrounding buildings. Building to west would only be effected for a couple of hours in the morning time, with the rest of the day as previous. The tower, whilst it's shadow does cross neighbouring buildings, the duration of this shadowing would on be for part of one hour.

3.3 Site Shading Spring Equinox

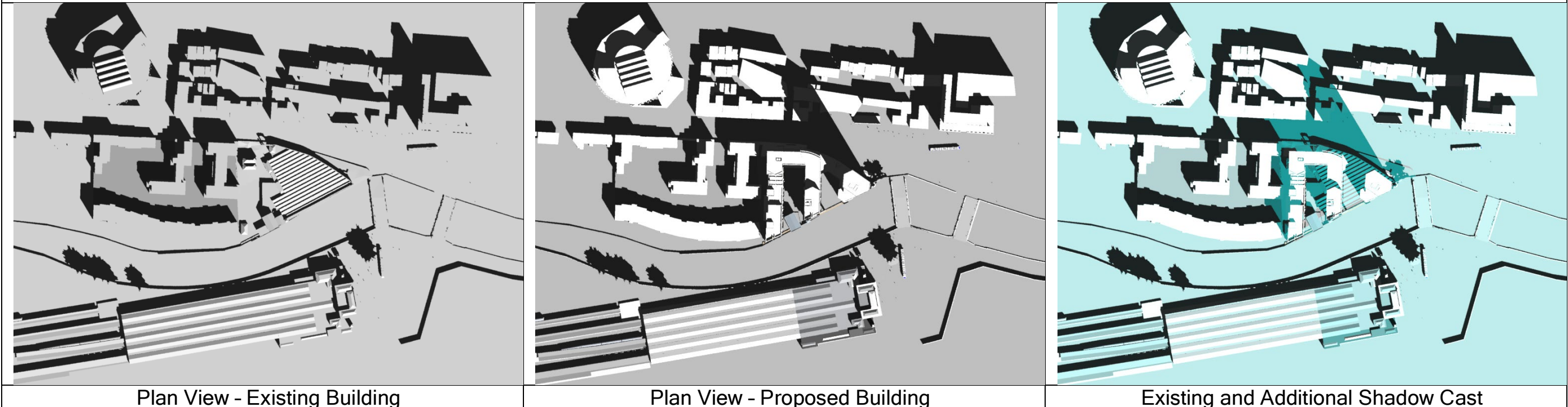
March 21st - 9am



3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 10 am

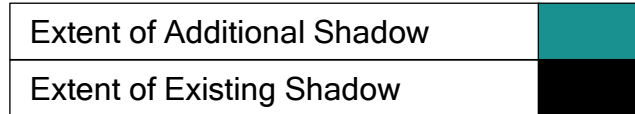
Site Sunlighting: Equinox (March 21st) 10:00



Plan View - Existing Building

Plan View - Proposed Building

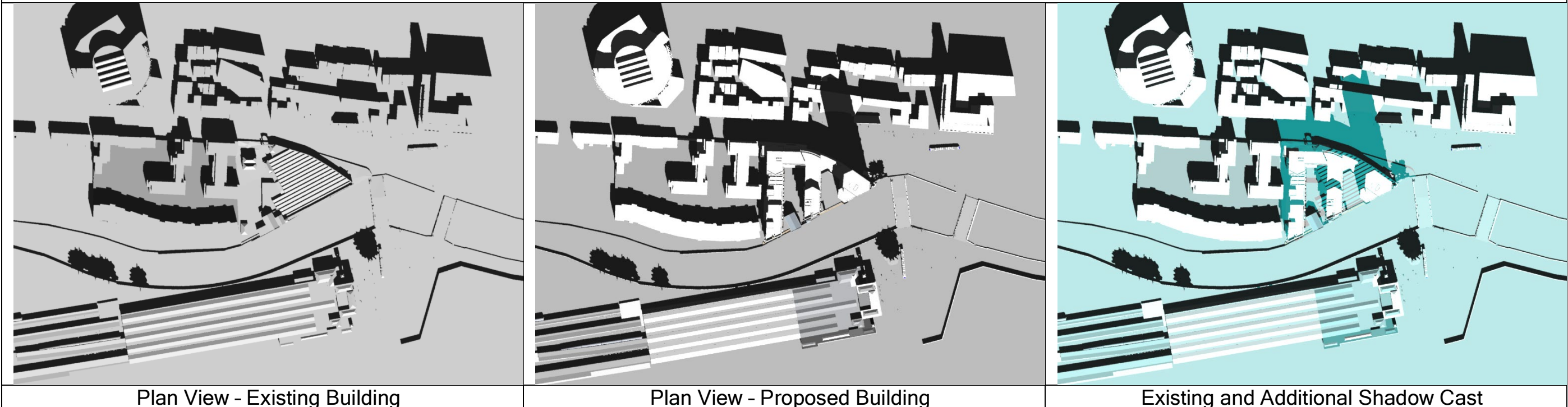
Existing and Additional Shadow Cast



3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 11 am

Site Sunlighting: Equinox (March 21st) 11:00



Plan View - Existing Building

Plan View - Proposed Building

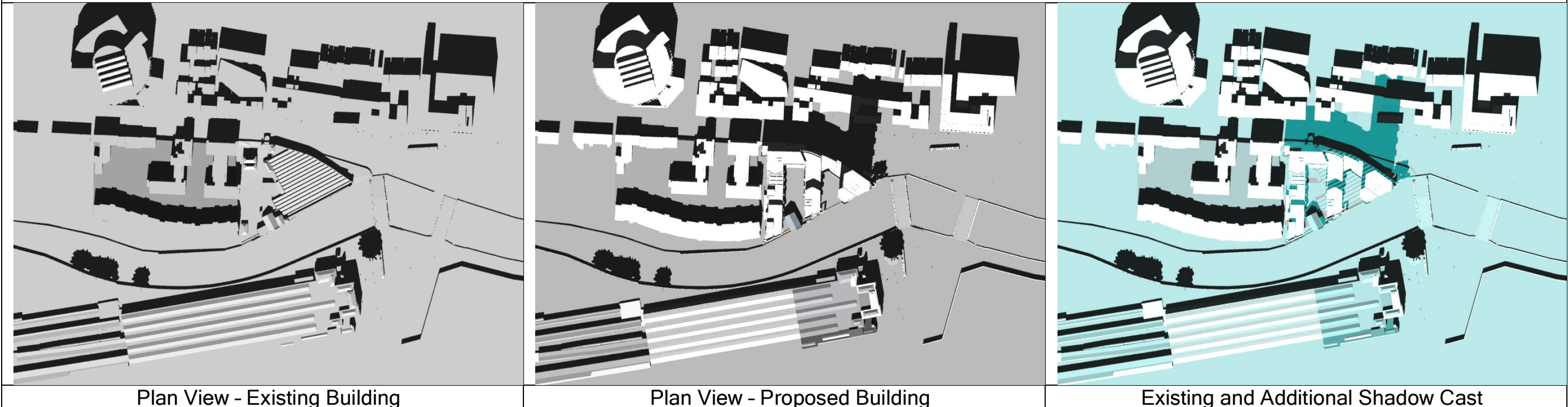
Existing and Additional Shadow Cast

Extent of Additional Shadow
Extent of Existing Shadow

3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 12 Noon

Site Sunlighting: Equinox (March 21st) 12:00

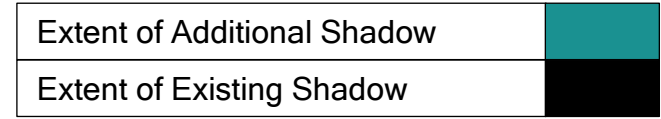
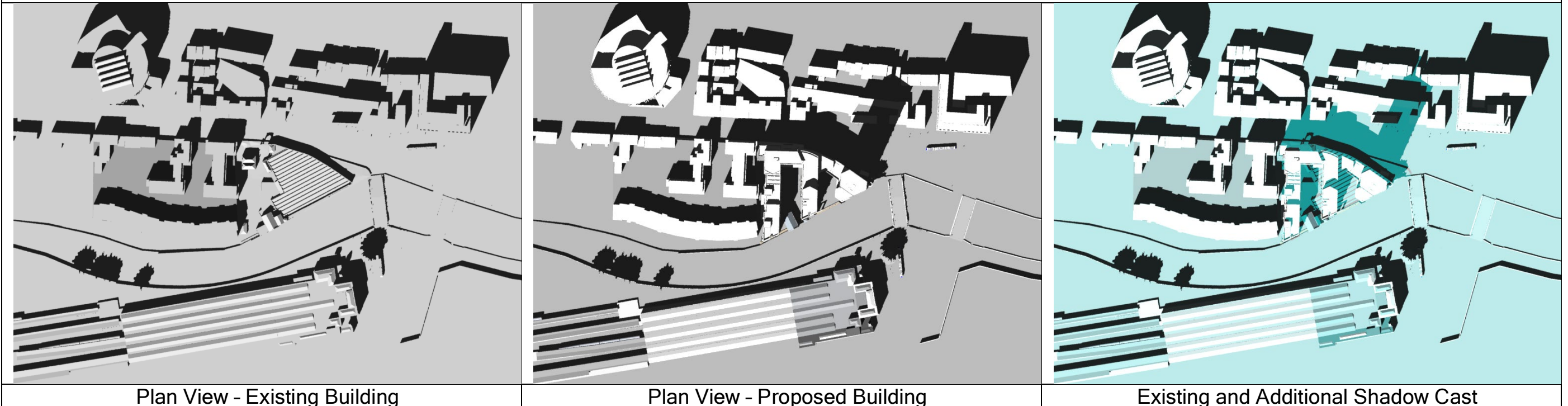


Extent of Additional Shadow
Extent of Existing Shadow

3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 1 pm

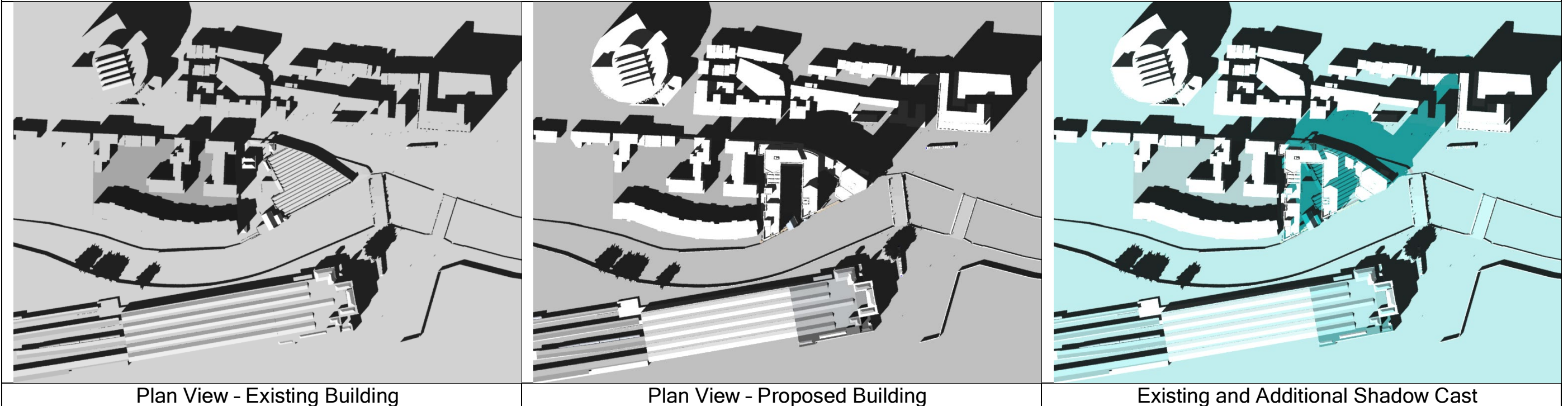
Site Sunlighting: Equinox (March 21st) 13:00



3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 2pm

Site Sunlighting: Equinox (March 21st) 14:00

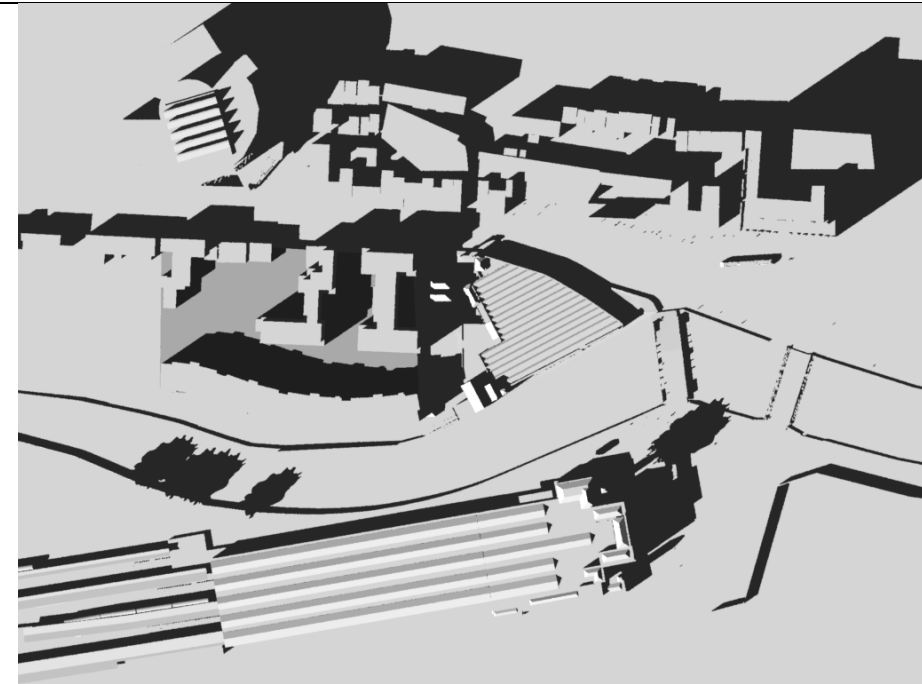


Extent of Additional Shadow
Extent of Existing Shadow

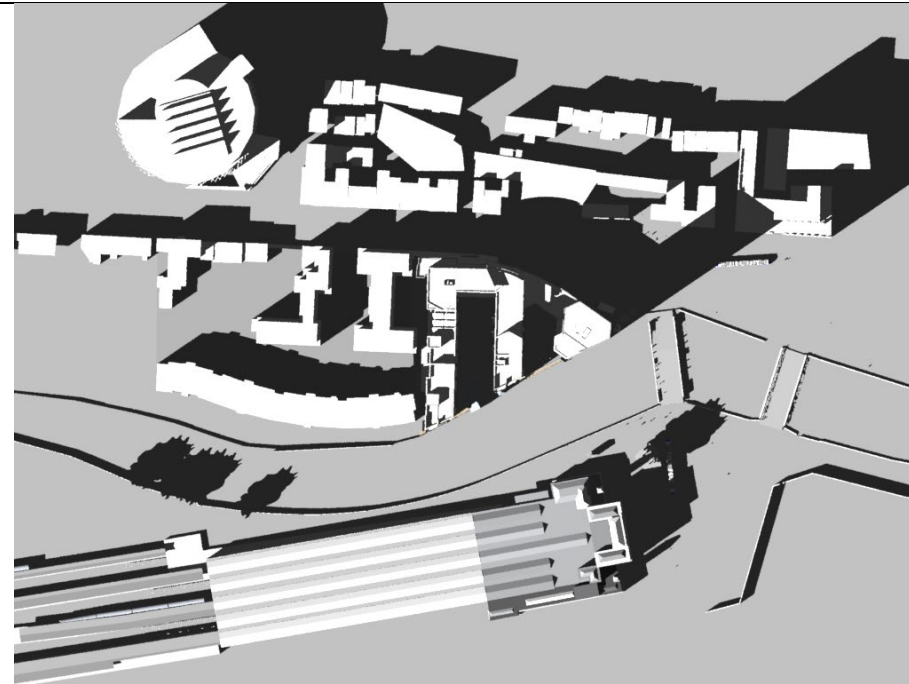
3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 3 pm

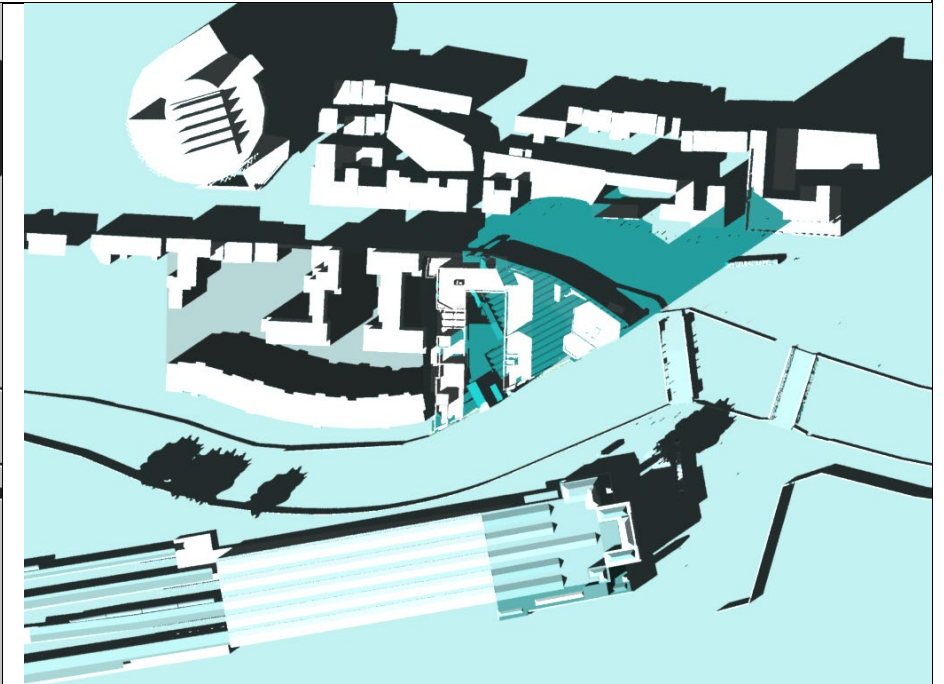
Site Sunlighting: Equinox (March 21st) 15:00




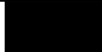
Plan View - Existing Building



Plan View - Proposed Building



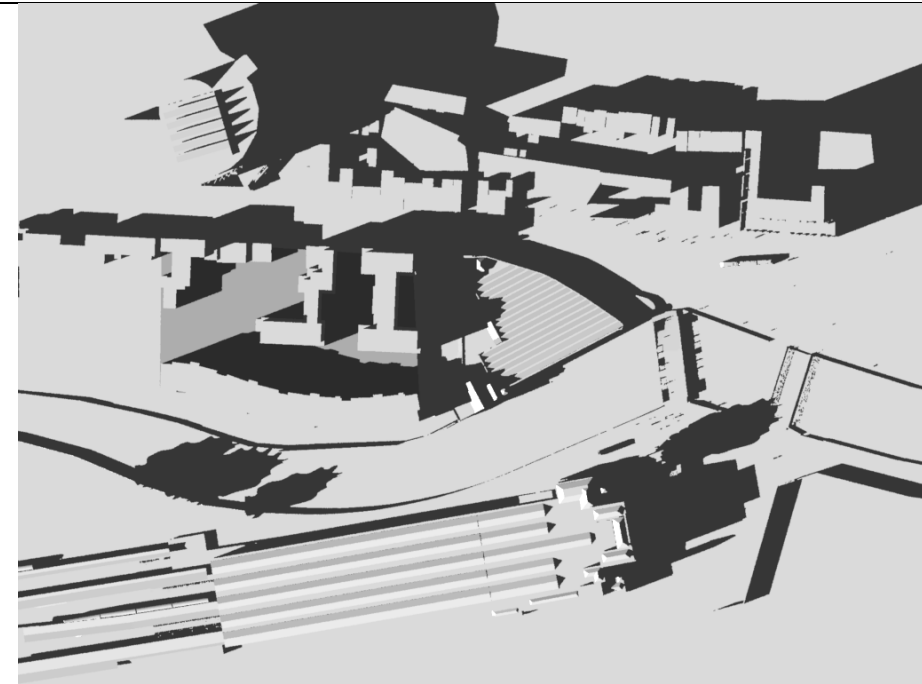
Existing and Additional Shadow Cast

Extent of Additional Shadow	
Extent of Existing Shadow	

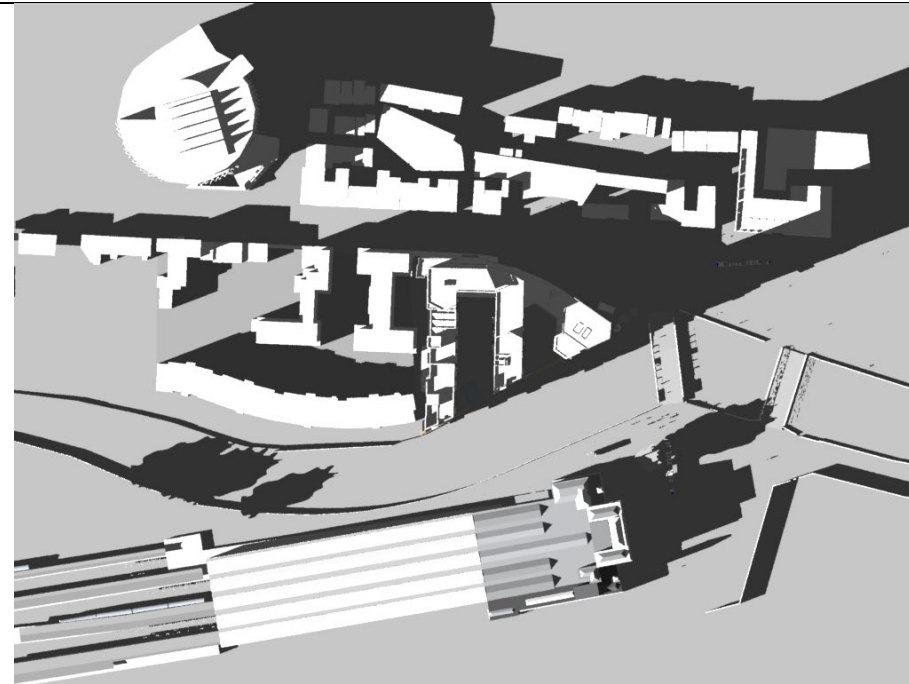
3.0 SHADOW ANALYSIS

3.3 Site Shading Spring Equinox March 21st - 4pm

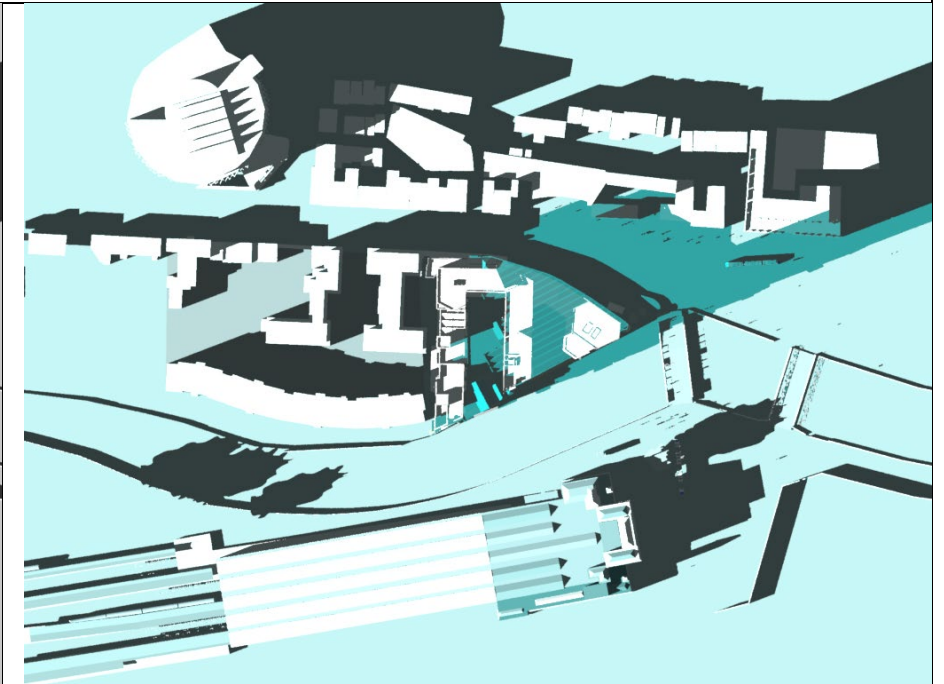
Site Sunlighting: Equinox (March 21st) 16:00



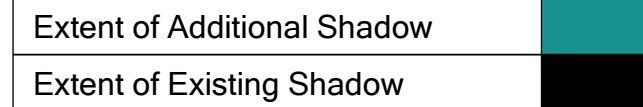
Plan View - Existing Building



Plan View - Proposed Building



Existing and Additional Shadow Cast



4.0 INTERNAL DAYLIGHT FACTORS

4.1 Methodology

The internal Average Daylight Factors were analysed using a dynamic simulation model (TAS Software). The daylight analysis accounts for building form, orientation, adjoining buildings along with detailed framing, cill depth and glazing properties in accordance with the architectural design drawings. Simulation results are displayed overleaf as colour contour plots showing the achieved values for Average Daylight Factors (ADF) to each apartment Living area and Bedroom.

Internal Lighting levels were determined for a CIE Overcast Sky of 10,000 Lux. This CIE sky is uni-directional, so façade orientation does not affect daylight factors.

Each habitable space was assessed against the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition), as relevant, for Daylighting which state;

"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. BS 8206-2 Code of practice for daylighting 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 BS 8206-2 also gives minimum values of ADF of 2% for kitchen, 1.5% for living rooms and 1% for bedroom."

Spaces were therefore assessed for the following daylight factors:

- > 1.5% for Living Areas
- >1% for Bedrooms

The daylighting models were calculated based on the following assumptions:

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

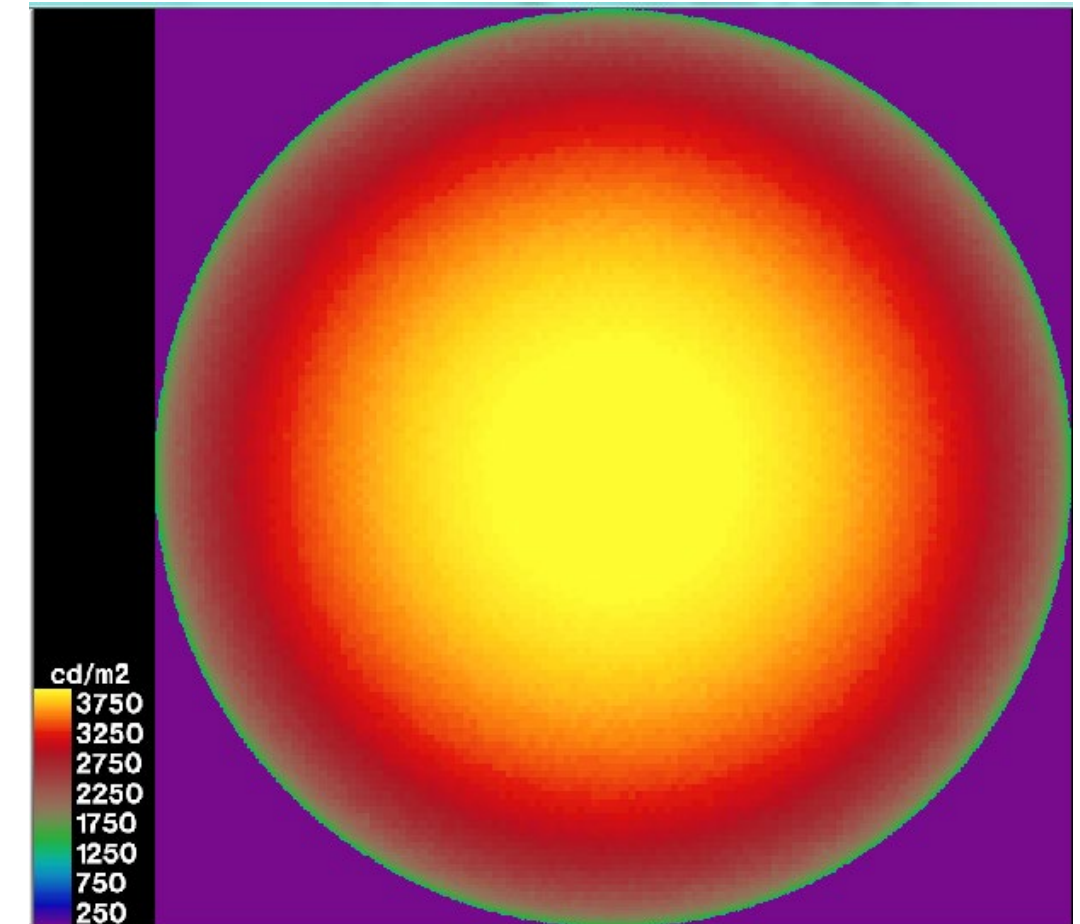


Fig 4.1 - CIE Overcast Sky

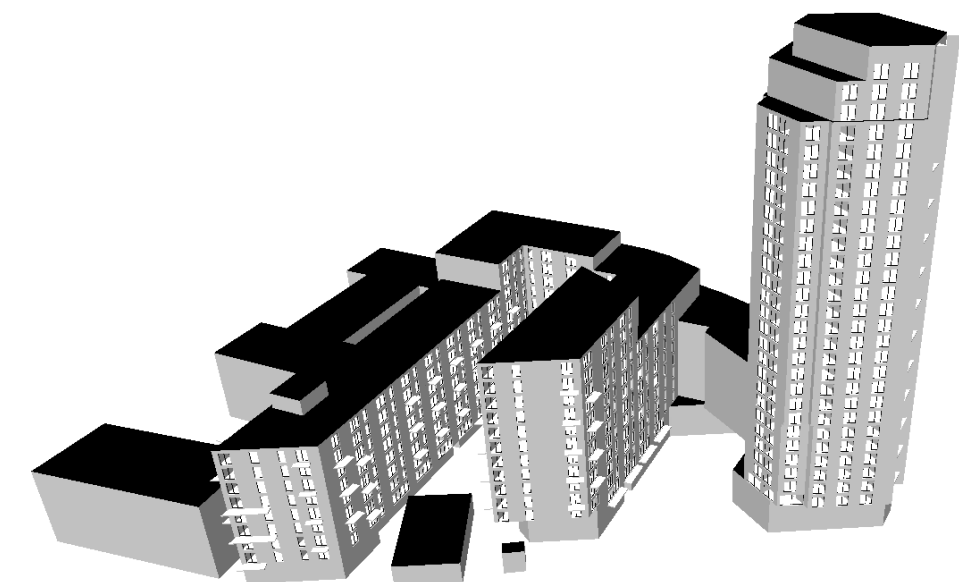


Fig 4.1 - Dynamic Simulation Model

4.0 INTERNAL DAYLIGHT FACTORS

4.2 Results

The Average Daylight Factors (ADF) results were determined for the development as detailed below.

These results determined that 96% of the residential rooms will achieve compliance with the BRE minimum recommendations. Of the remaining 4%, the design has ensured that no sub quality spaces, i.e. less than 0.4%, are proposed. The results determined that an average ADF of 3% for all living / dining space across the development with 50% of the spaces achieving 2.5% as illustrated in Figure 4.2. Results below illustrate achieved results for all floors with achieved values identified for lower floors and representative upper floor.

Due to the massing and height of this development, an element of self-shading was inevitable. This has been recognised within the scheme by providing excellent amenity space (in terms of daylight availability as detailed in section 2.0).

We note the BRE guide should be seen as advisory only as the guide was developed for low density urban housing and was developed to inform design rather than to constrain it. Although the guide provides numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design.

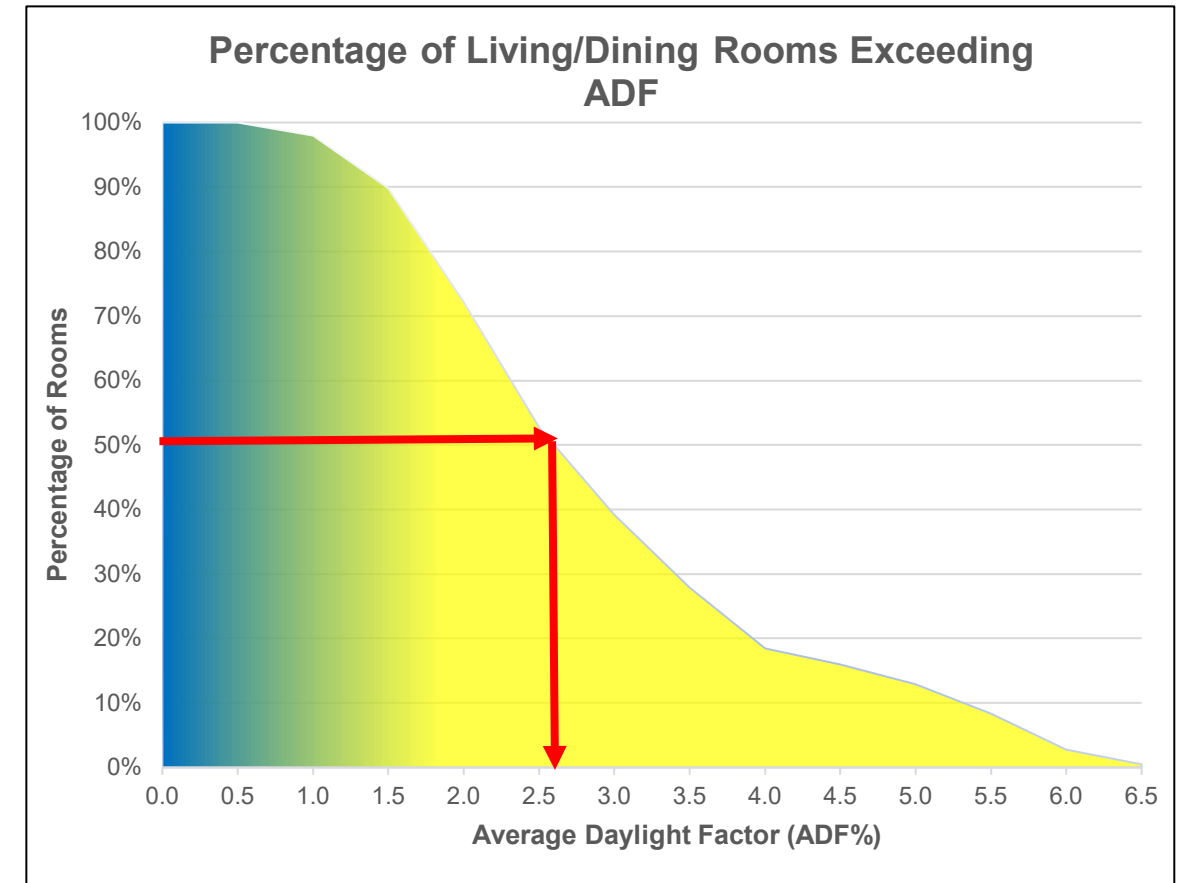


Fig 4.2 - Percentage of Living / Dining Rooms Exceeding ADF%

Entire Scheme		
Total Room Breakdown		
Above Target	908	96%
Below Target	38	4%

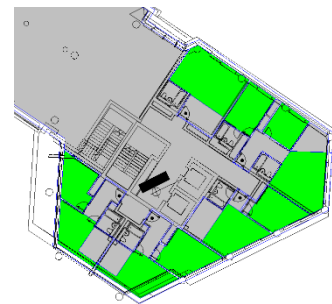
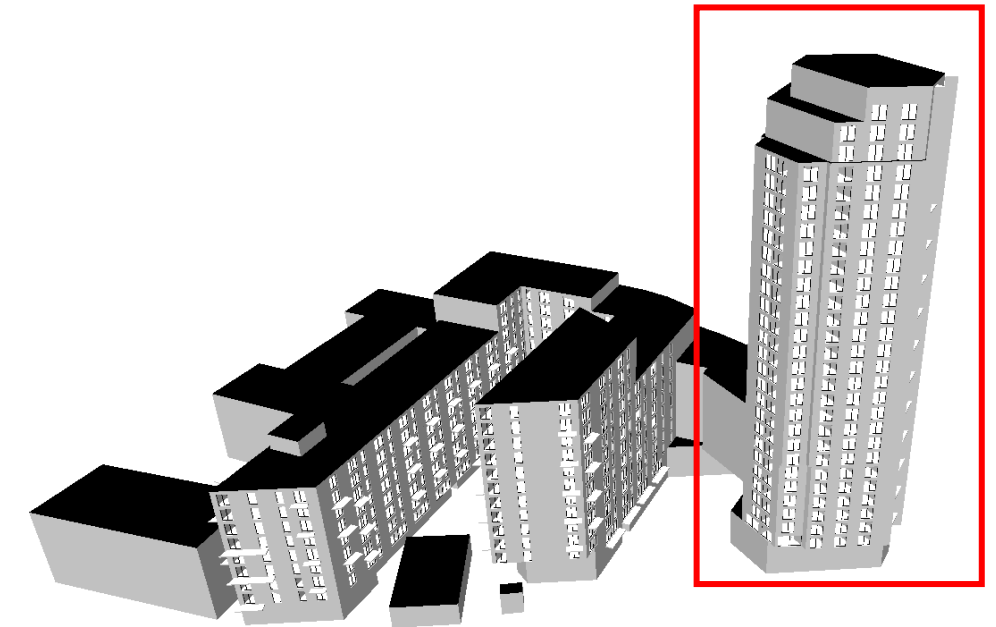
4.0 INTERNAL DAYLIGHT FACTORS

Block A Results

Block A		
Room Breakdown		
Above Target	327	>99%
Below Target	1	<1%

Daylight Target Bedroom	
>1%	
<1%	

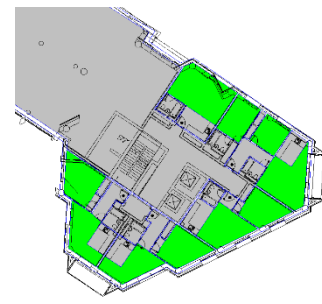
Daylight Target Living	
>1.5%	
<1.5%	



1st Floor



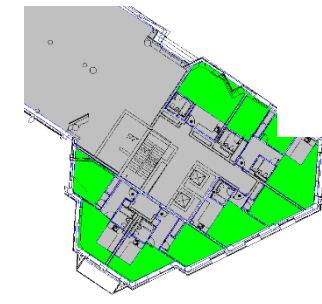
2nd Floor



3rd Floor



4th Floor



5th Floor



6th Floor



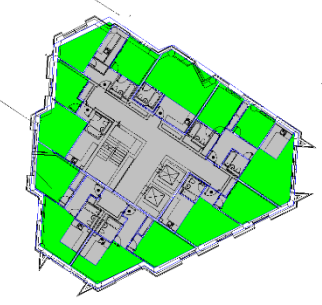
7th Floor



8th Floor



9th Floor



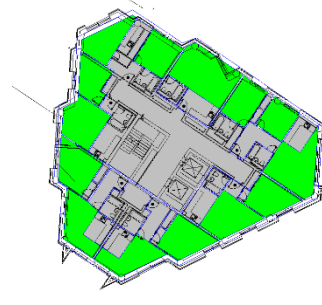
10th Floor



11th Floor



12th Floor



13th Floor



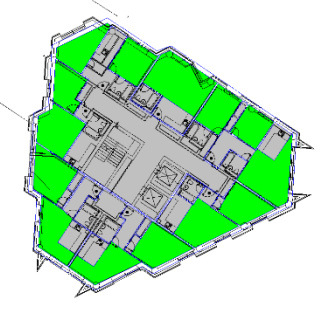
14th Floor



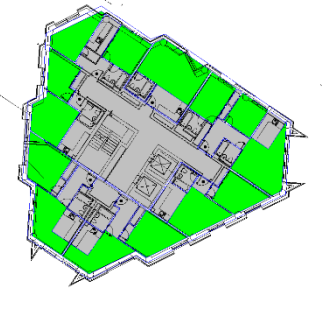
15th Floor



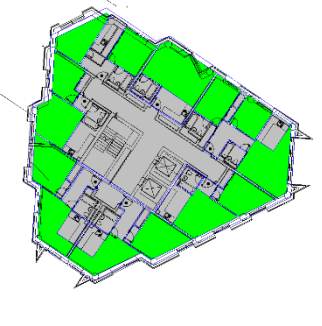
16th Floor



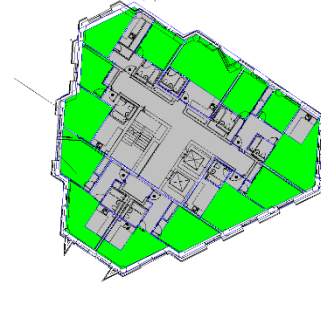
17th Floor



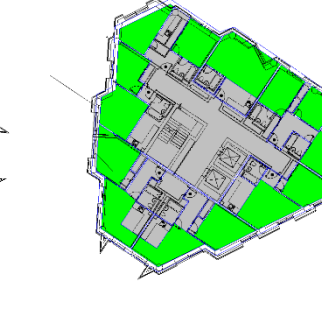
18th Floor



19th Floor



20th Floor



21st -25th Floors

4.0 INTERNAL DAYLIGHT FACTORS

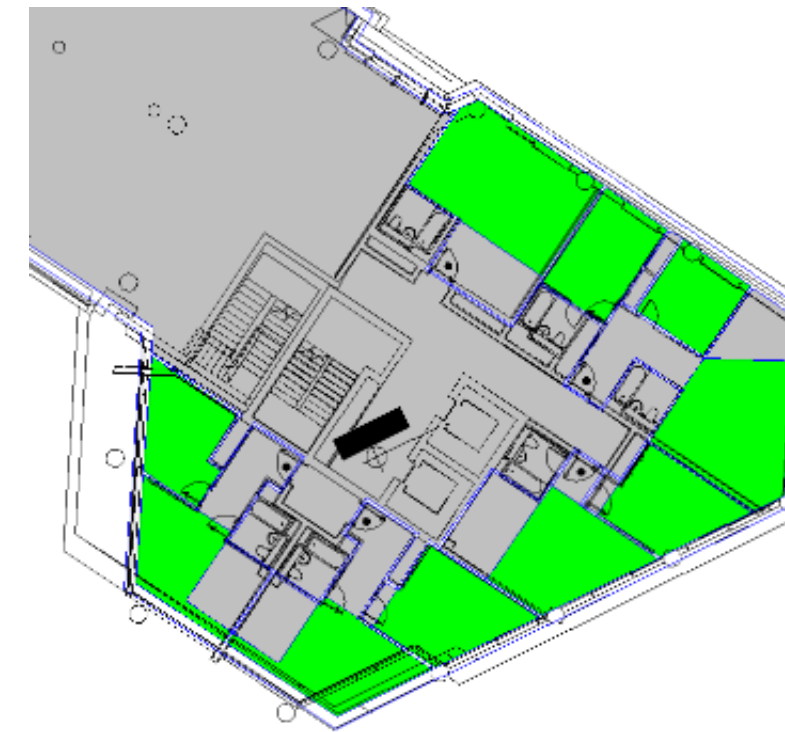
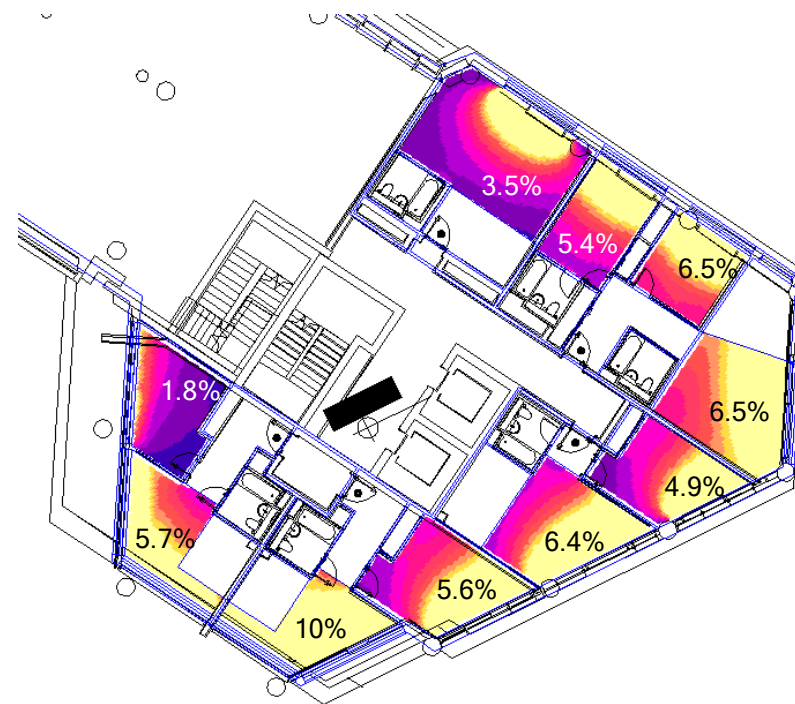
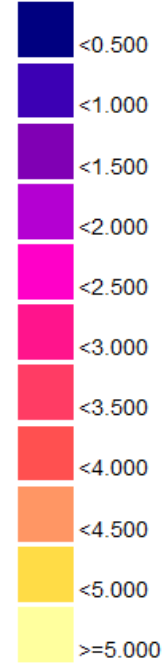
Block A Results

First Floor

Daylight Target Bedroom	
>1%	Green
<1%	Pink

Daylight Target Living	
>1.5%	Green
<1.5%	Pink

Daylight Factors (<)

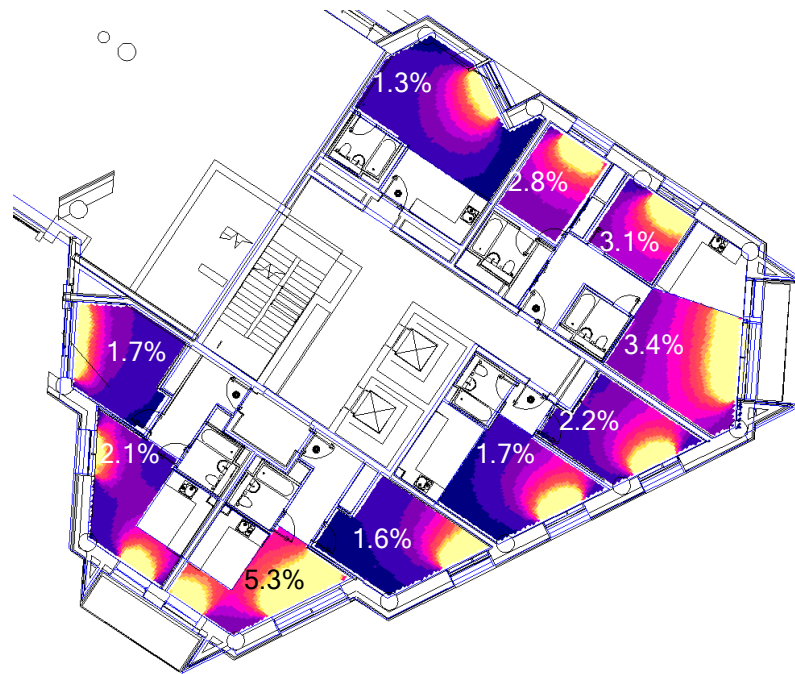
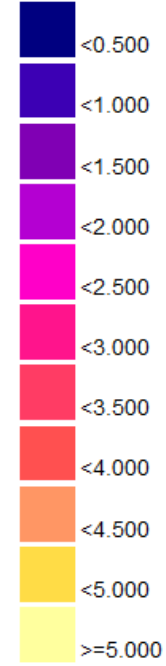


4.0 INTERNAL DAYLIGHT FACTORS

Block A Results

Second Floor

Daylight Factors (<)



Daylight Target Bedroom	
>1%	Green
< 1%	Pink

Daylight Target Living	
>1.5%	Green
< 1.5%	Pink

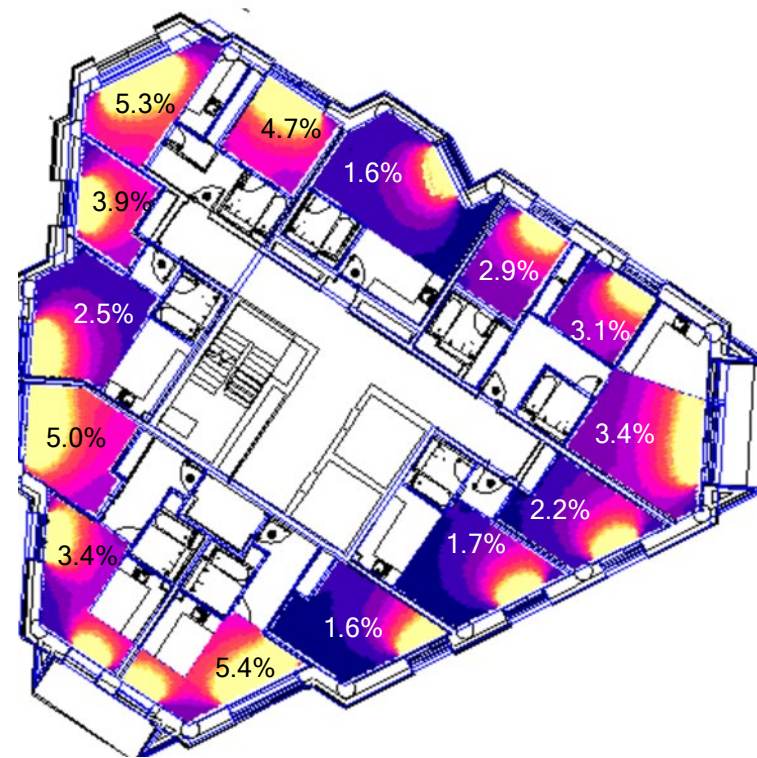
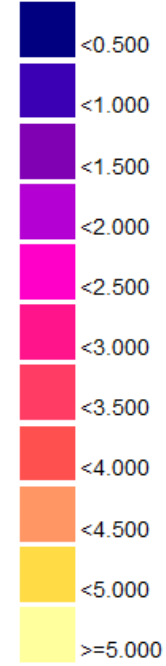


4.0 INTERNAL DAYLIGHT FACTORS

Block A Results

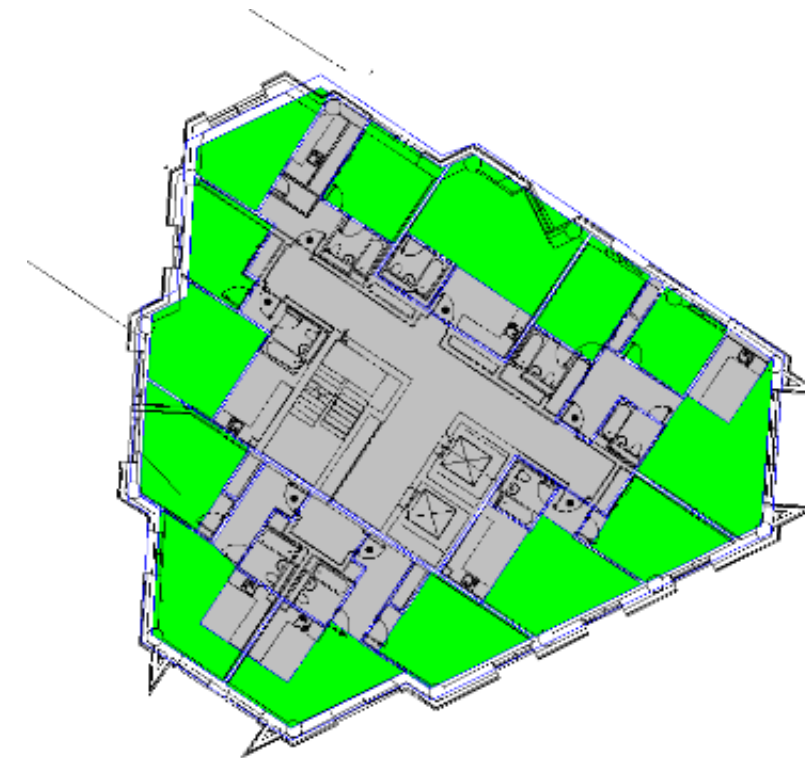
Twelfth Floor

Daylight Factors (<)



Daylight Target Bedroom	
>1%	Green
<1%	Pink

Daylight Target Living	
>1.5%	Green
<1.5%	Pink



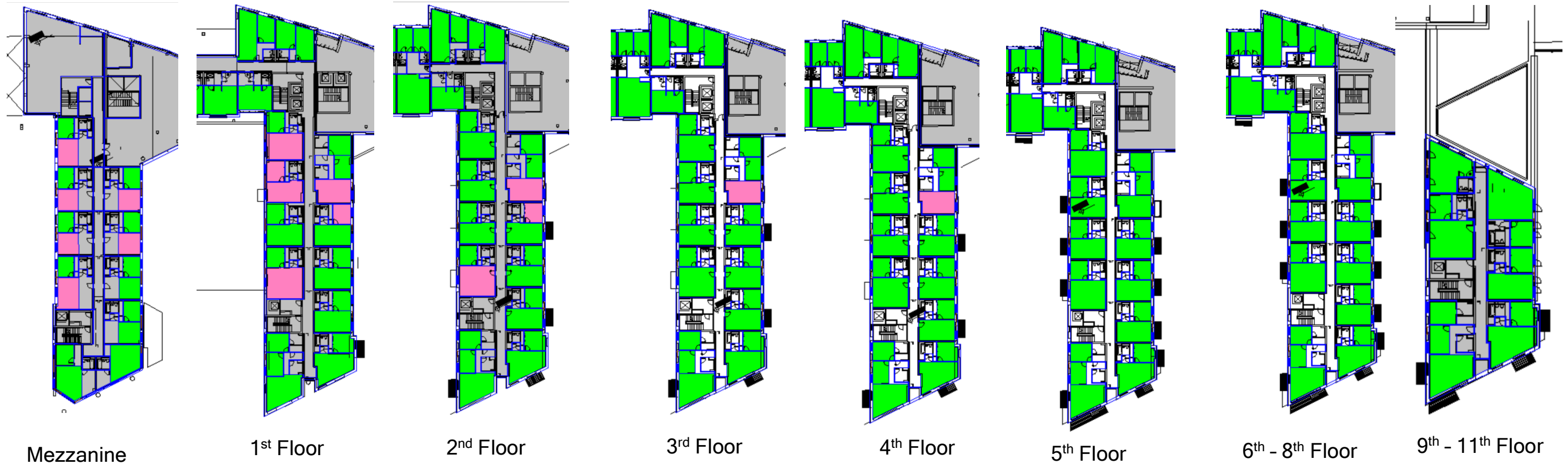
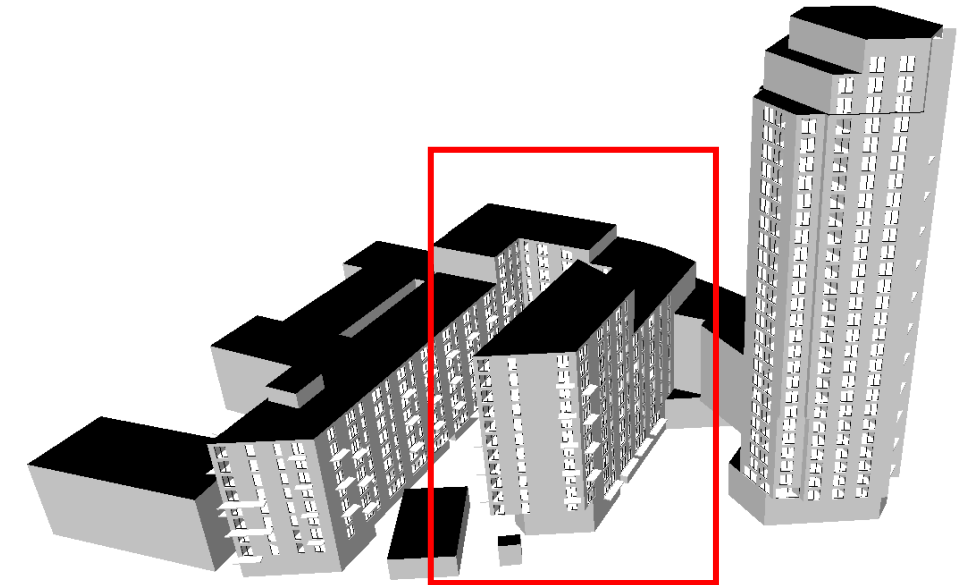
4.0 INTERNAL DAYLIGHT FACTORS

Block B Results

Block B		
Room Breakdown		
Above Target	276	94%
Below Target	17	6%

Daylight Target Bedroom	
>1%	
< 1%	

Daylight Target Living	
>1.5%	
< 1.5%	

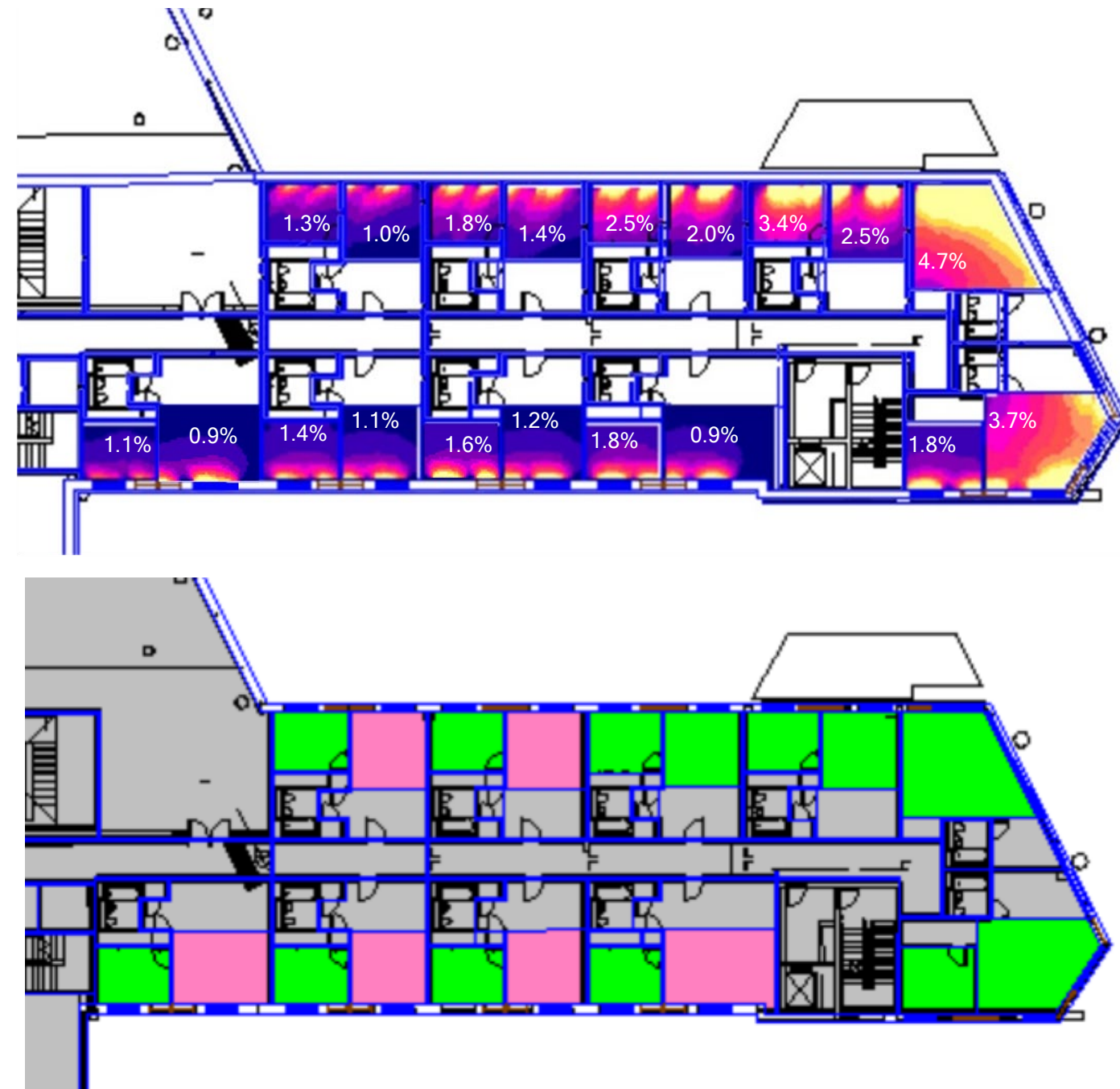
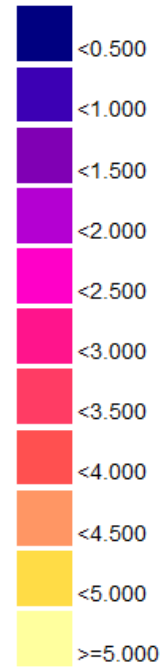


4.0 INTERNAL DAYLIGHT FACTORS

Block B Results

Mezzanine Floor

Daylight Factors (<)



4.0 INTERNAL DAYLIGHT FACTORS

Block B Results

First Floor

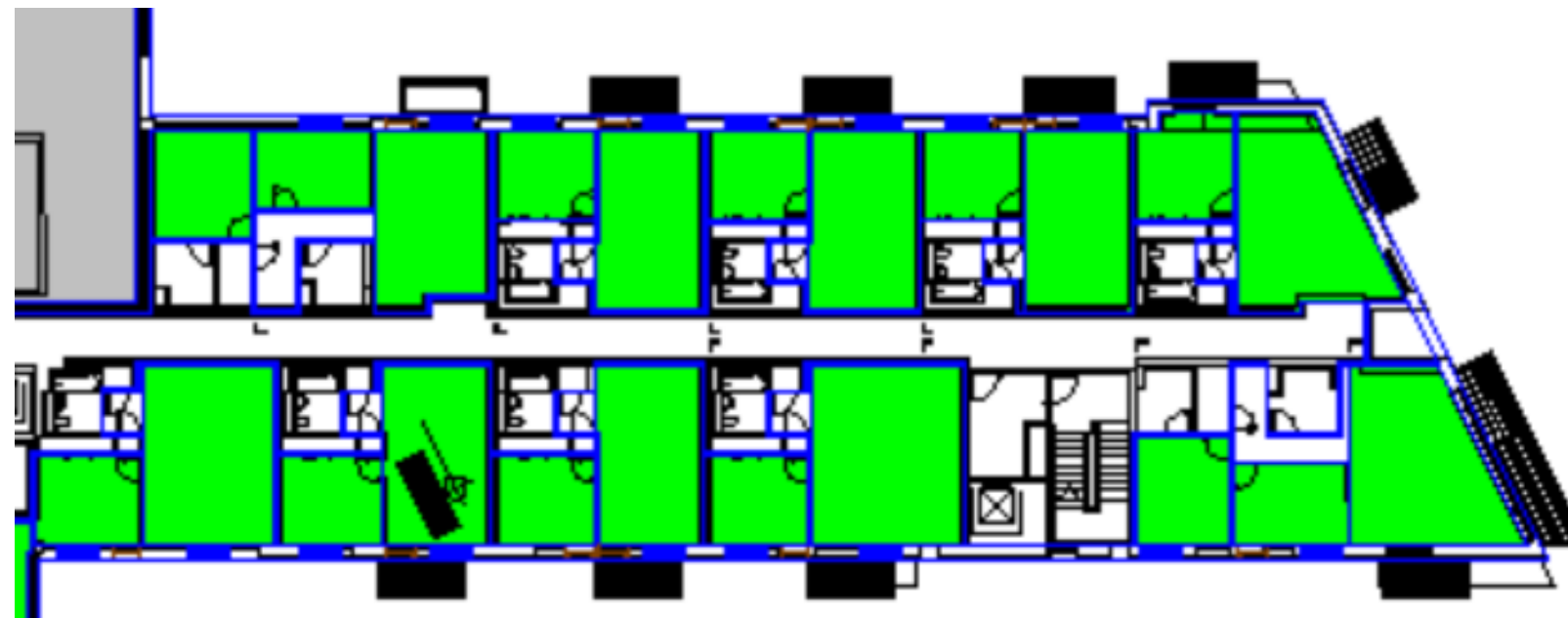
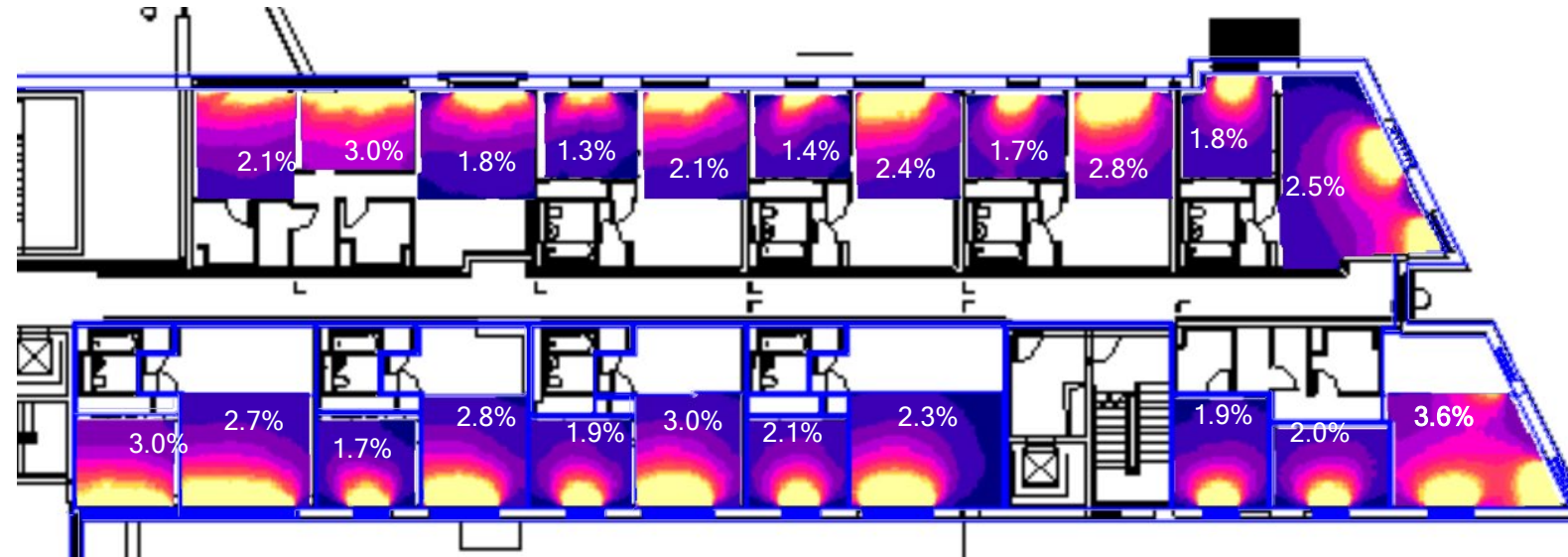
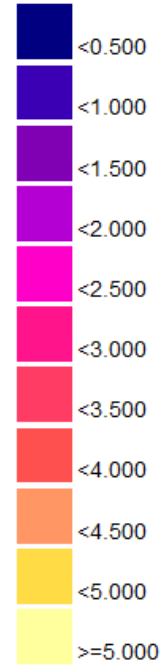


4.0 INTERNAL DAYLIGHT FACTORS

Block B Results

Sixth Floor

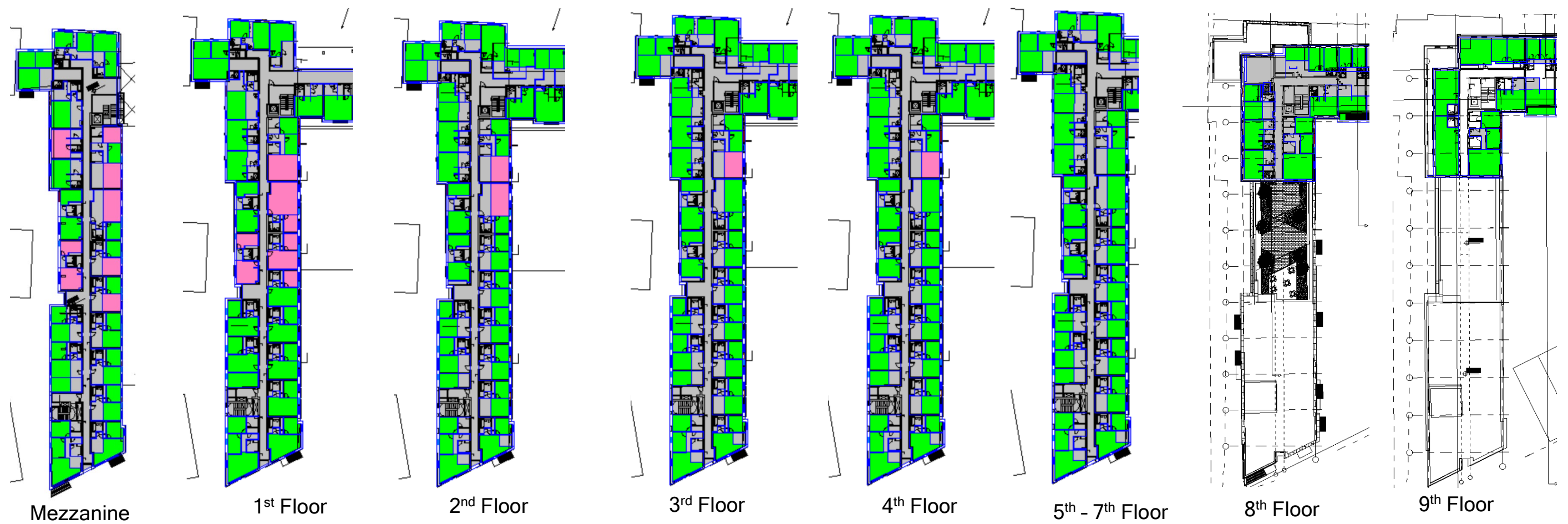
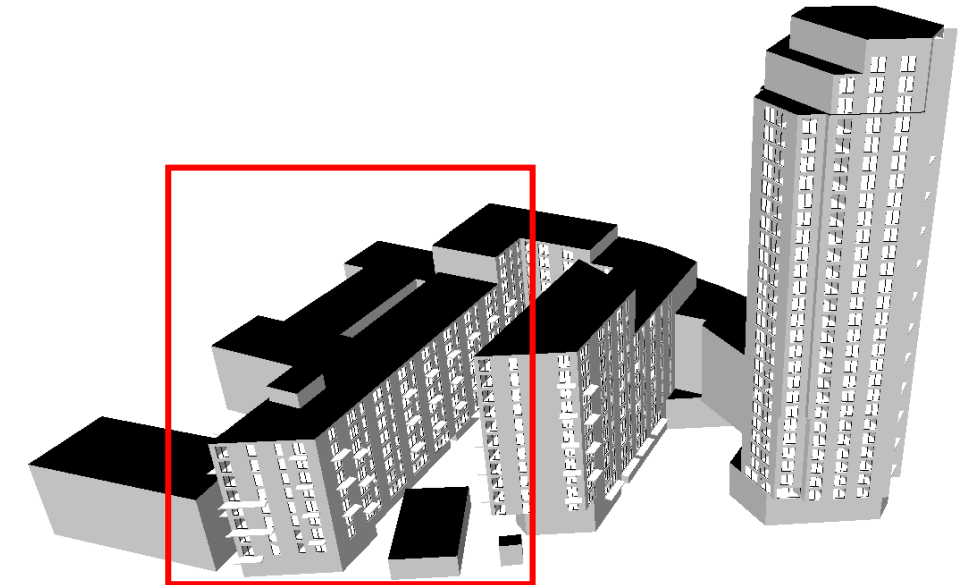
Daylight Factors (<)



4.0 INTERNAL DAYLIGHT FACTORS

Block C Results

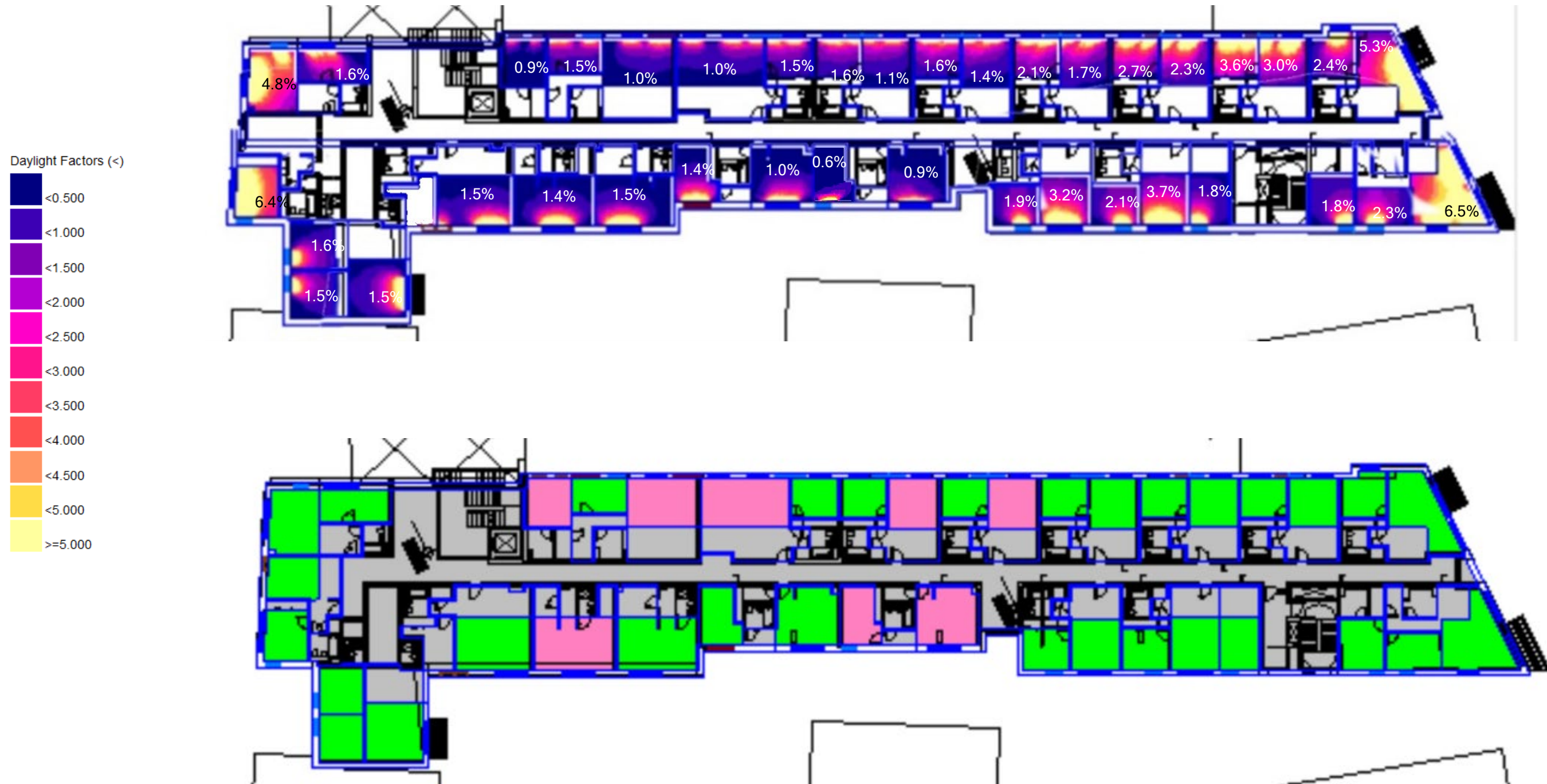
Block C		
Room Breakdown		
Above Target	305	94%
Below Target	20	6%



4.0 INTERNAL DAYLIGHT FACTORS

Block C Results

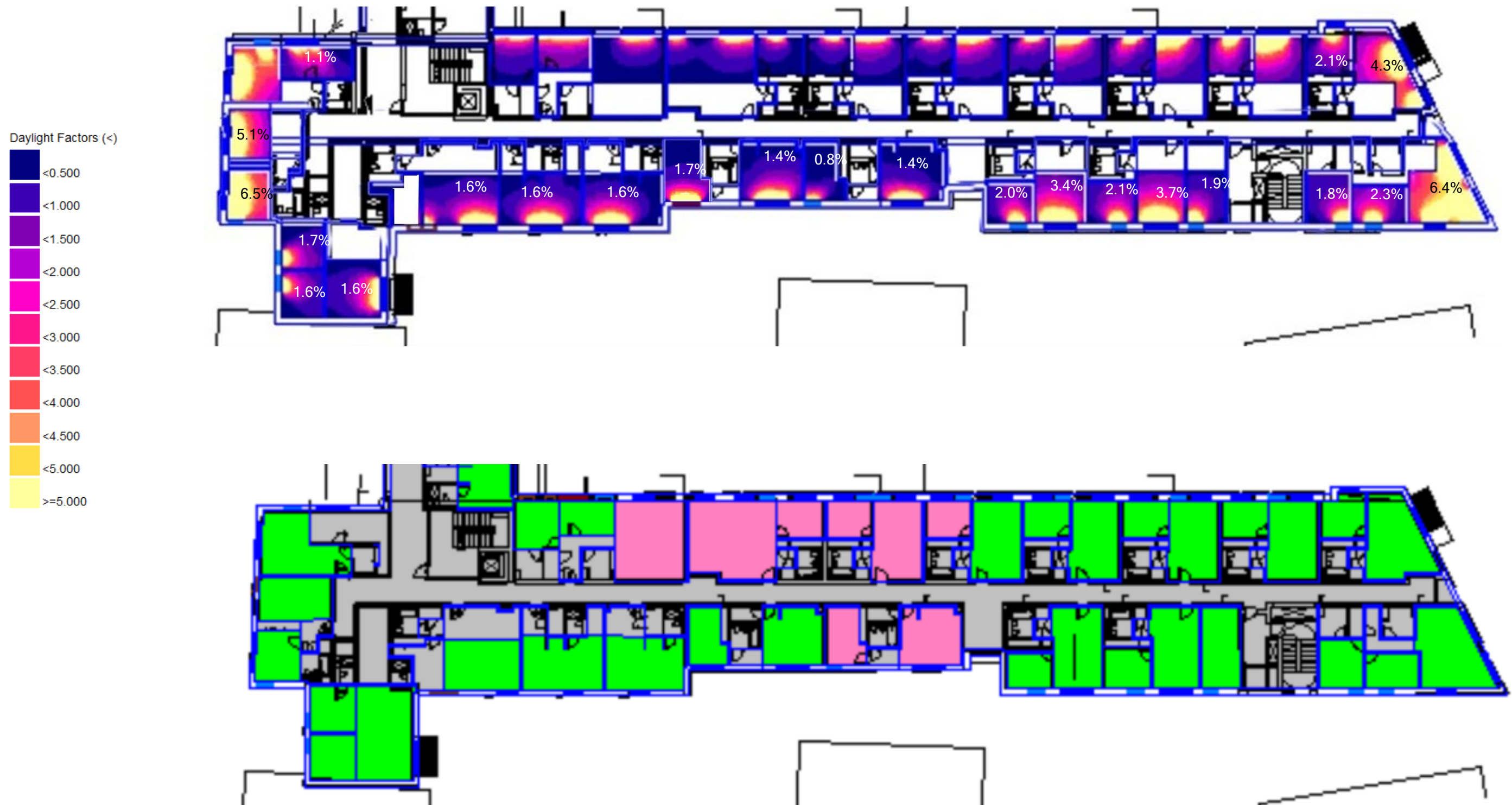
Mezzanine Floor



4.0 INTERNAL DAYLIGHT FACTORS

Block C Results

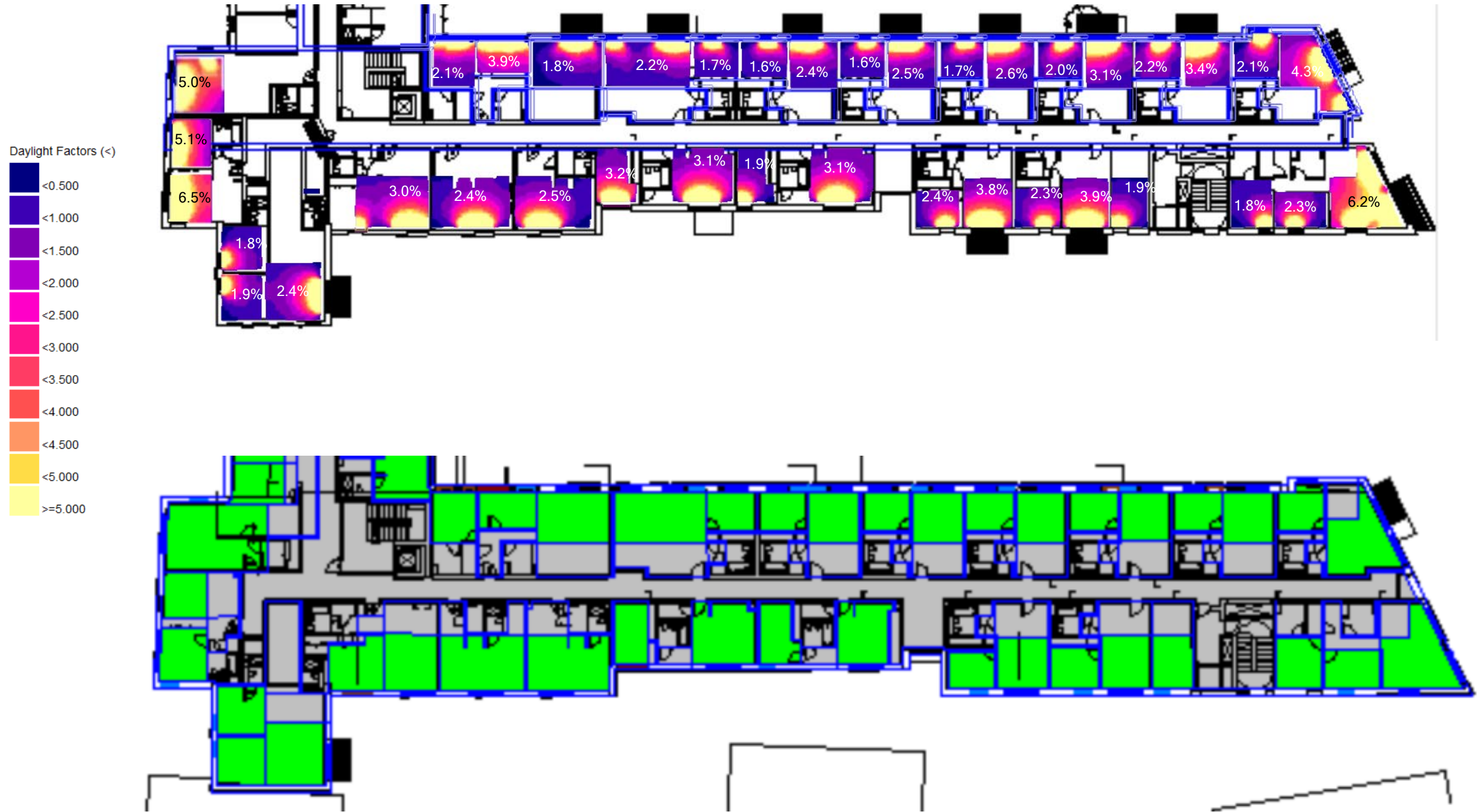
First Floor



4.0 INTERNAL DAYLIGHT FACTORS

Block C Results

Sixth Floor



APPENDIX - 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 - Design Standards for New Apartments which advises that:

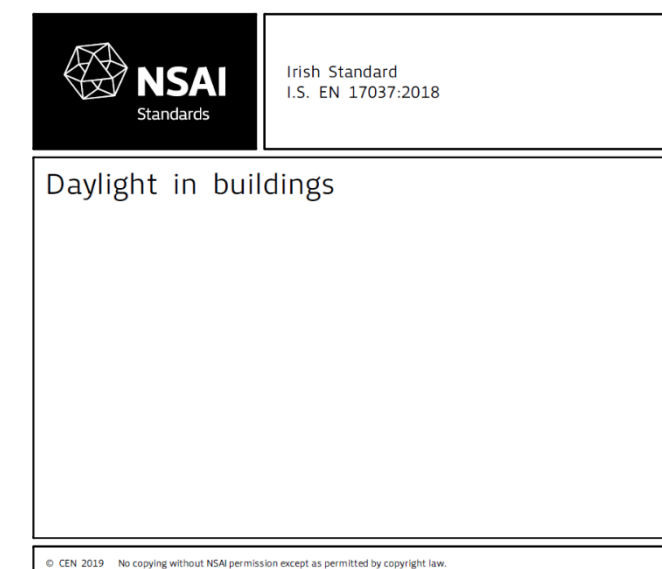
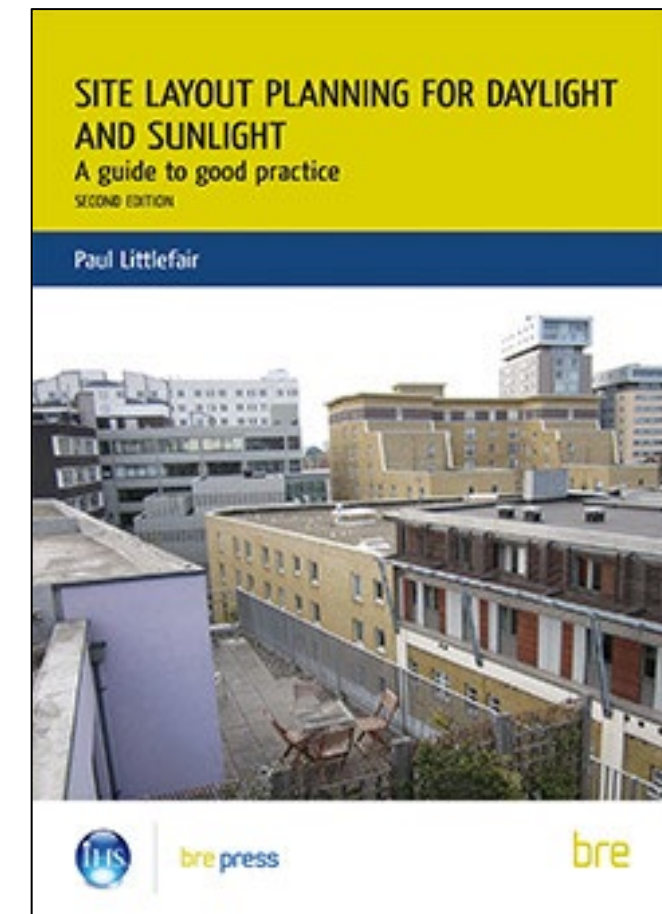
Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 - 'Lighting for Buildings - Part 2: Code of Practice for Daylighting' when undertaken 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 directive of the EU or any Irish Statutory Instrument and therefore remains advisory.

On release of the EN standard the BRE confirmed their intention to provide a National Annex, which would subsequently inform an updated and revised BRE 209 document. The rationale for this Annex is that the Median Daylight Factors 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 in all cases. This minimum target is deemed excessive for Dwellings, which 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). Providing higher daylight level in residential applications may indeed be counter productive in that it 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 the points on a reference plane 0.85m above the floor, for at least half of the daylight hours (i.e. median). Utilising the Median External Illuminance of 14,900 Lux for Dublin (Table A.3) the following Median Daylight Factors may be applied, adopting the methodology used in BS.EN 17037 Annex NA.

Room type	Target illuminance E_T (lx)	Median Daylight Factors
Bedroom	100	0.7%
Living room	150	1.0%
Kitchen	200	1.3%



APPENDIX - DAYLIGHT STANDARDS (Cont'd)

The scatter graph (Fig A.1) compare the ADF as per BER 209 (vertical axis) against the EN 17037 Annex target illuminance levels (horizontal axis) for the sample spaces assessed throughout the Parkgate development, as contained within the body of the report.

The analysis determined that 82% Living / Dining spaces are compliant with the requirements of both methodologies, as evident from their location in the north east quadrant, green area, of the graph.

The graph illustrate the results are aligned under both methodologies, the BRE 209 and the BS EN 17037 Annex NA. As BRE 209 is specifically referenced with the Design Standards for New Apartments guidance, coupled with this being the industry standard, and thereby more recognisable and more widely understood, the approach adopted within this report has been to follow this guidance.

Each habitable space was therefore assessed against the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition), as relevant, for Daylighting which state;

- Kitchens 2%
- Living Rooms 1.5%
- Bedrooms 1%

Regarding the target kitchen Average Daylight Factor of 2%, we note the BRE 209 guide was developed for residential housing where the kitchen is an identifiable separate room with seating where residents would be expected to eat and spend time as well as being generally present throughout the day. Apartments do not include a kitchen of this type; they instead include a kitchenette which would be expected to be used solely to prepare food with the residents spending most of their time in the living area. We therefore do not assess to the kitchen figure of 2% ADF, instead referencing the 1.5% ADF for living/dining rooms and 1% ADF for bedrooms.

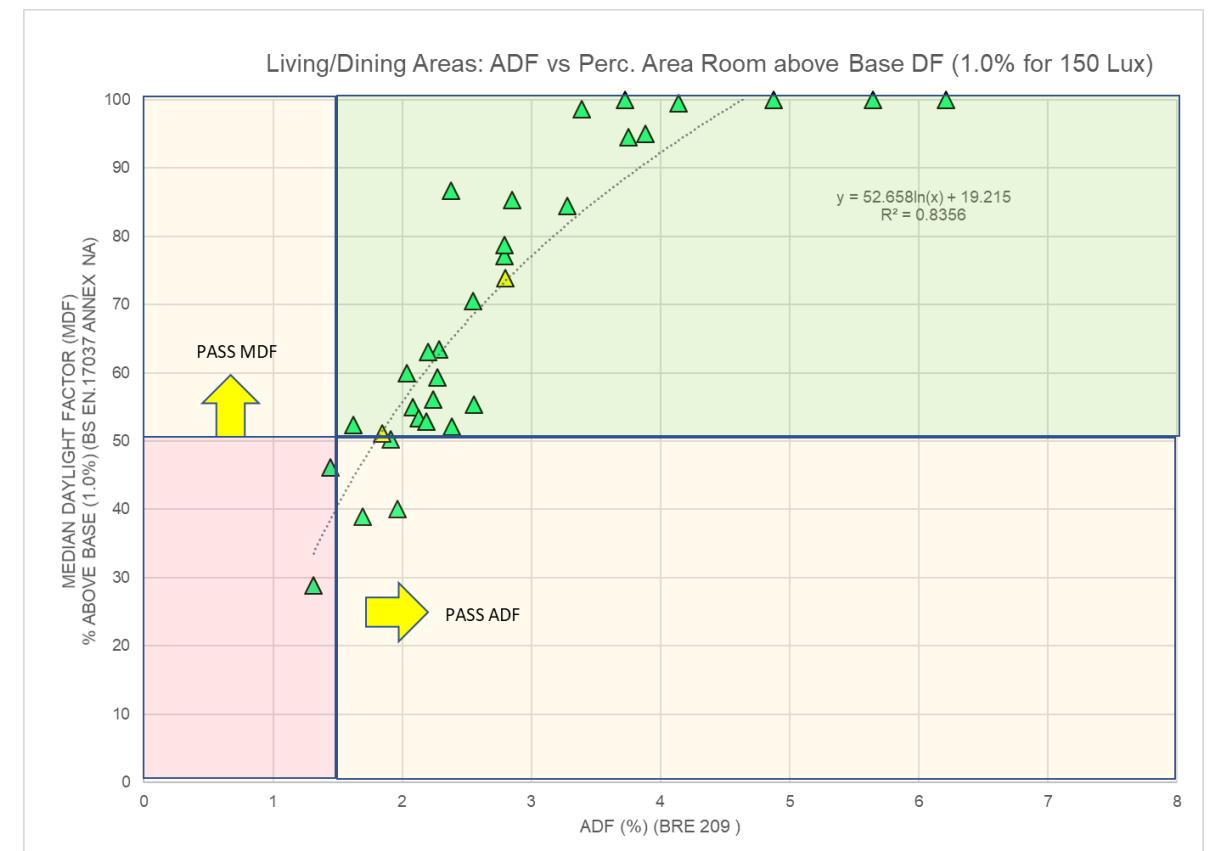


Fig A.1 Living / Dining Results for Parkgate Residential
(4th Floor Sample Shown)