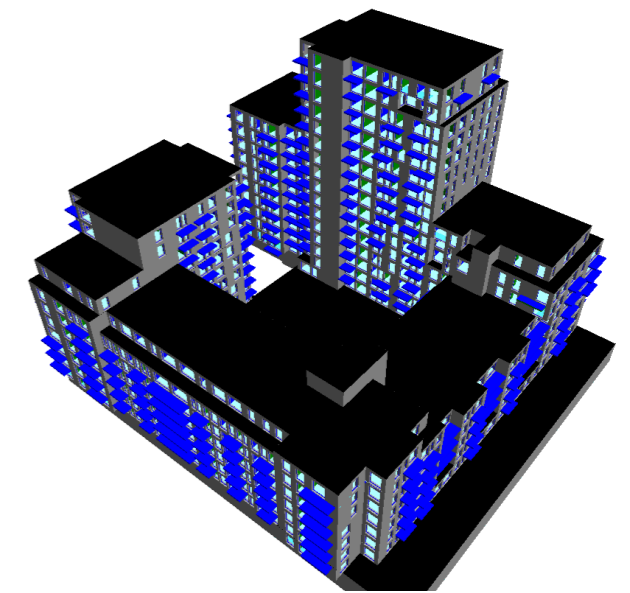


Proposed Residential Development
Carmanhall Road,
Sandyford,
Dublin 18



Sunlight & Daylight Analysis

IN2 Project No. D2020

09/02/2021

Planning REV00



Revision History

Date	Revision	Description
09/02/2021	00	Initial issue for review

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1.0 Executive Summary

This report complies analysis as carried out for Sunlight and Daylight for the proposed residential development at Carmanhall Road Sandyford.

Assessments were undertaken in accordance with Building Research Establishment's Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE.209) and BS.8206-2:2008: Lighting for Buildings – Part 2 Code of Practice for Daylighting in accordance with DoHPLG's Sustainable Urban Housing: Design Standards for New Apartments – Guidelines for Planning Authorities. In addition, a comparison of results was carried out against the new European Standard EN.17037 – Daylight for Buildings. It should be noted that this is a guidance document, and it is noted within "(it should) be interpreted flexibly since natural lighting is only one of many factors in site layout design" and therefore "should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer".

Sunlight availability to the Amenity spaces was assessed against the BRE.209 criterion of achieving at least 2 hours potential sunlight on March 21st to the majority of its area. Section 2.0 outlines how compliance was determined for the proposed amenity space with 79% of the proposed amenity space achieving compliance.

The internal daylight analysis, as detailed in section 3.0, has been undertaken for all units across the development. The analysis determined that 96% of rooms were in excess of the BRE guidelines for average daylight factors (ADF). This extent of compliance was achieved through design development, with increased glazing/ reduced balcony depths etc. applied to ensure the residences can benefit from maximised daylight availability.

Further internal daylight analysis, as detailed in APPENDIX D, was undertaken for the scheme with the addition of the proposed neighbouring development to the west. The analysis determined that with this building in place, 95% of rooms were in excess of the BRE guidelines.

Sunlight and shading analysis were also undertaken which demonstrated that the proposed development would not negatively impact on existing neighbouring buildings. Appendix A compiles the results of this analysis, with site shading diagrams displayed on an hourly basis for the Equinox and Summer/ Winter Solstices.

Appendix B refers to the BRE methodology on impact to neighbouring residential buildings. This assessment was not required for this development as there are no residential premises within close proximity to the site.

Finally, 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. This analysis determined generally good correlation between the existing and new standards applied, with those rooms generally deemed compliant in the former methodology also achieving compliance under the latter.

In summary, this report confirms that Best Practice Sunlight and Daylight Availability have been ensured for the proposed Carmanhall Road development, with no undue impact on existing neighbouring environment.

2.0 Sight Sunlighting and Shading

2.1 Methodology

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

The guidance recommends “that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21st March”.

The methodology assesses sunlight performance at the Equinox, as this is the mid solar position throughout the year (as illustrated in Fig.2.1), 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).

An example analysis of Amenity Spaces is indicated in Figure 3.1. In this development, the main amenity space (to right hand side) is located to the North of a building block which provides some degree of overshadowing (dark green contours).

However, as the majority of the Amenity Space was determined to be able to receive at least 2 hours of sunlight at the Equinox (light green contours), this would be deemed to be compliant.

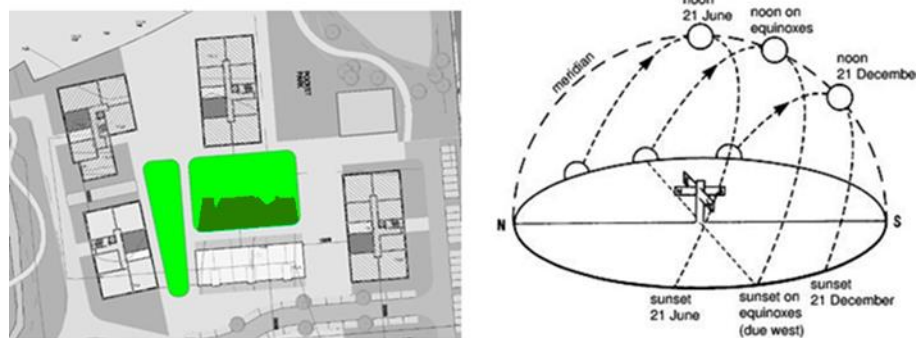


Fig 2.1 – Example Amenity Spaces

2.2 Results

Fig 2.2 confirms that 79% of the proposed amenity space for the development, well above the recommended 50%, will be **compliant** with the criterion.

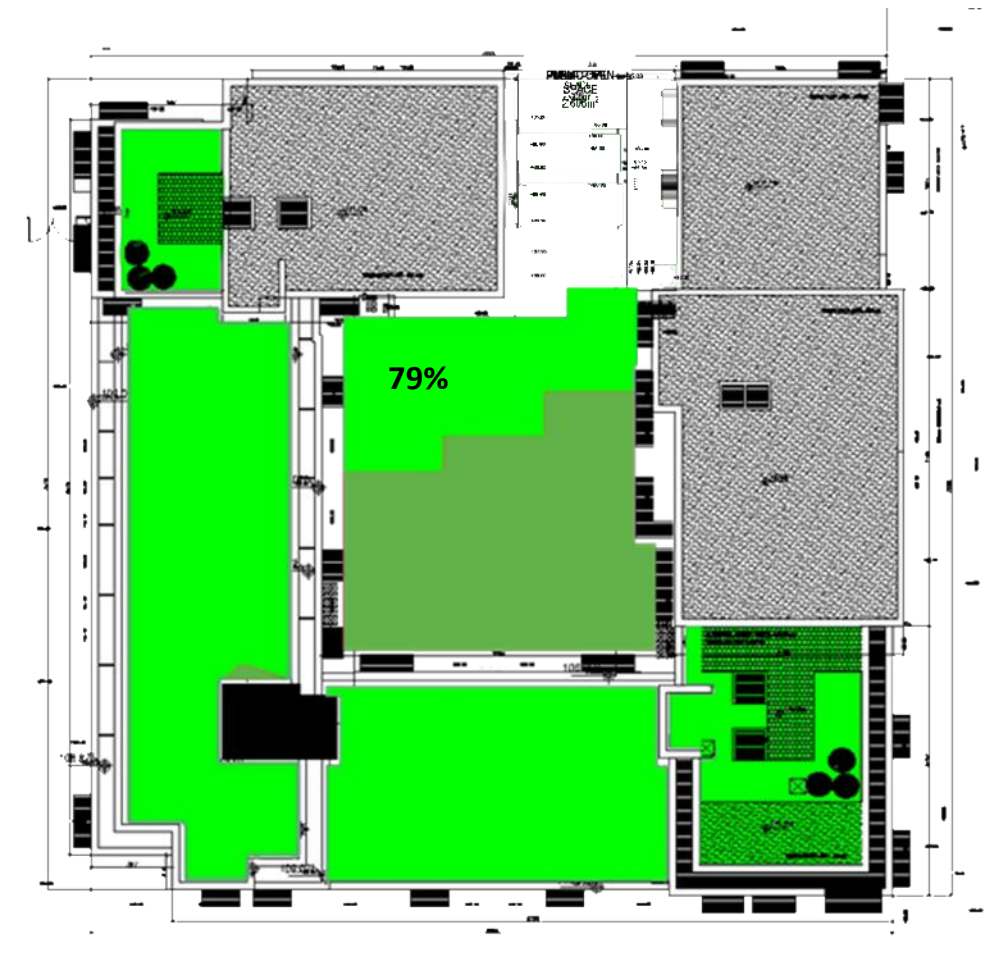


Fig 2.2 –Sunlight Availability to Amenity Spaces for Proposed Development

3.0 Internal Daylight Analysis

3.1 Methodology

Daylighting analysis was undertaken 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 as colour images contour plots showing the achieved values for average daylight factors.

Internal daylighting for all internal spaces were assessed by undertaking lighting simulations, enabling both quantification and visualisation of predicted illumination levels (lux) and uniformity. This enabled Average Daylight Factor (ADF) values to be determined for each floor space.

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 for Daylighting against the BRE guide ‘Site Layout Planning for Daylight and Sunlight’ (2nd edition), as relevant, 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.”

It can be seen from the above that there is a recognition within the Best Practice Guide and associated Standard that daylight requirements in non-domestic buildings are more critical than within dwellings. This is due to the expectation that dwellings would not typically be occupied during daytime. Therefore, living areas and bedrooms were provided with reduced targets of Average Daylight Factor (ADF).

It may be noted that the sole residential space that had been set as a target equivalent to non-domestic buildings (2% minimum) were kitchens; however, this was done so on the premise that such a space within a traditional house would be continuously occupied throughout daytime.

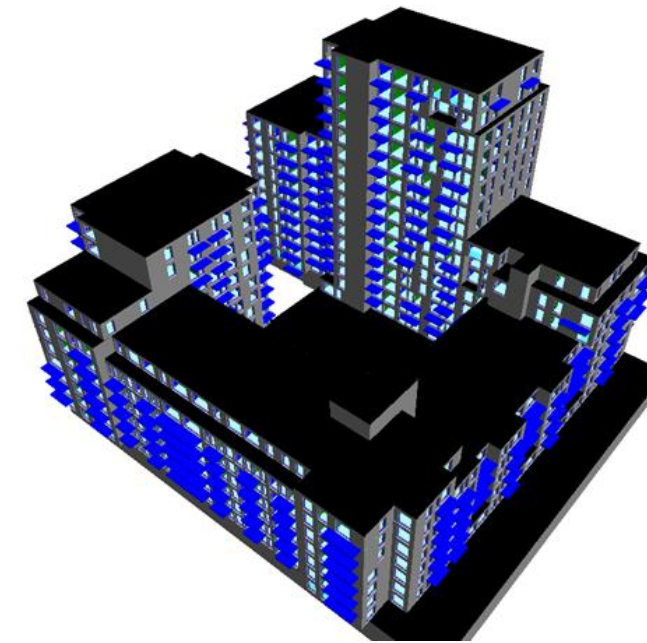


Fig 3.1 – TAS 3D Model

	Pass	Fail	Total
Floor 1	89	11	100
Floor 2	92	14	106
Floor 3	101	5	106
Floor 4	104	2	106
Floor 5	104	2	106
Floor 6	87	2	89
Floor 7	80	0	80
Floor 8	52	0	52
Floor 9	41	0	41
Floor 10	41	0	41
Floor 11	17	0	17
Floor 12	17	0	17
Floor 13	17	0	17
Floor 14	17	0	17
Floor 15	15	0	15
Floor 16	15	0	15
Total	889	36	925
%	96%	4%	

Fig 3.2 –Summary of Results

Conversely, it would be envisaged that the kitchenettes within the apartments would be intermittently occupied, with the living area being the main area of occupation through daytime (if occupants are present). Therefore, the analysis has been undertaken based on assessing the main Living/ Dining Areas as being an appropriate area to achieve good daylighting, with an associated target ADF of 1.5%.

The following daylight factors were targeted:

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

The daylighting models were calculated based on the following assumptions:

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

The visual results overleaf illustrate the daylight contours assessed for sample applicable spaces.

The results determined that 96% of spaces achieved in excess of the BRE. Further, it was determined that an average ADF of 3.5% would be provided for all living / dining space across the development, with 50% of the living spaces achieving an ADF in excess of 3.5%, as illustrated in Figure 3.3. Similarly, the average daylight factor in the bedrooms across the scheme was in excess of 2.5%.

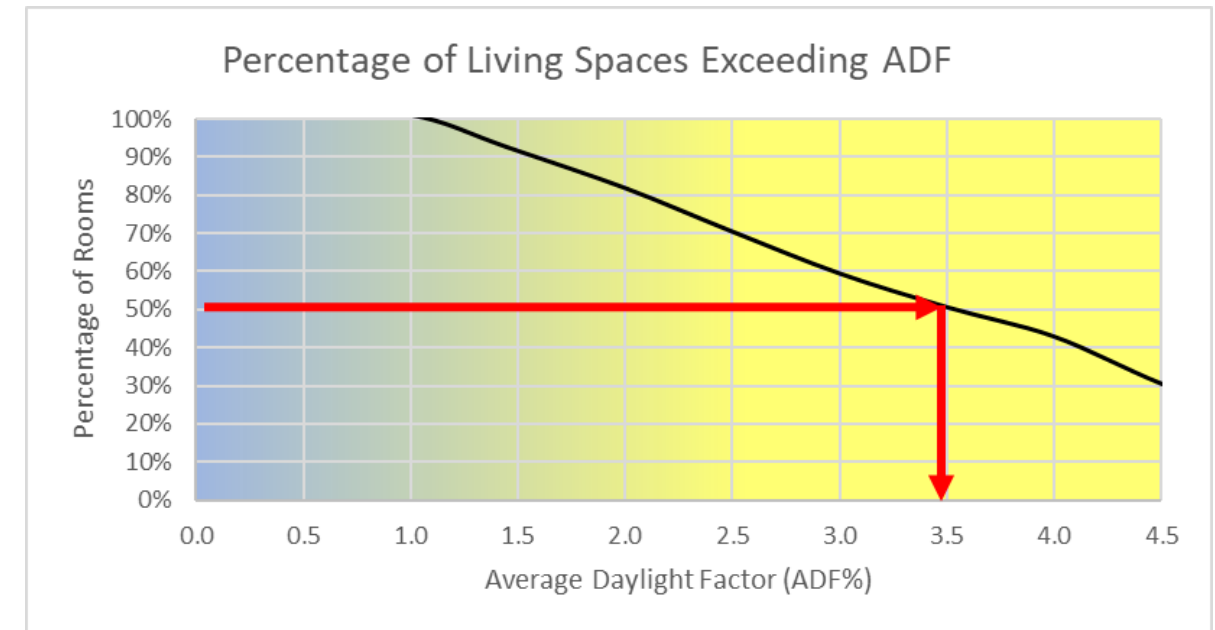


Fig 3.3 Frequency Graph for Living Spaces

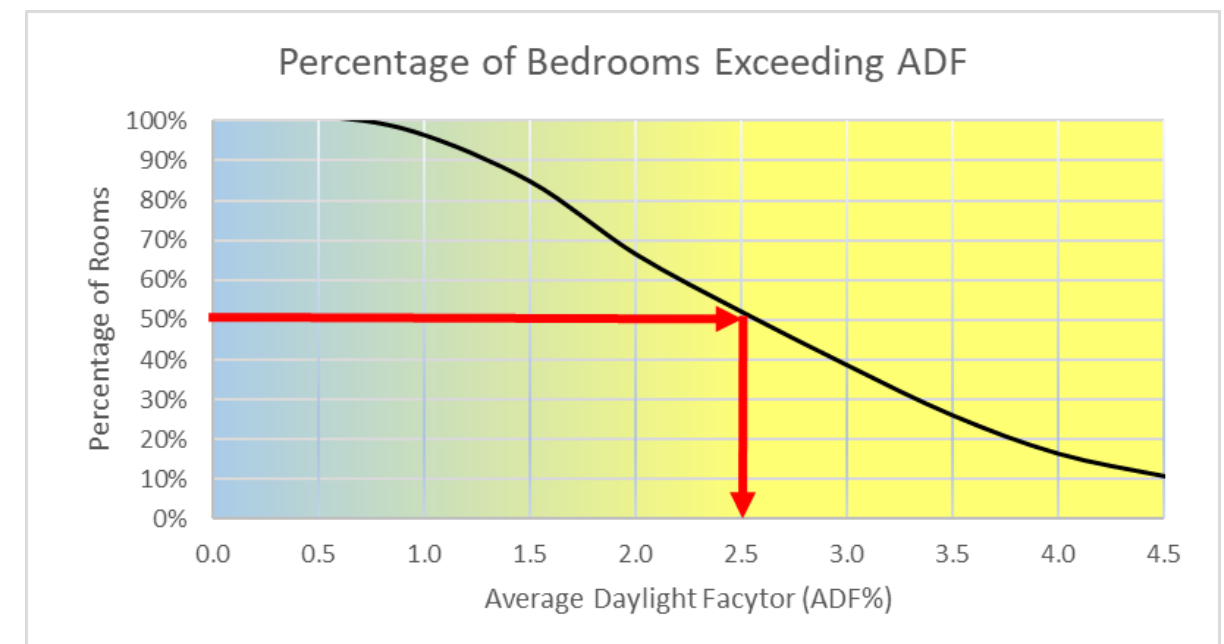
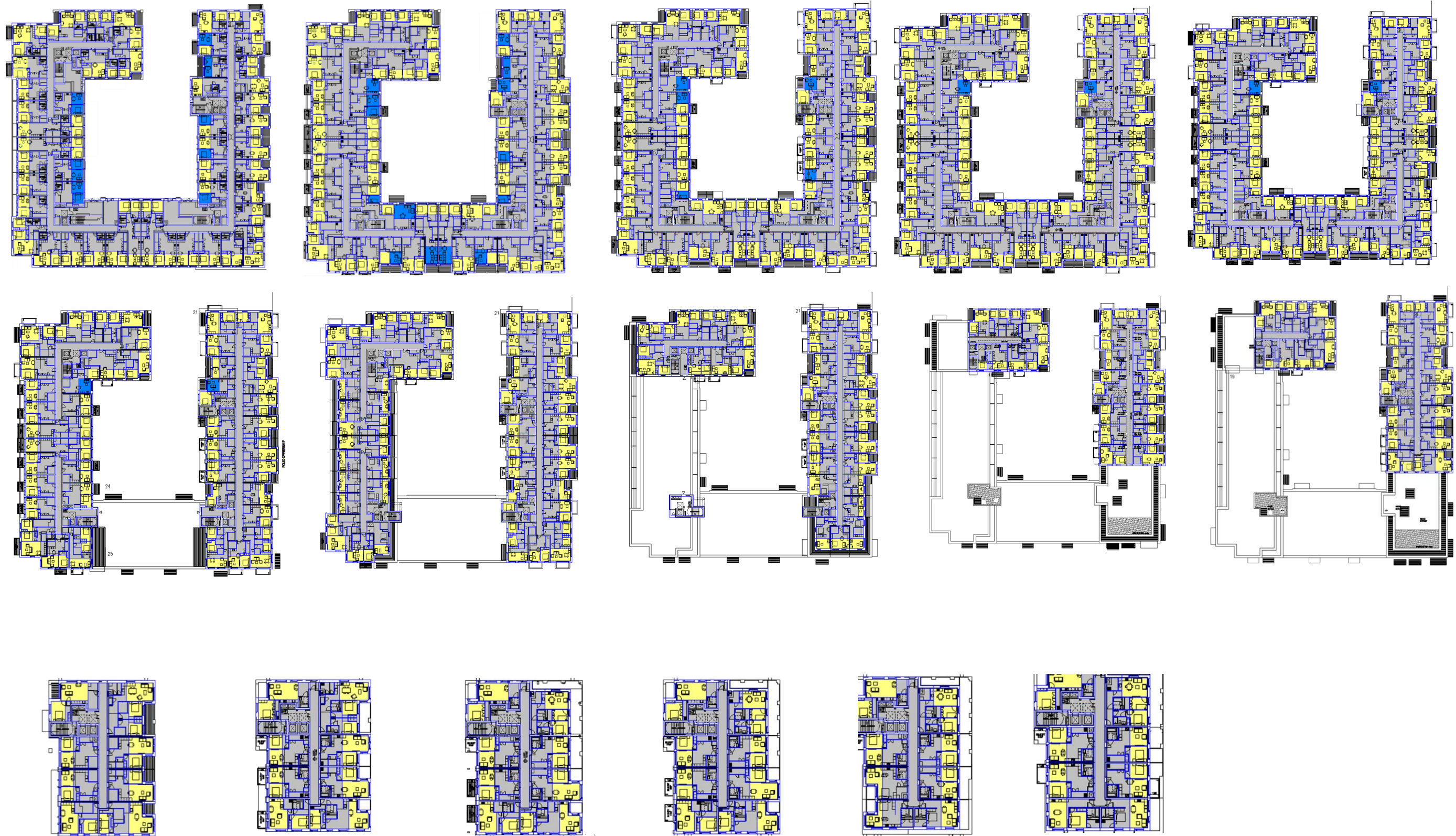
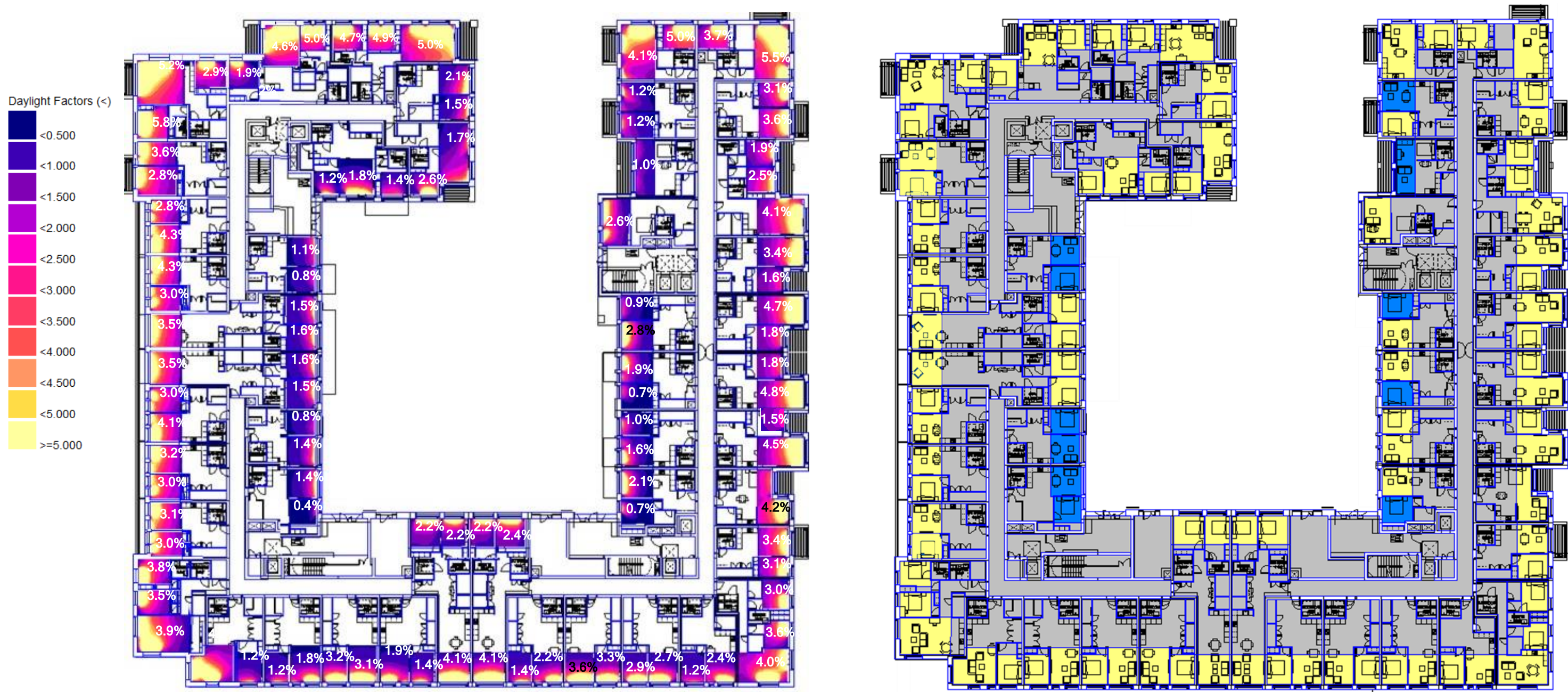


Fig 3.4 Frequency Graph for Bedrooms

3.2 Summary of Results



3.3 First Floor



3.4 Second Floor



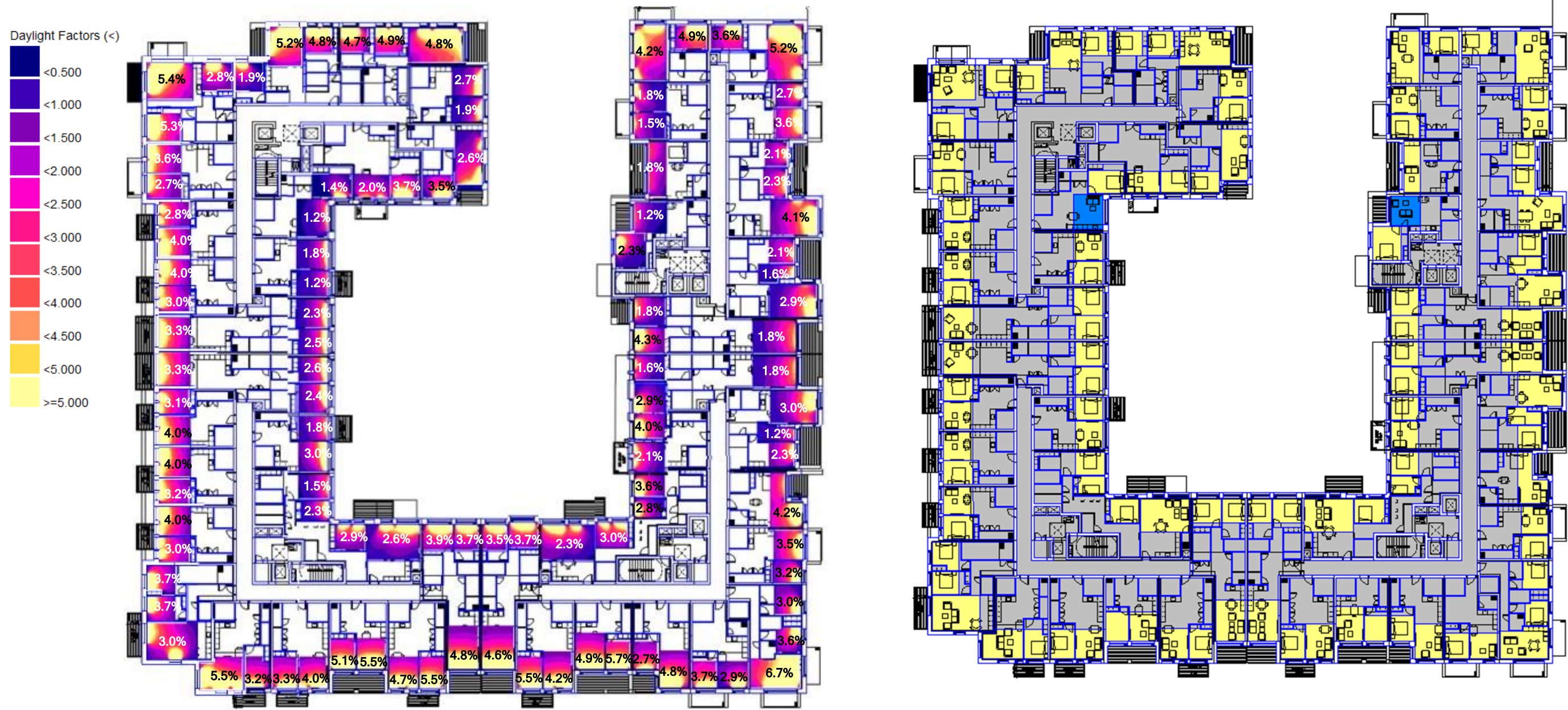
3.5 Third Floor



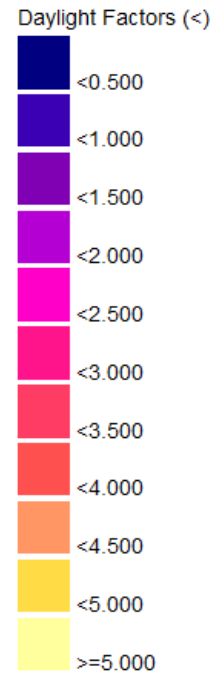
3.6 Fourth Floor



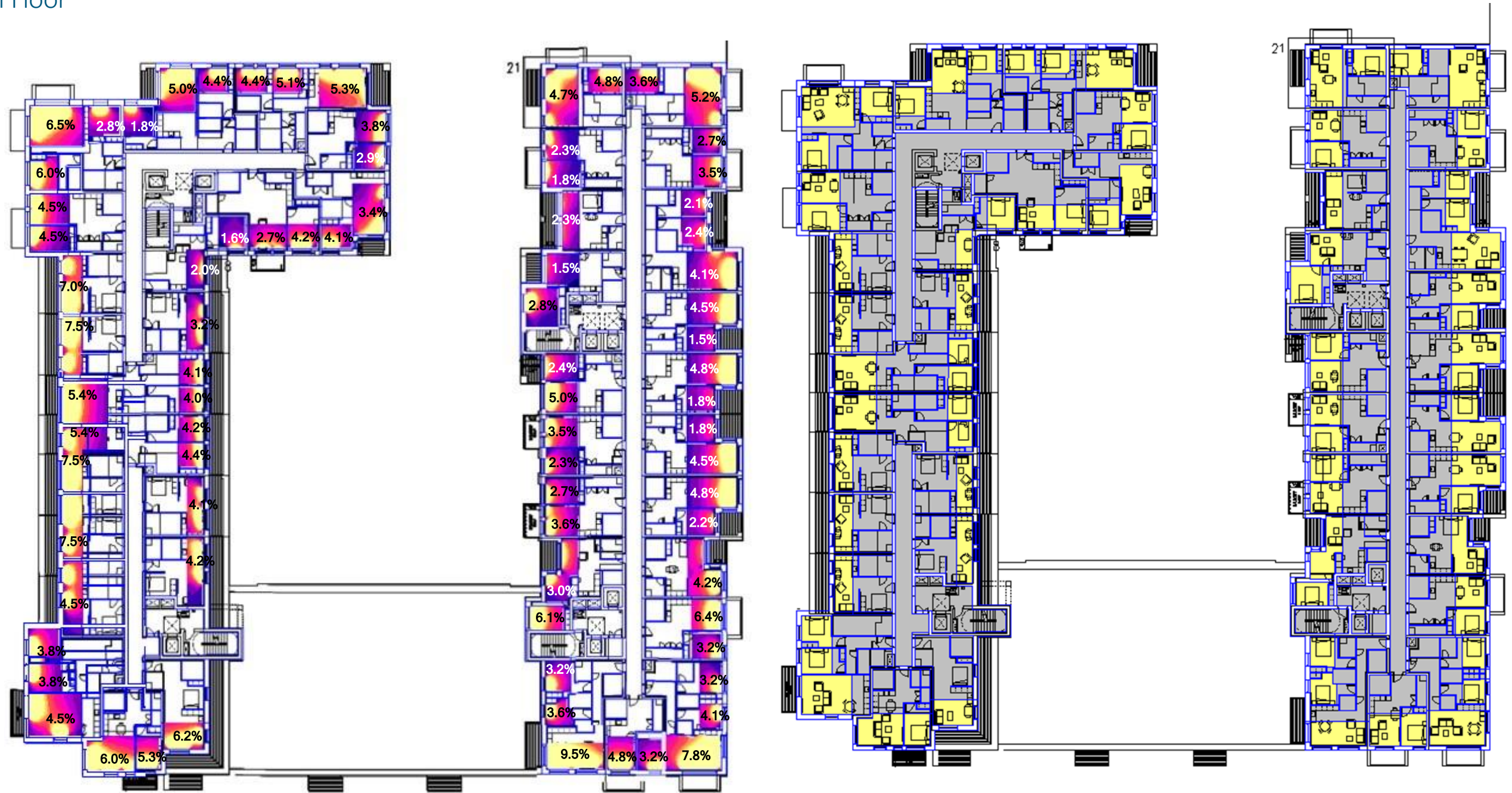
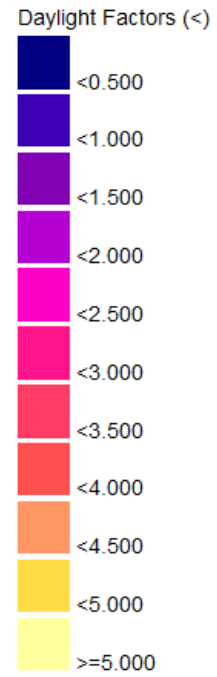
3.7 Fifth Floor



3.8 Sixth Floor



3.9 Seventh Floor



3.11 Ninth Floor

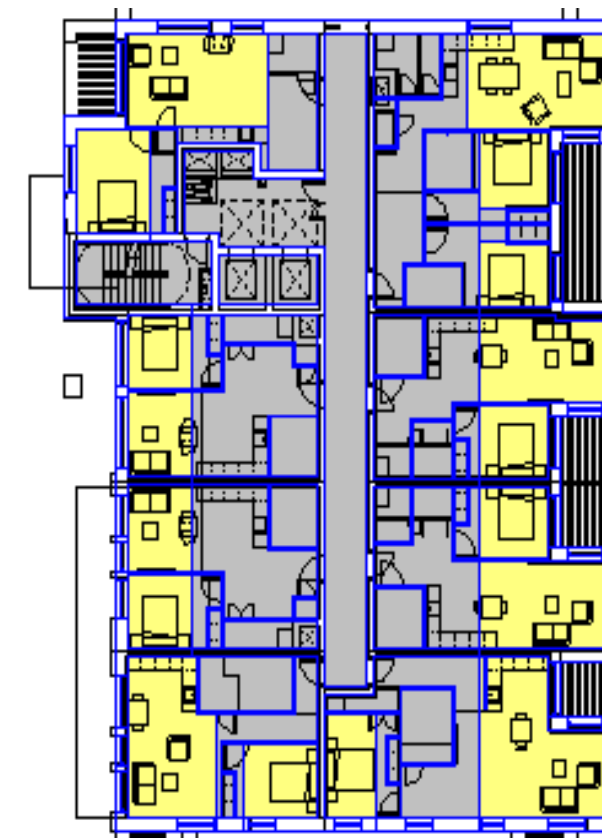
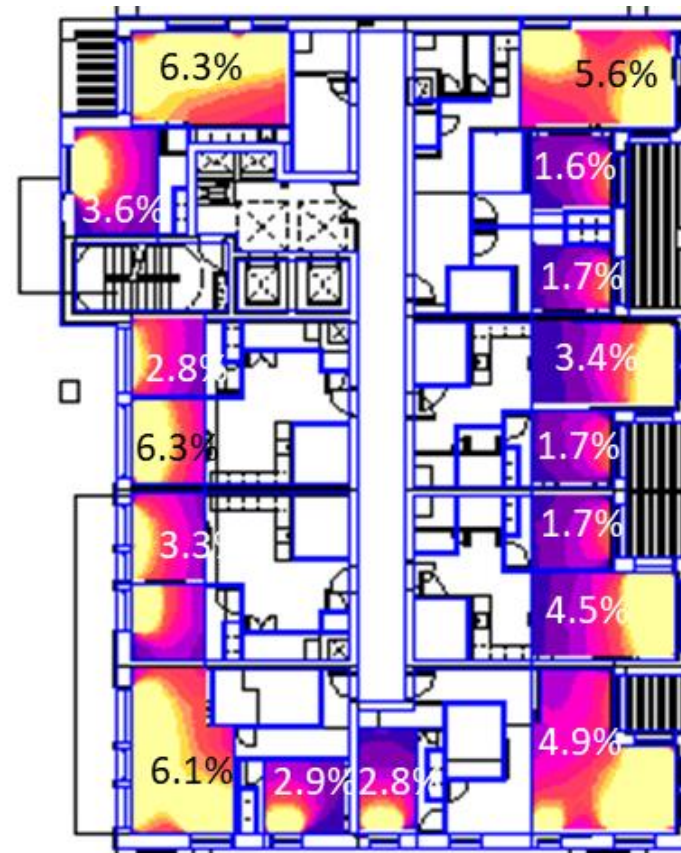
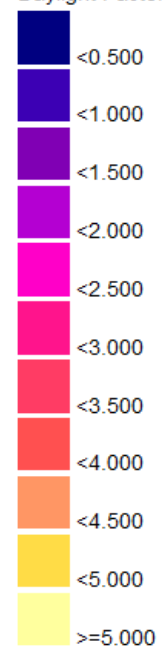


3.12 Tenth Floor



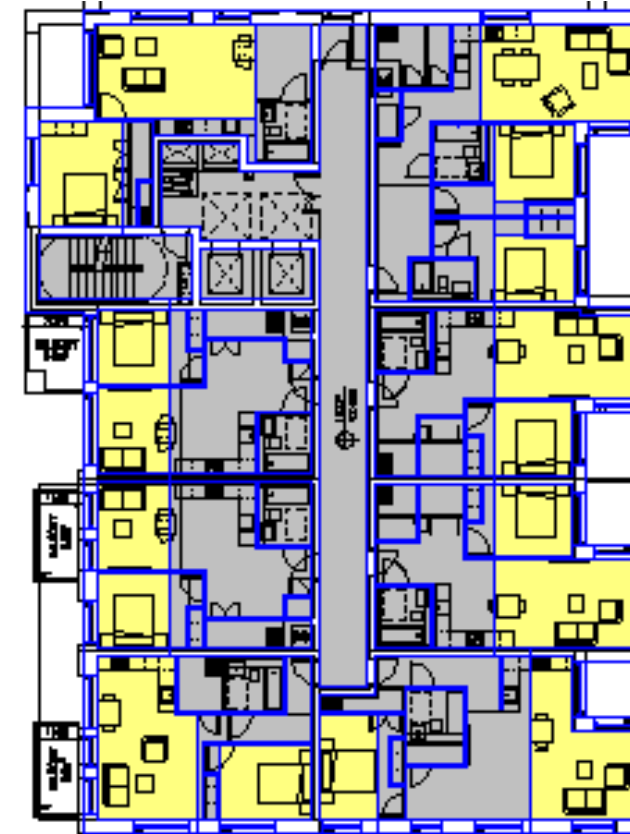
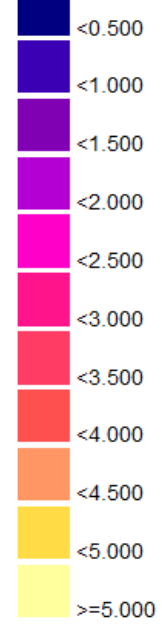
3.13 Eleventh Floor

Daylight Factors (<)



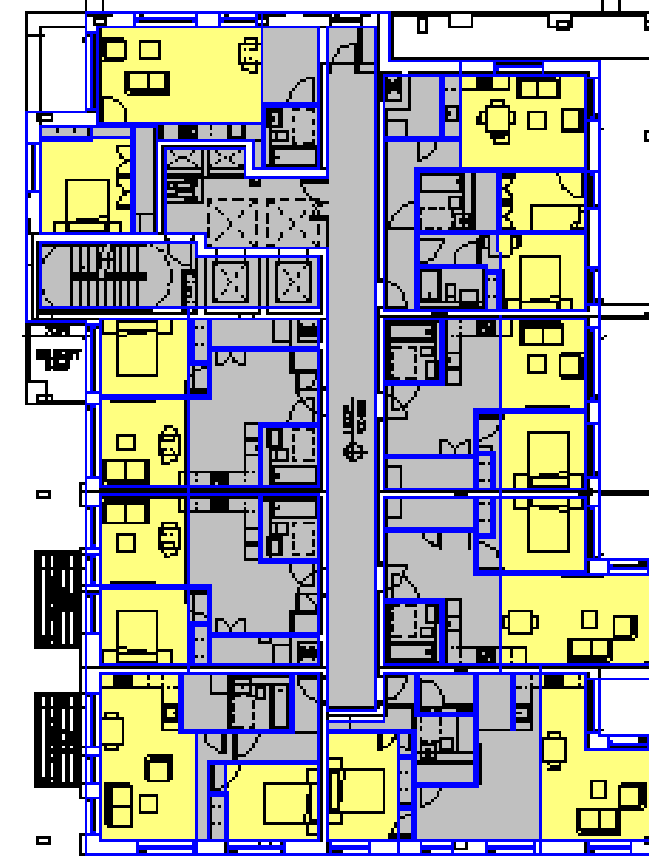
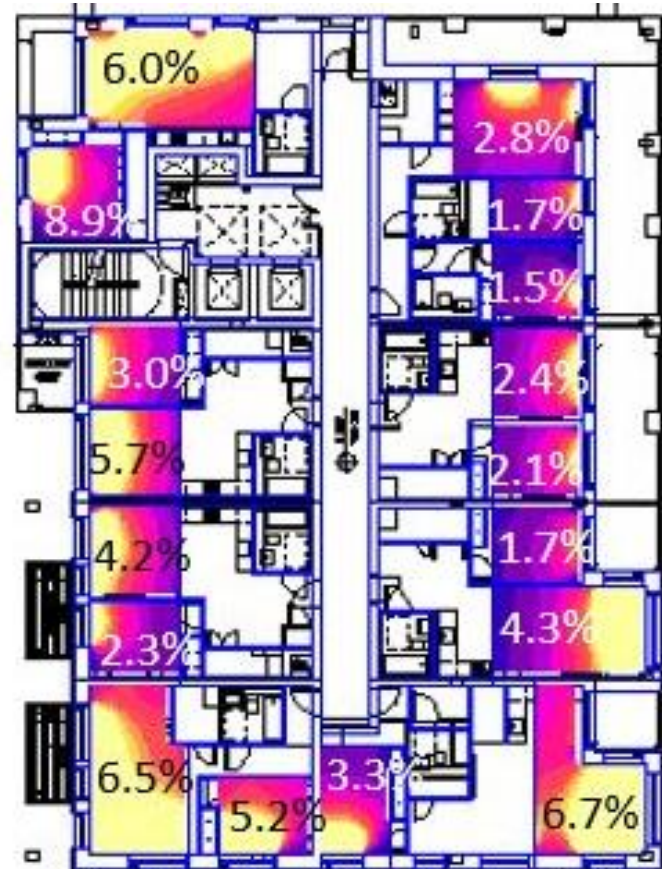
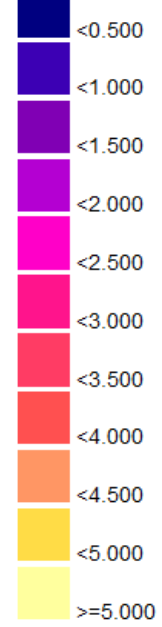
3.14 Twelfth Floor

Daylight Factors (<)



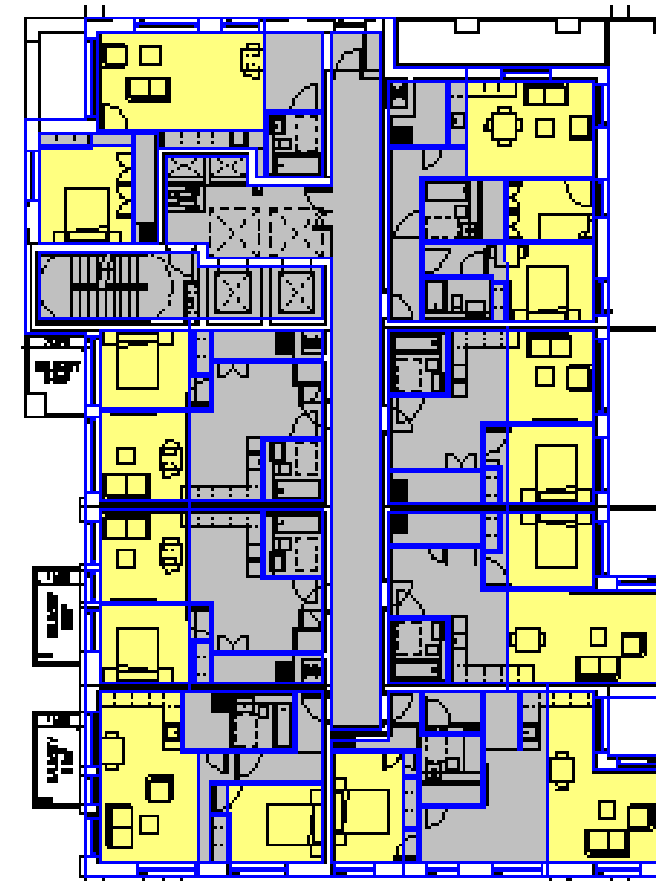
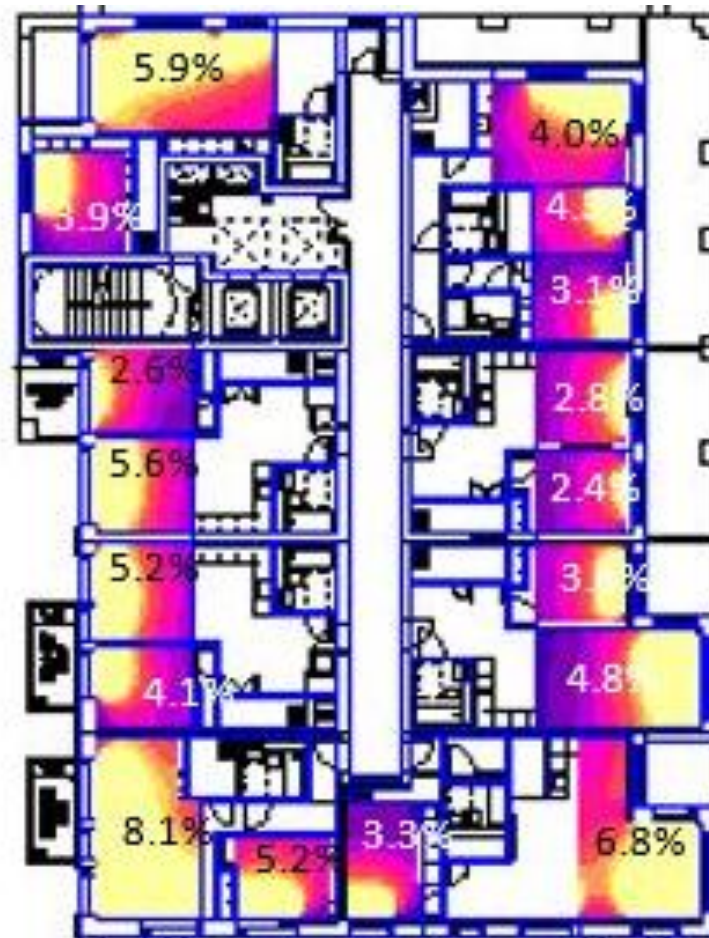
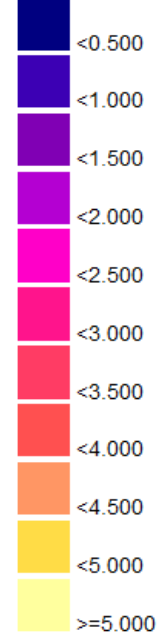
3.15 Thirteenth Floor

Daylight Factors (<)

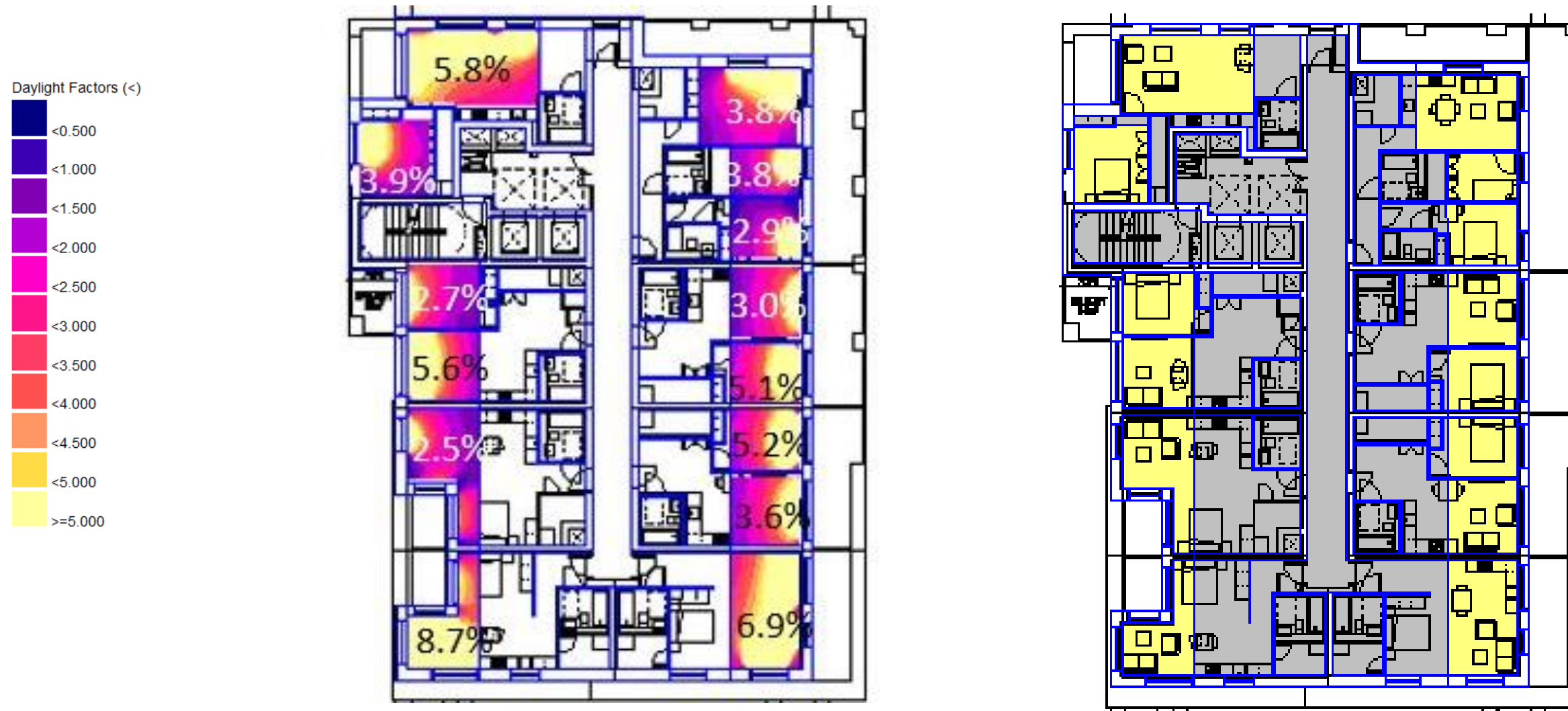


3.16 Fourteenth Floor

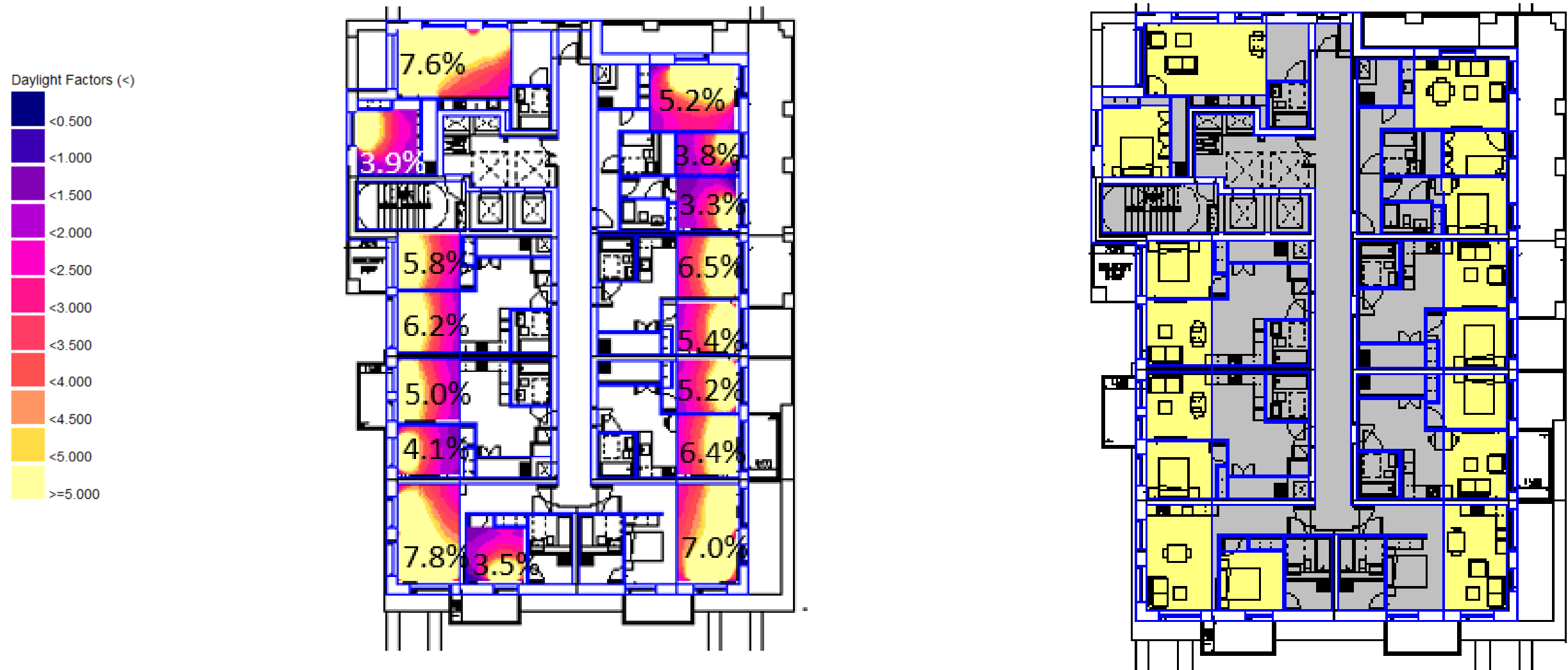
Daylight Factors (<)



3.17 Fifteenth Floor



3.18 Sixteenth Floor



APPENDIX A – Site Shading Diagrams

Equinox March 21st

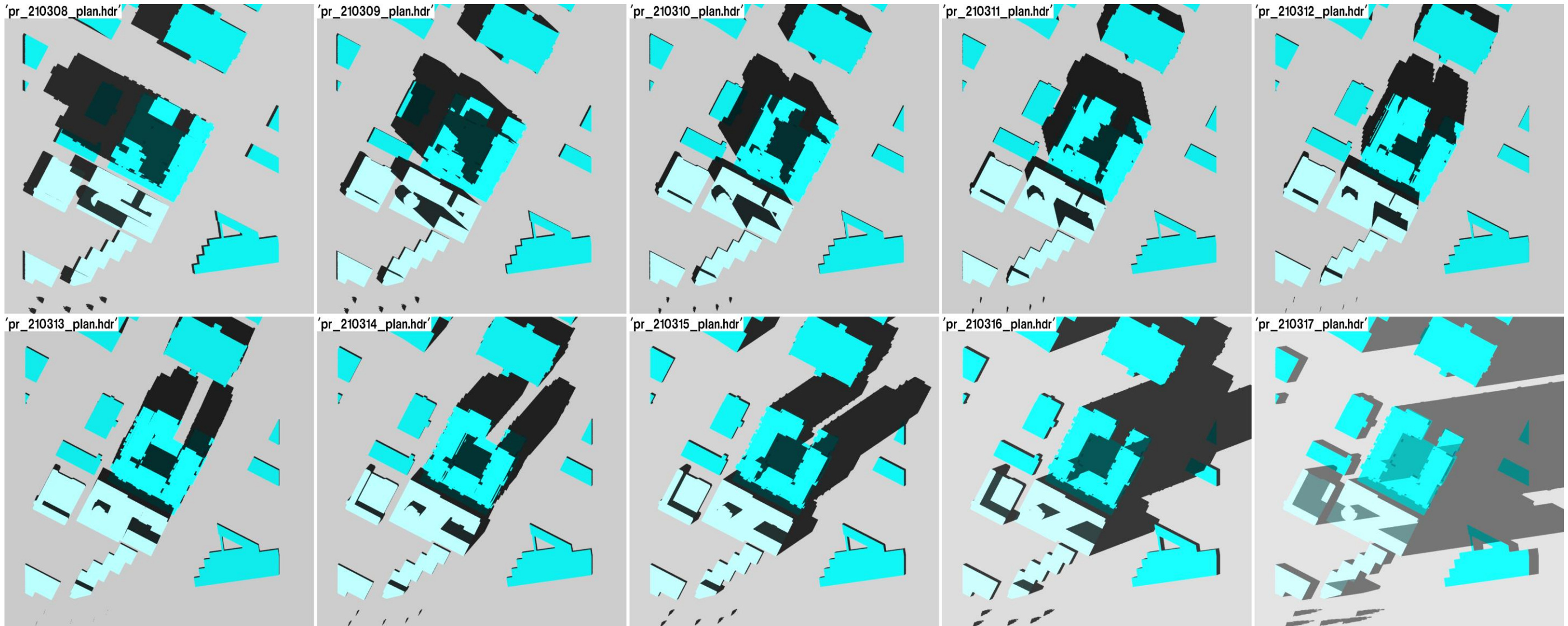


Fig A1: Sunlight and Site Shading Diagrams - Equinox (March 21st): 08:00-17:00 hrs

Summer Solstice June 21st

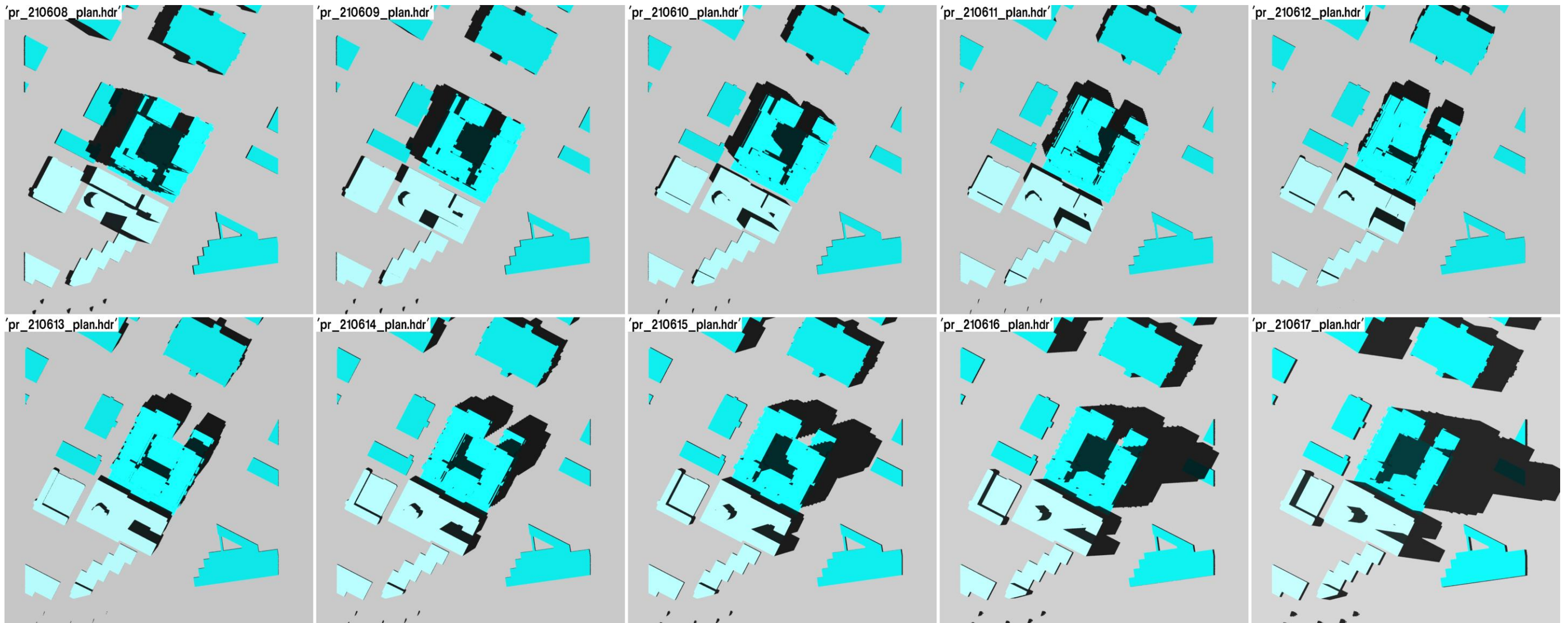


Fig A2: Sunlight and Site Shading Diagrams – Summer Solstice (June 21st): 08:00-17:00 hrs

Winter Solstice December 21st

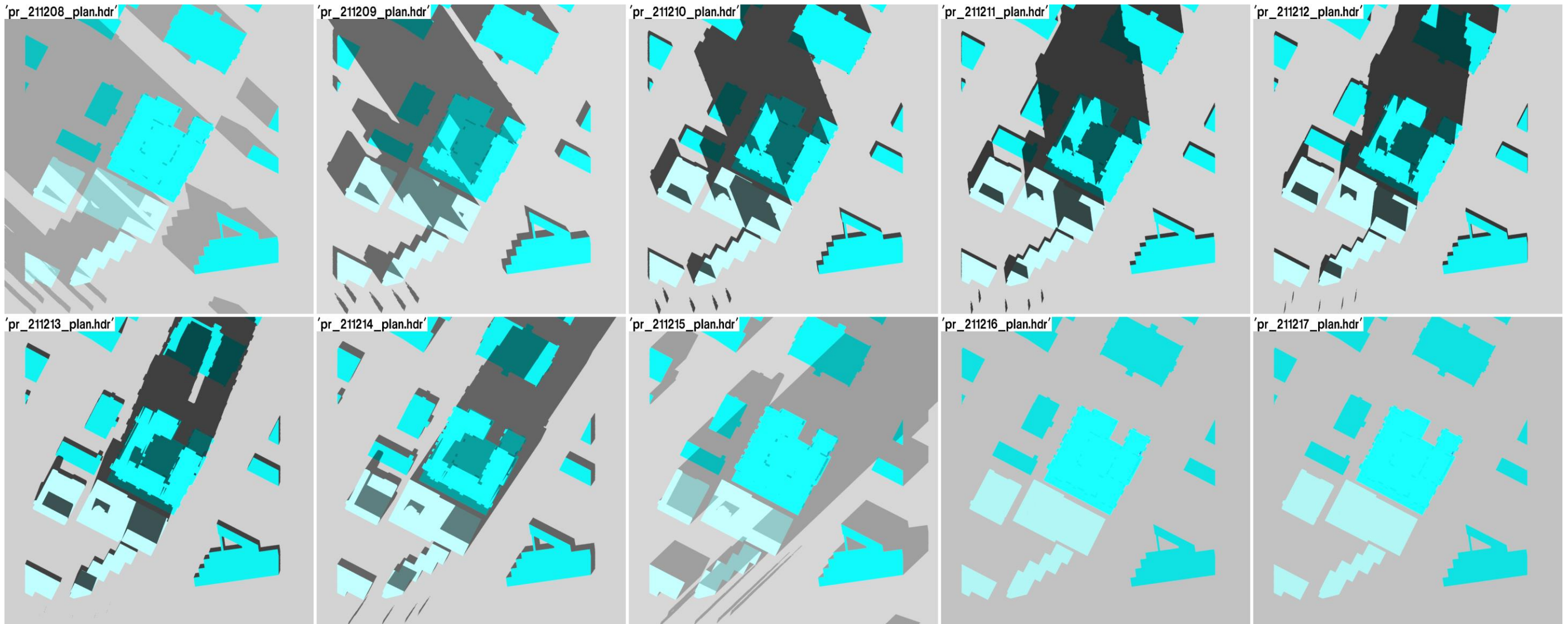


Fig A3: Sunlight and Site Shading Diagrams – Winter Solstice (December 21st): 08:00-17:00 hrs

APPENDIX B - Impact on Neighbouring Buildings

The industry best practice guideline for daylight and sunlight is 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

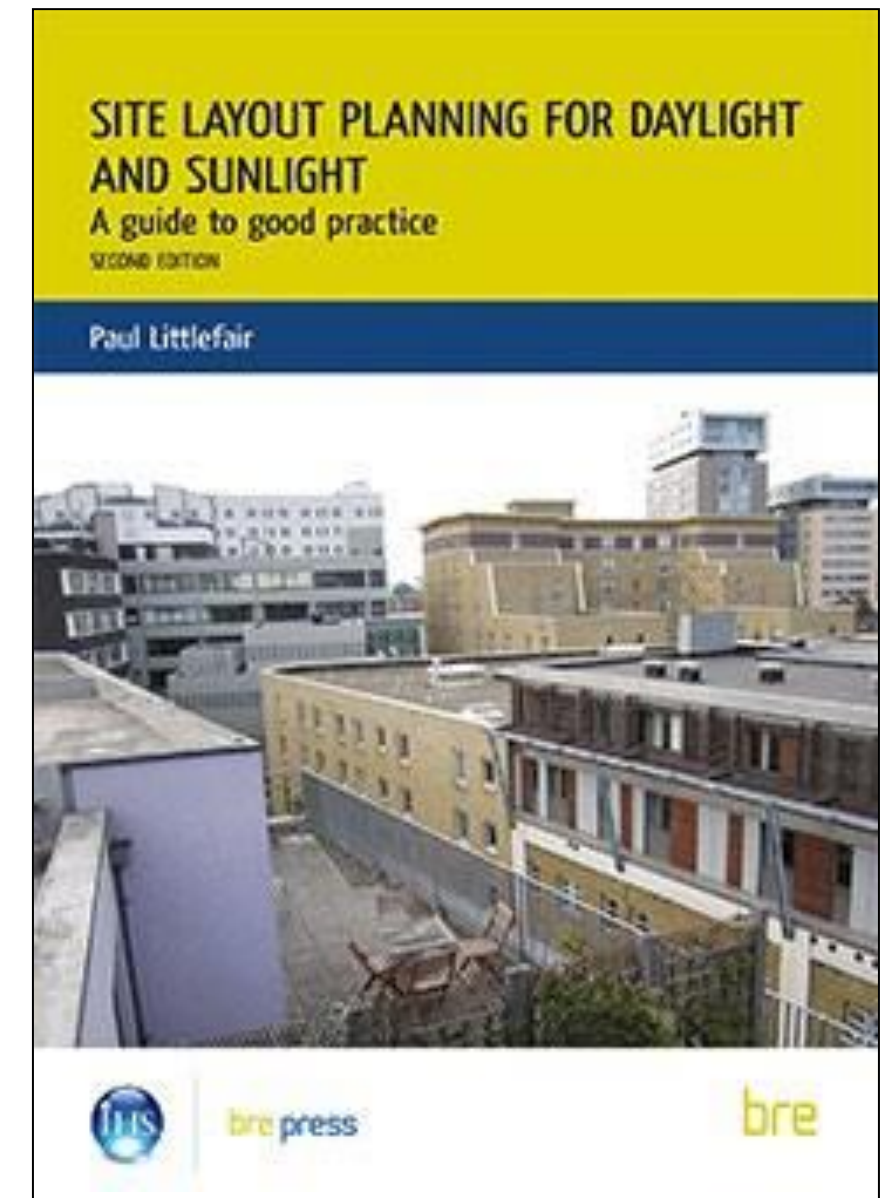
The analysis is based on measuring the VSC at the existing main windows. Main windows included, living rooms, kitchens, and bedrooms.

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.*

As no there are no residences within the neighbouring surrounds, this assessment was deemed not relevant for the development.



APPENDIX C - 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:

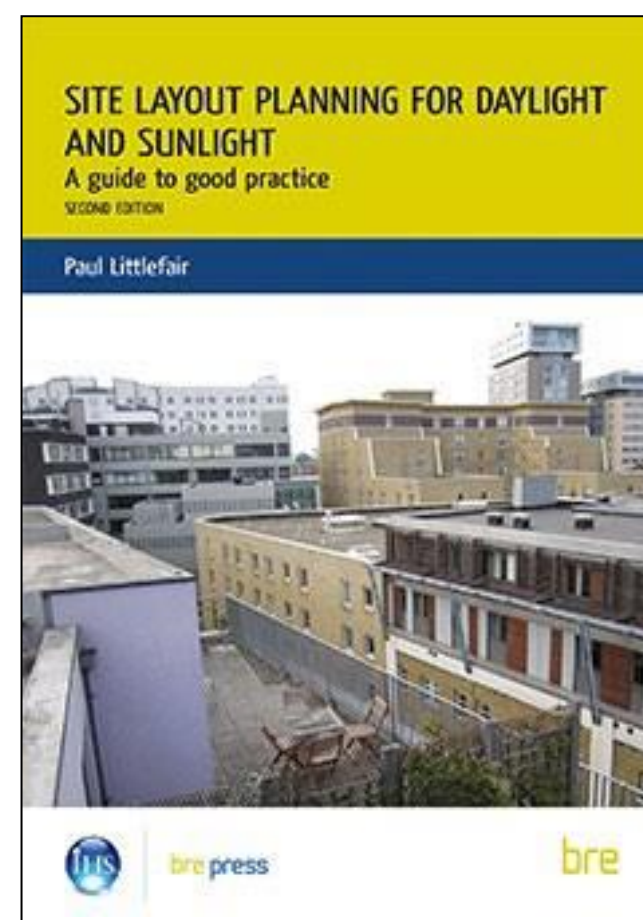
Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 - 'Lighting for Buildings - Part 2: Code of Practice for Daylighting' when undertaken 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 E_T (lx)	Median Daylight Factors
Bedroom	100	0.7%
Living room	150	1.0%



	Irish Standard I.S. EN 17037:2018
	Daylight in buildings
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A compliance comparison 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 C.2 compares for each Living/ Dining space sampled:

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). There were only some isolated rooms found compliant to BS.8206-2 deemed (borderline) non-compliant to the EN.17037 methodology assessed.

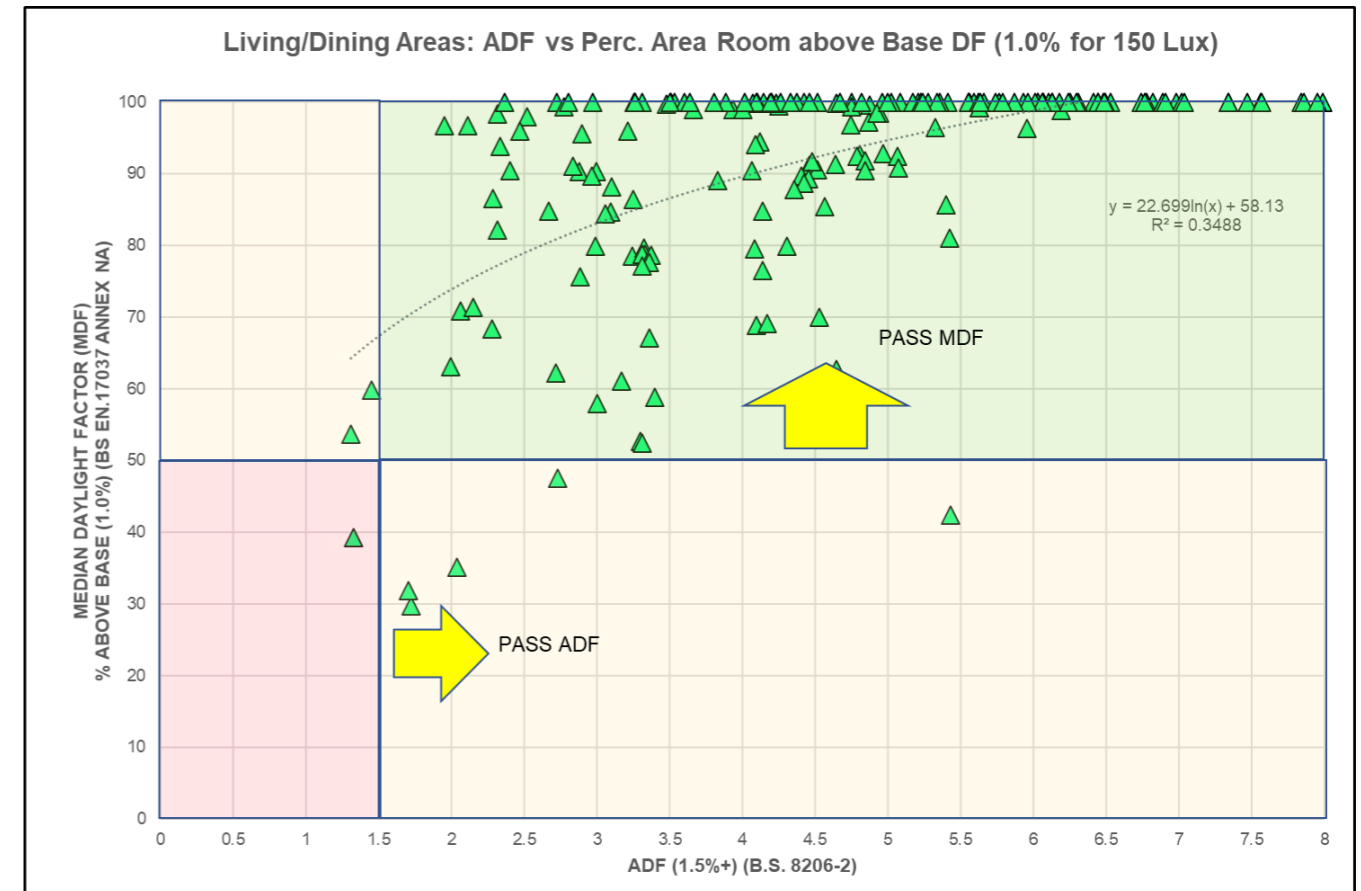


Fig C.2: Compliance Comparison: ADF-v-MDF

APPENDIX D – Internal Daylight including Proposed Neighbouring Building

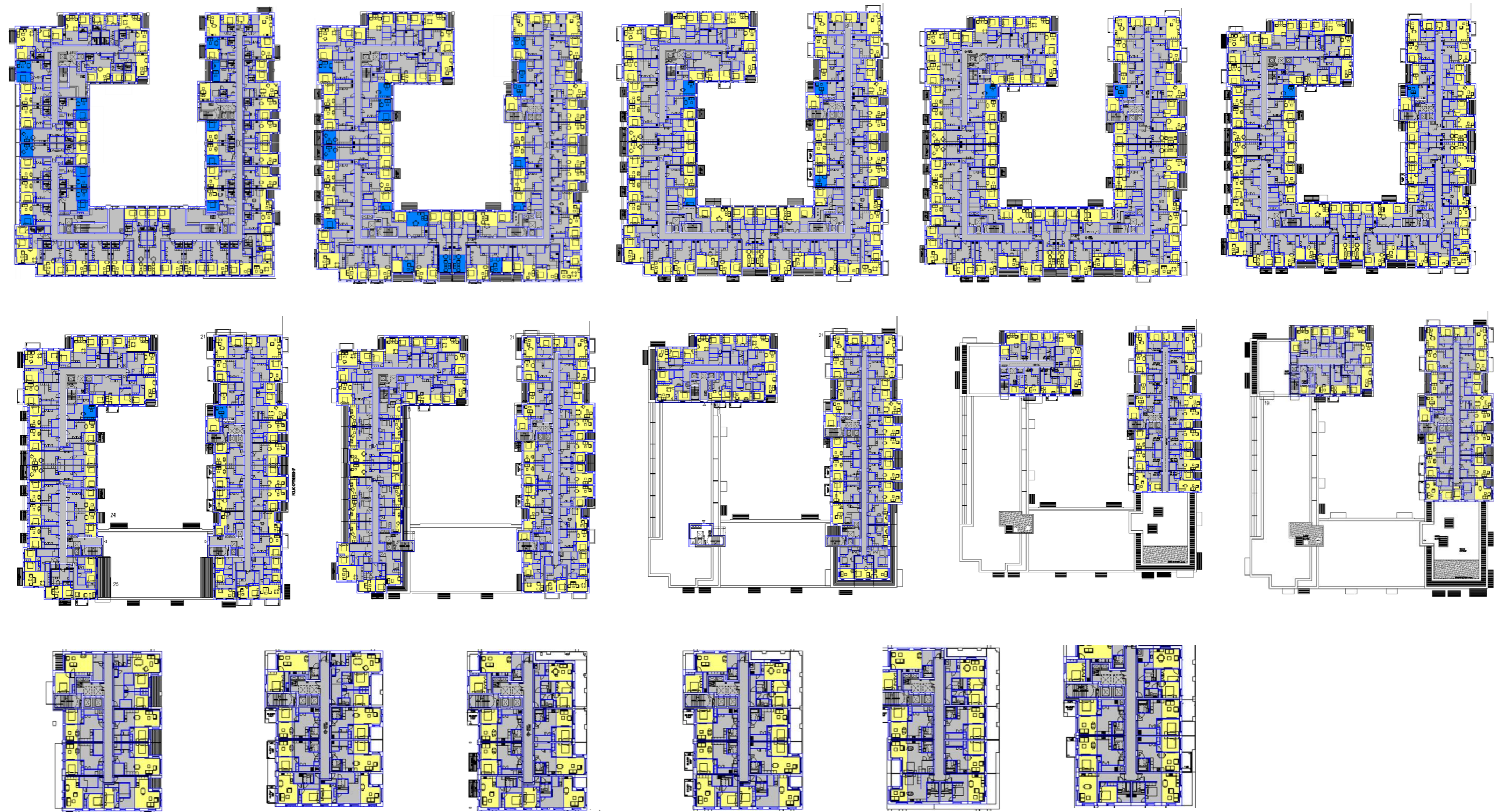
Internal daylight was assessed based on the addition of the proposed new development to the adjoining property to the west of the site.

The analysis determined that 95% of space would be compliant with BRE criteria as detailed in section 3.0.

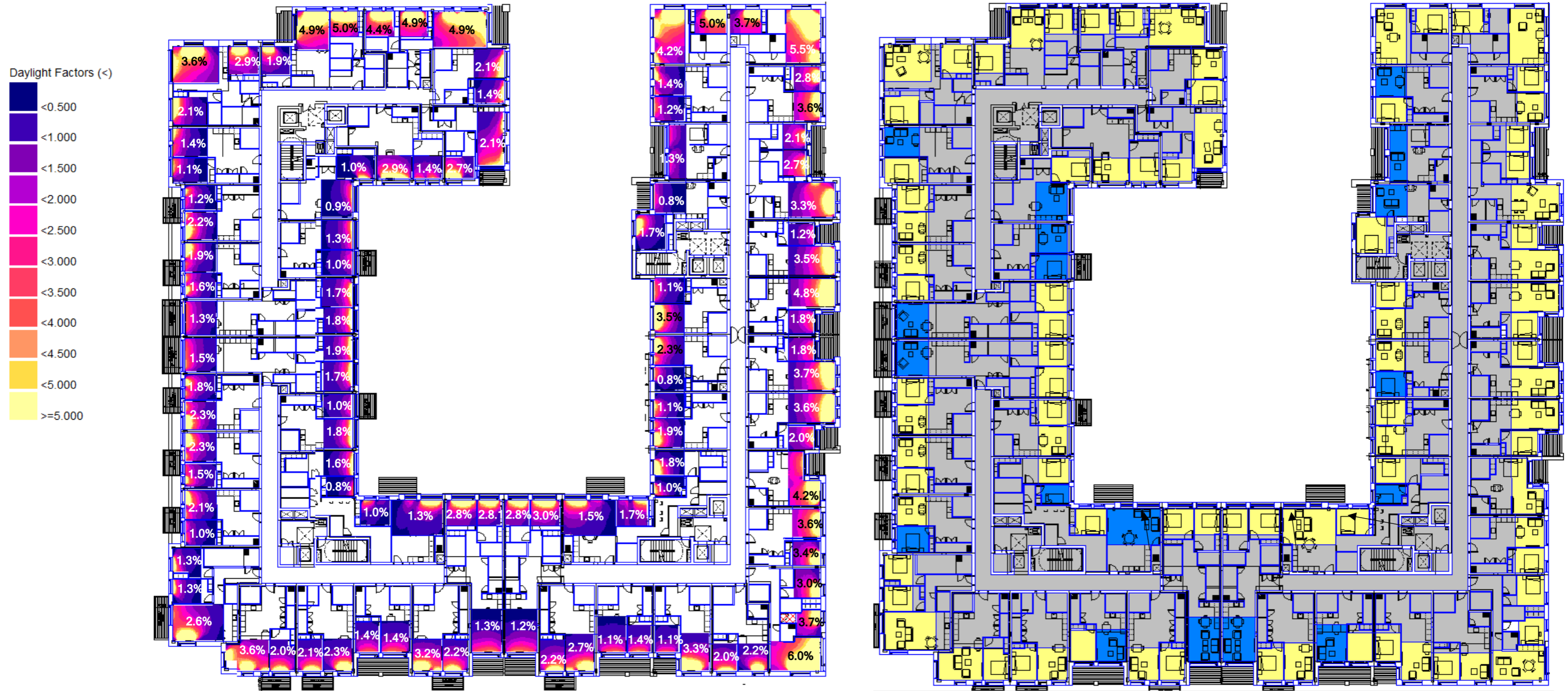


	Pass	Fail	Total
Floor 1	84	16	100
Floor 2	88	18	106
Floor 3	101	5	106
Floor 4	104	2	106
Floor 5	104	2	106
Floor 6	87	2	89
Floor 7	80	0	80
Floor 8	52	0	52
Floor 9	41	0	41
Floor 10	41	0	41
Floor 11	17	0	17
Floor 12	17	0	17
Floor 13	17	0	17
Floor 14	17	0	17
Floor 15	15	0	15
Floor 16	15	0	15
Total	880	45	925
%	95%	5%	

Summary of Results with Proposed New Building to the West

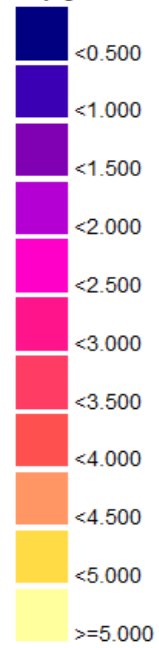


Second Floor



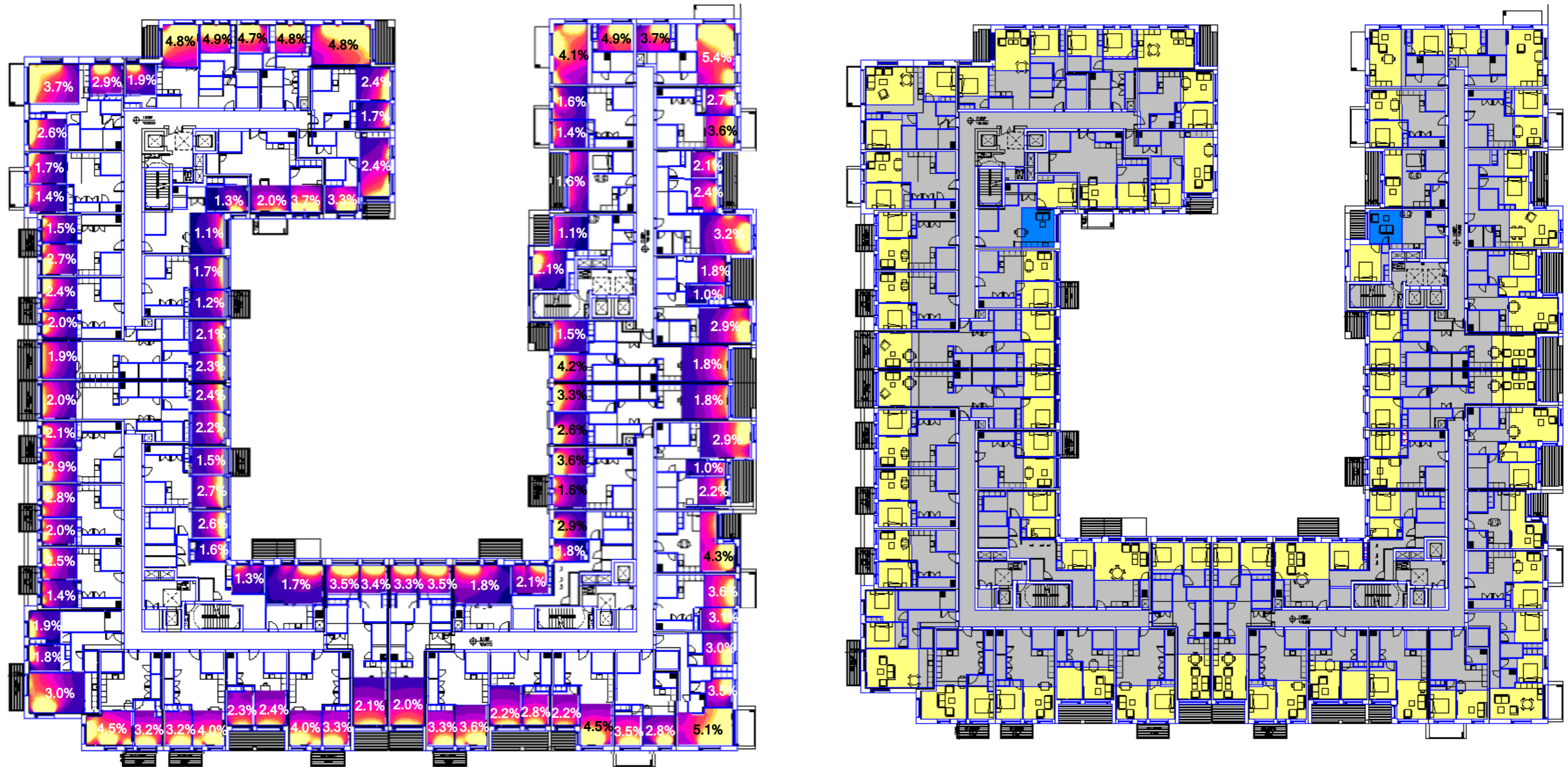
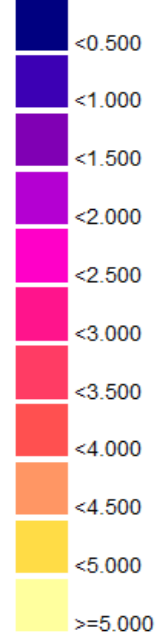
Third Floor

Daylight Factors (<)



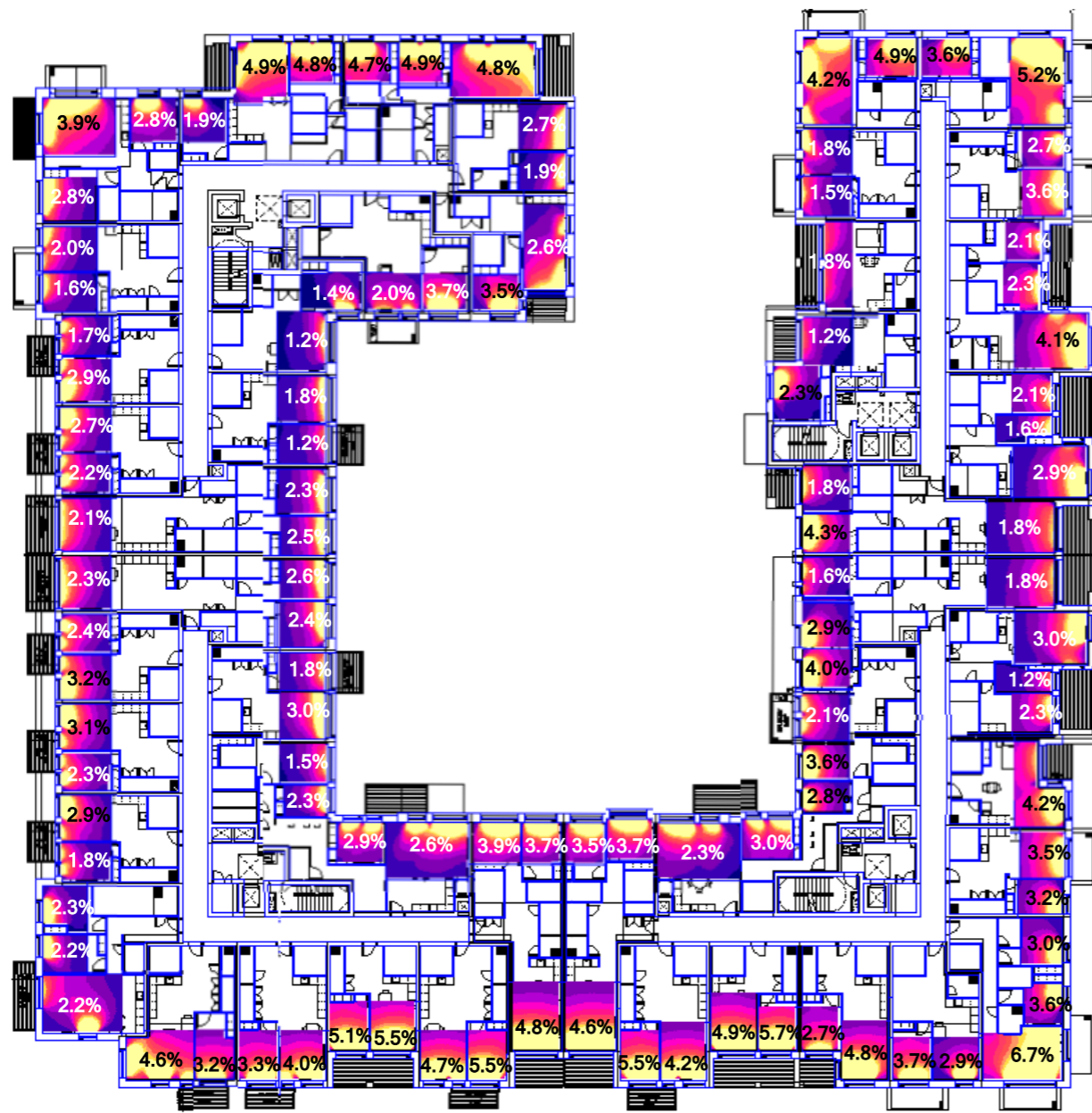
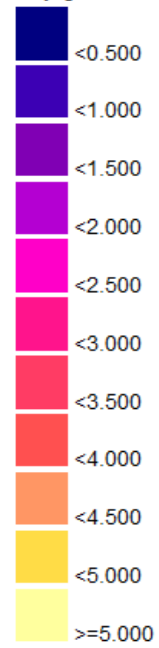
Fourth Floor

Daylight Factors (<)



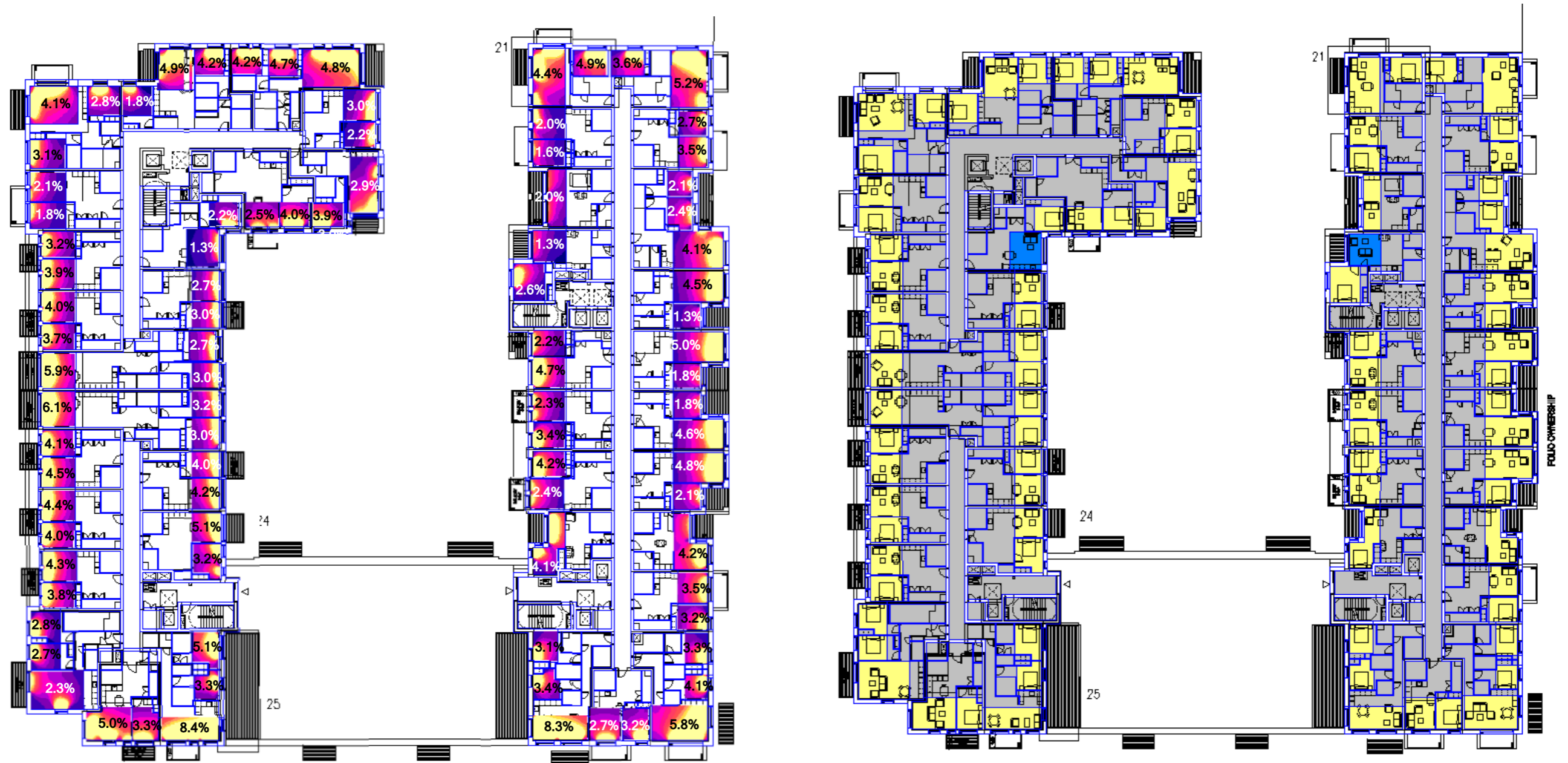
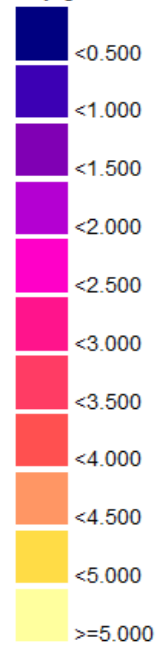
Fifth Floor

Daylight Factors (<)

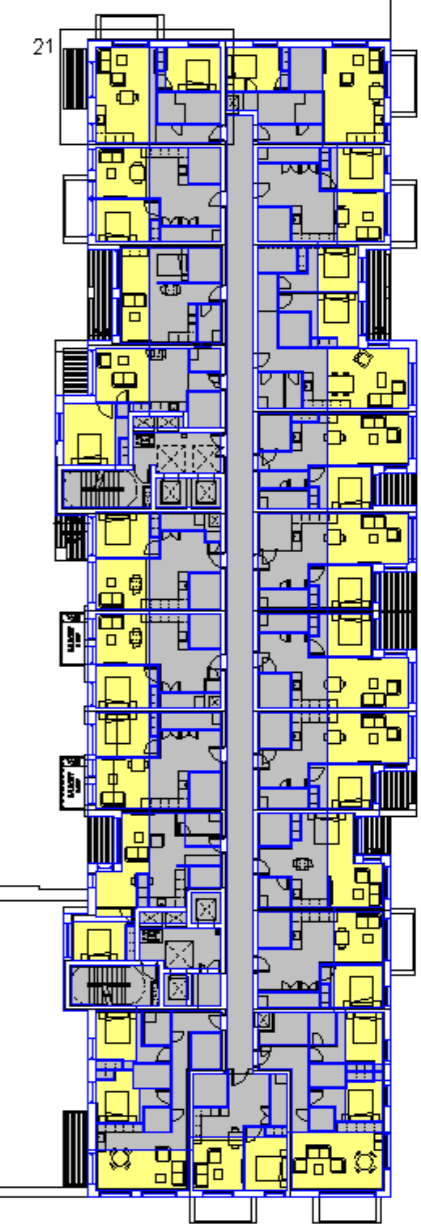
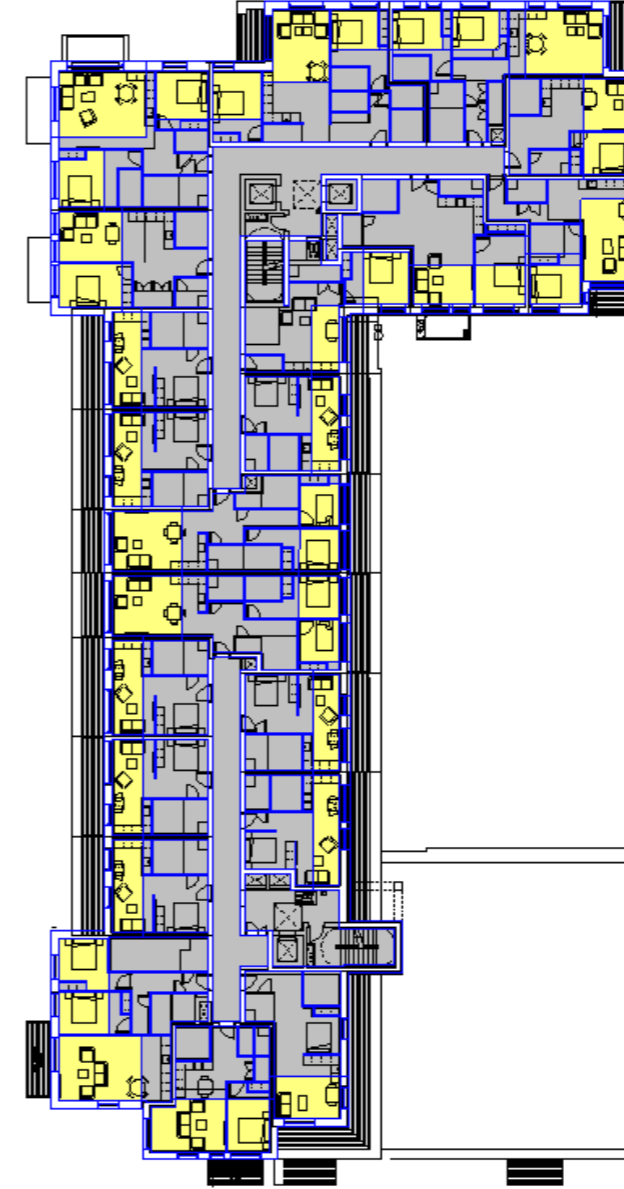
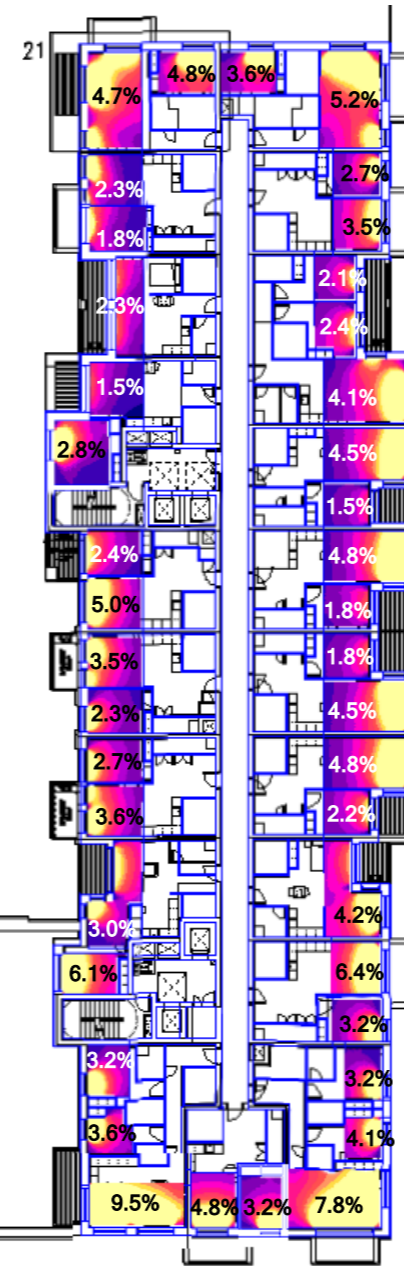
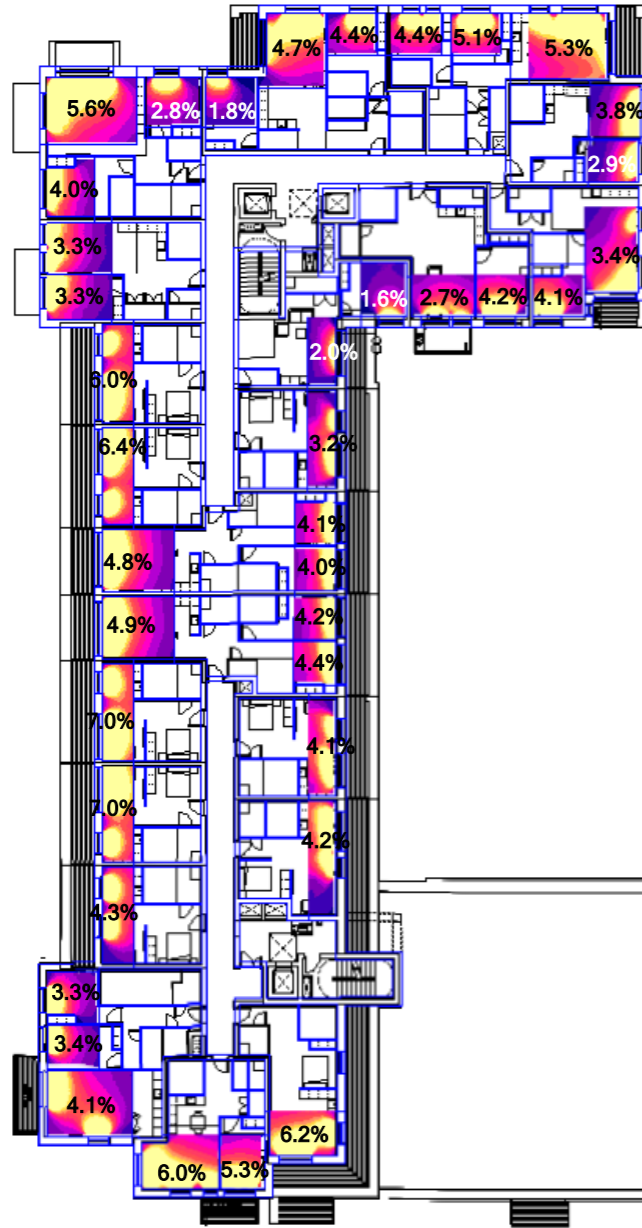
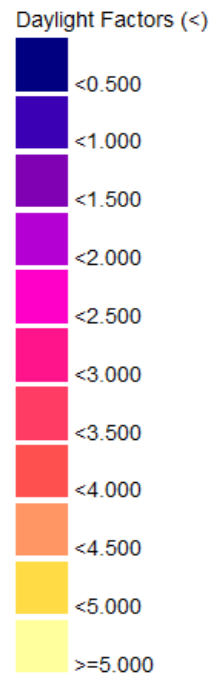


Sixth Floor

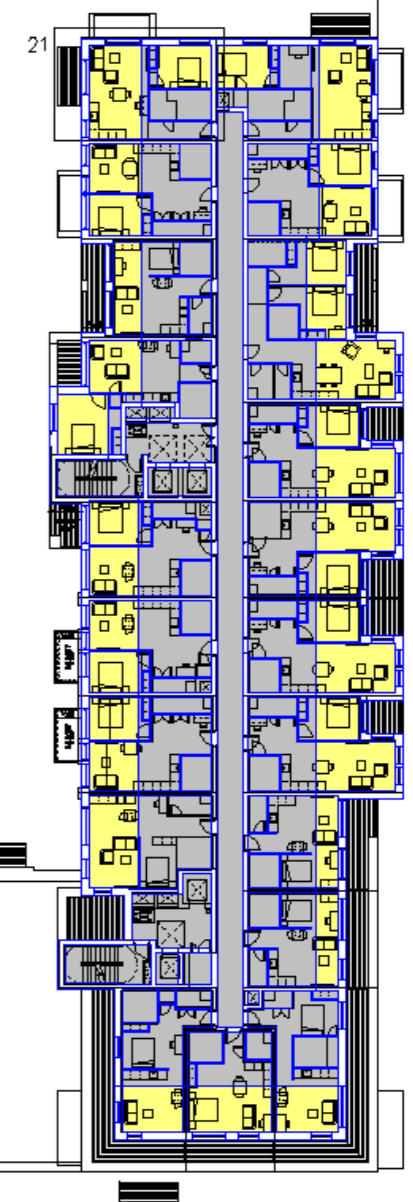
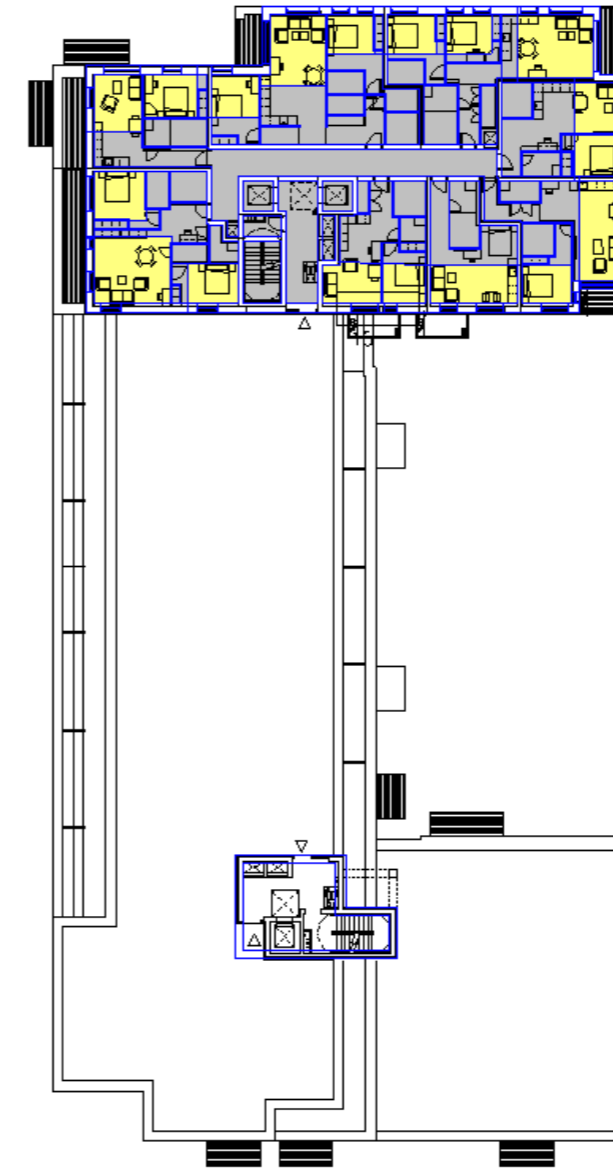
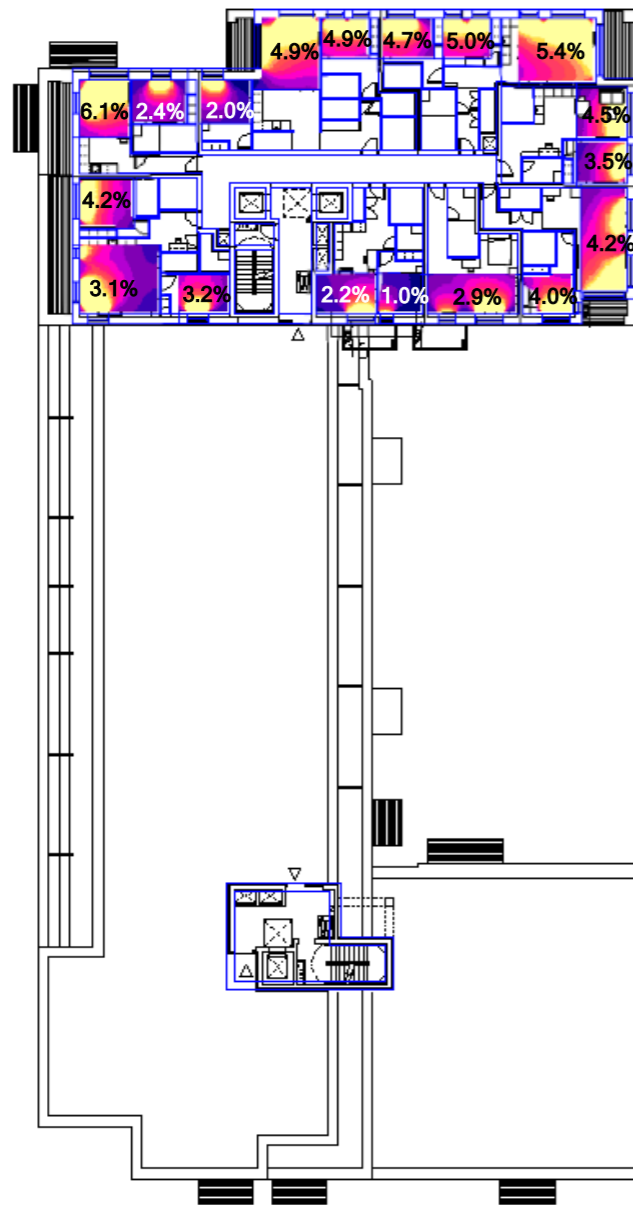
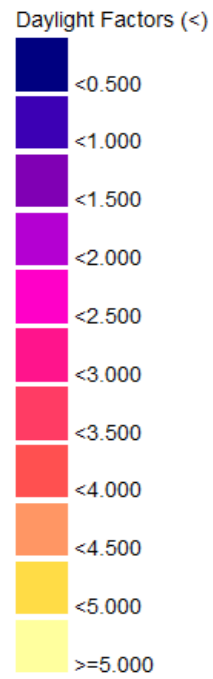
Daylight Factors (<)



Seventh Floor

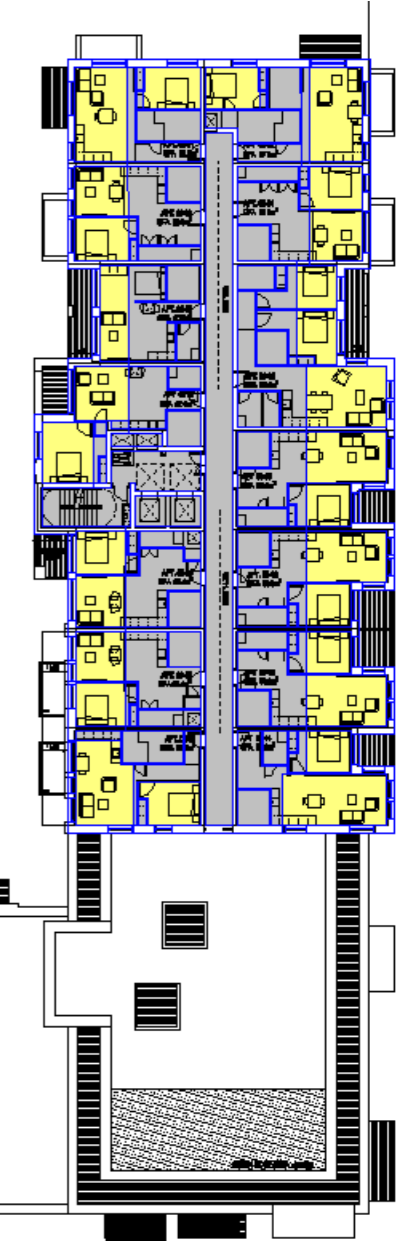
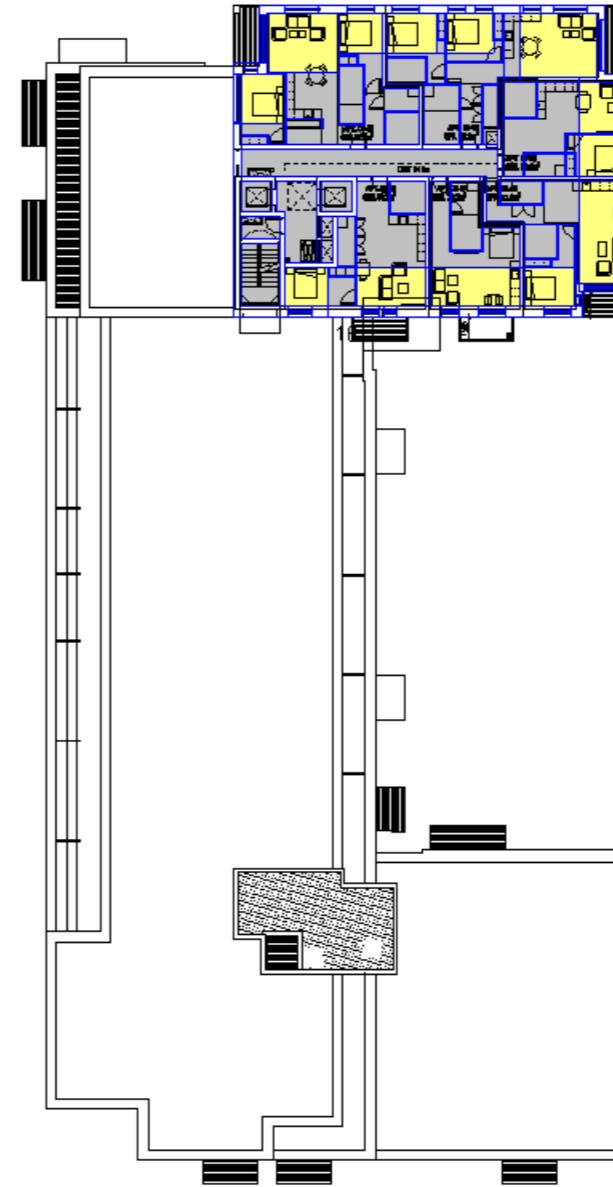
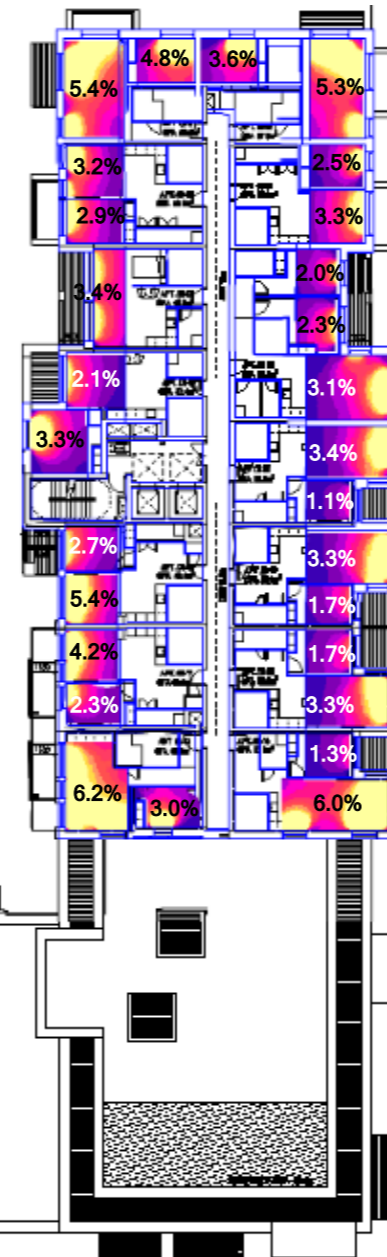
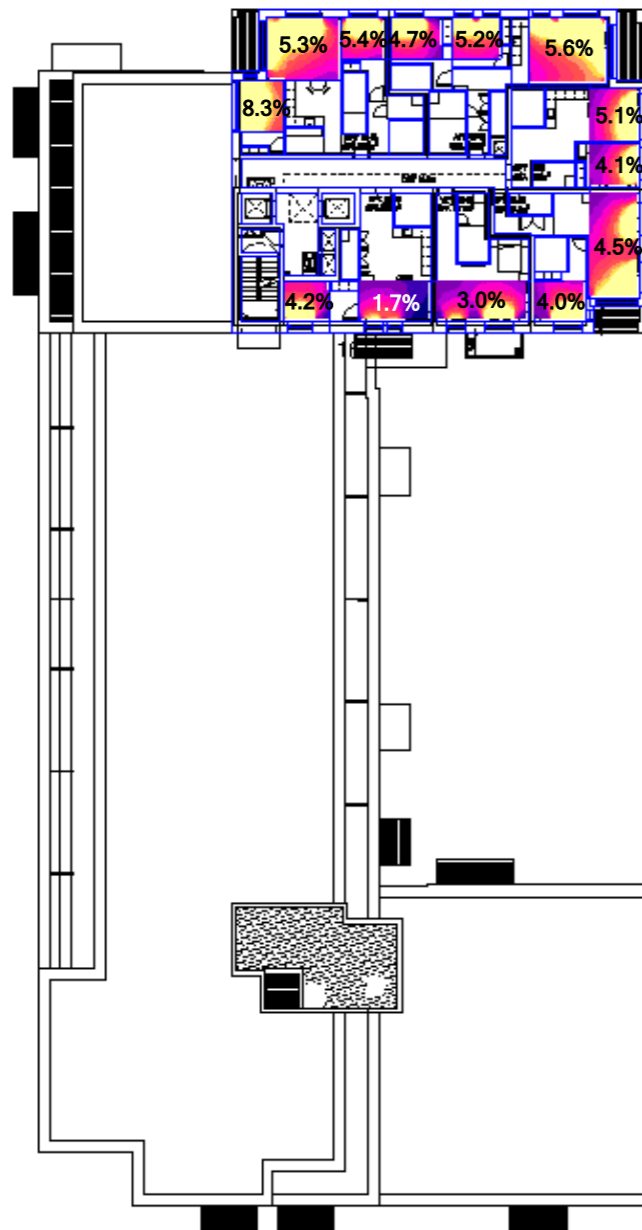
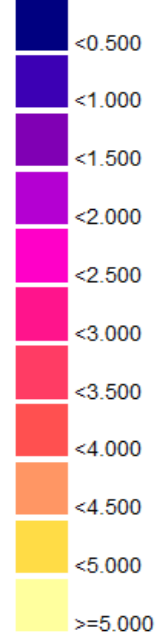


Eighth Floor



Ninth Floor

Daylight Factors (<)

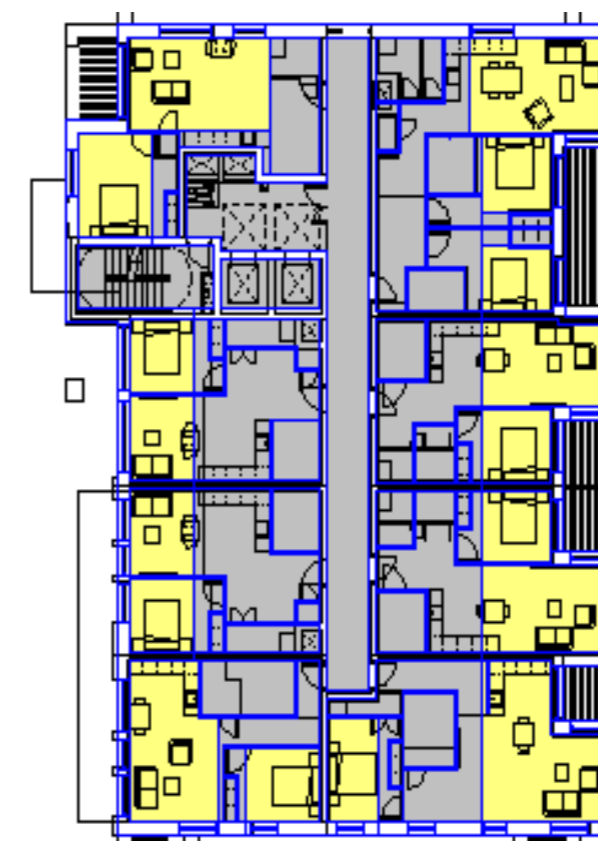
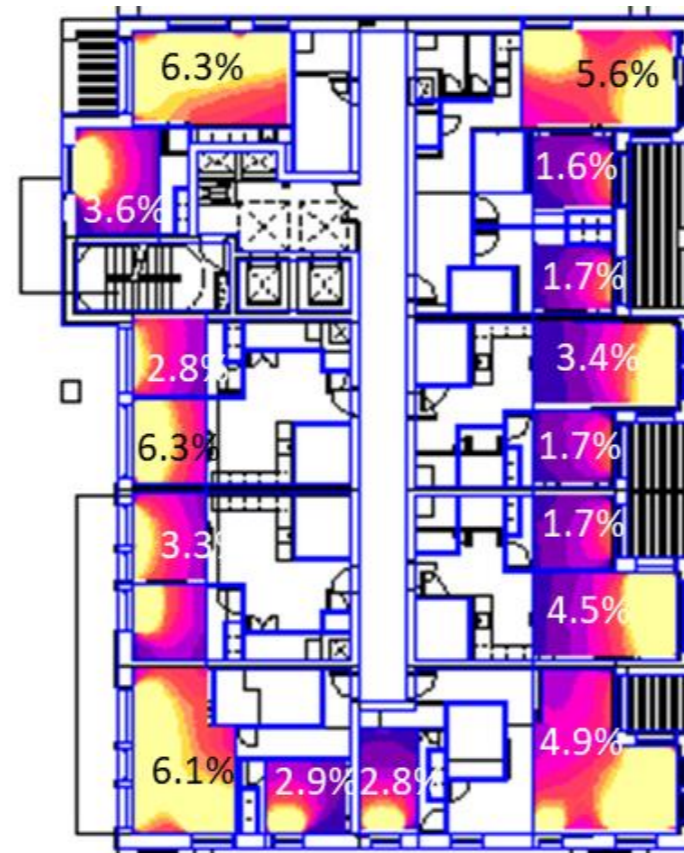
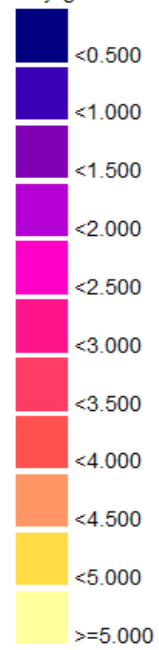


Tenth Floor



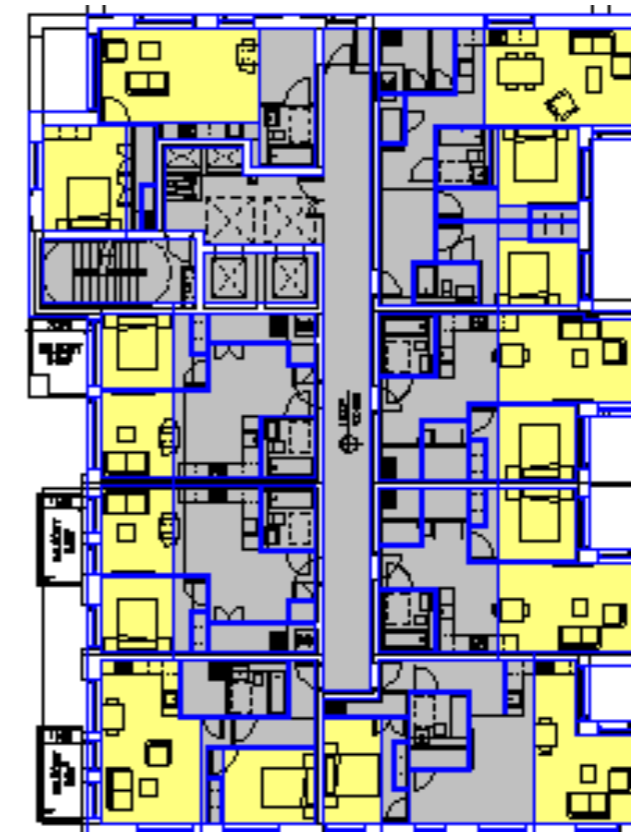
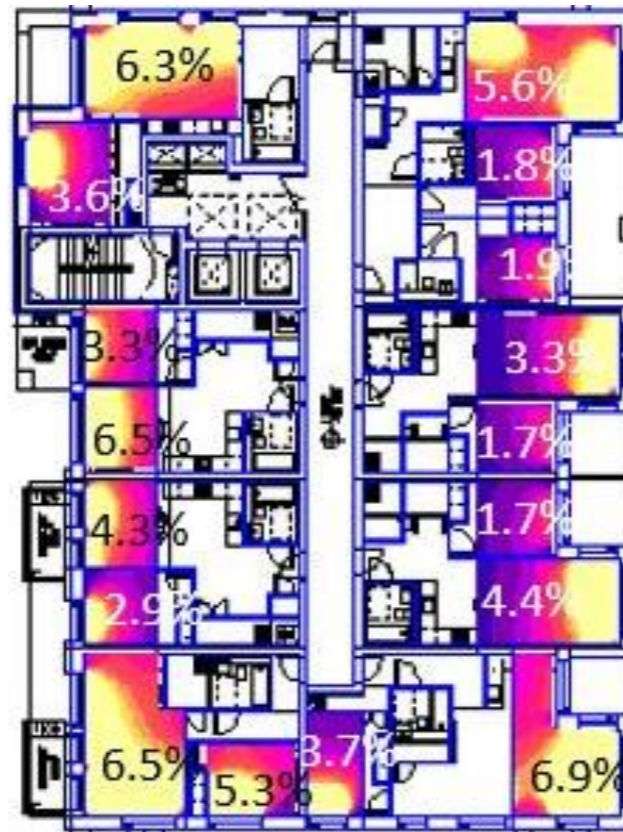
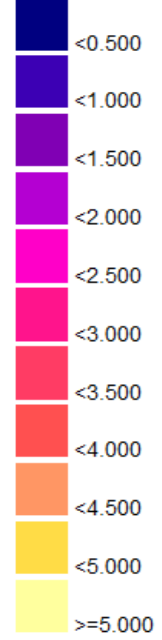
Eleventh Floor

Daylight Factors (<)



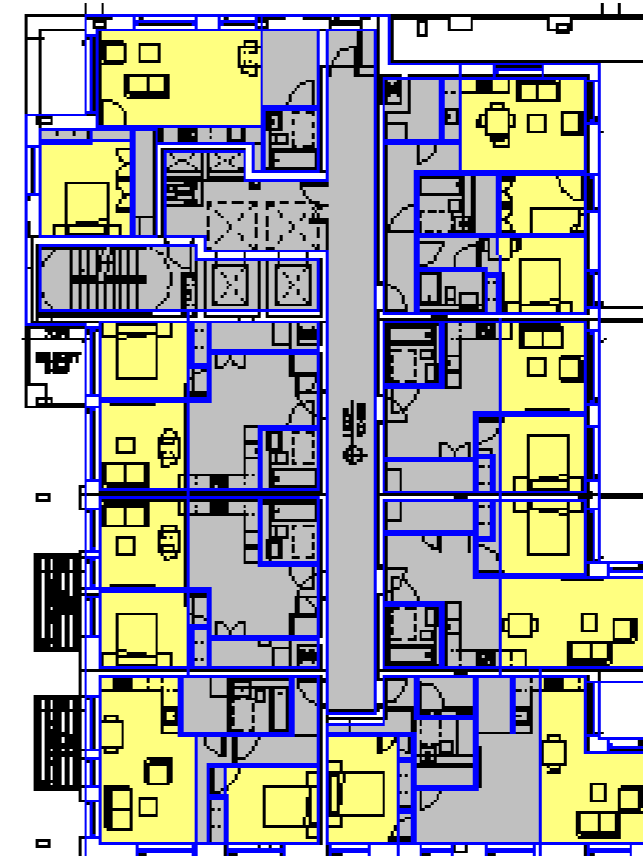
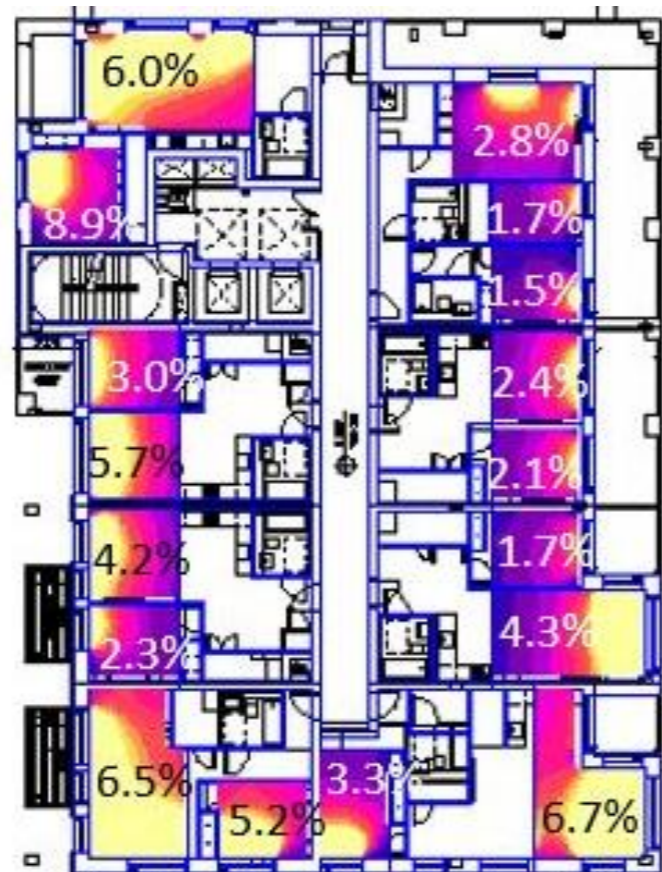
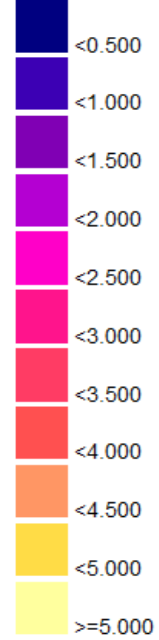
Twelfth Floor

Daylight Factors (<)



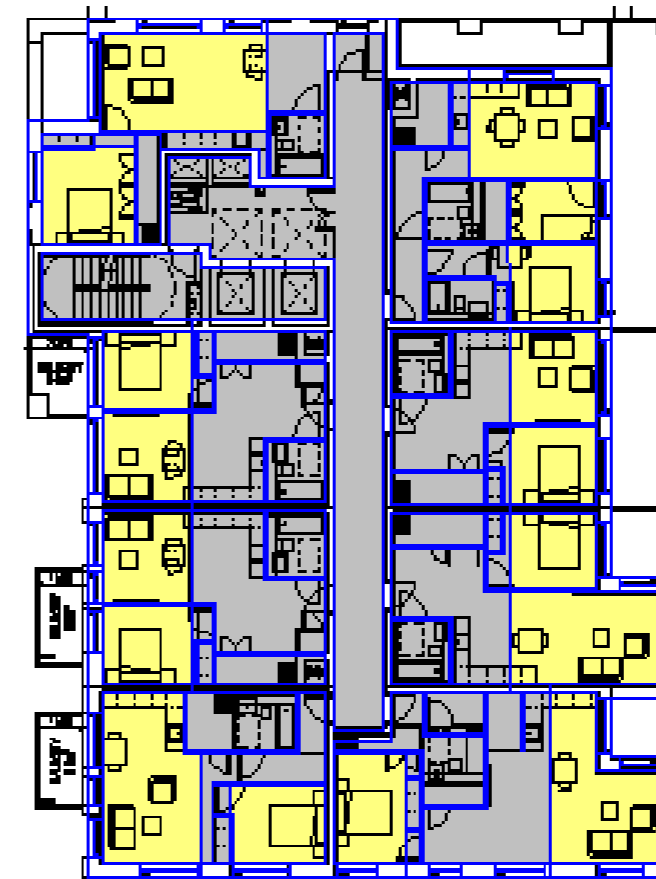
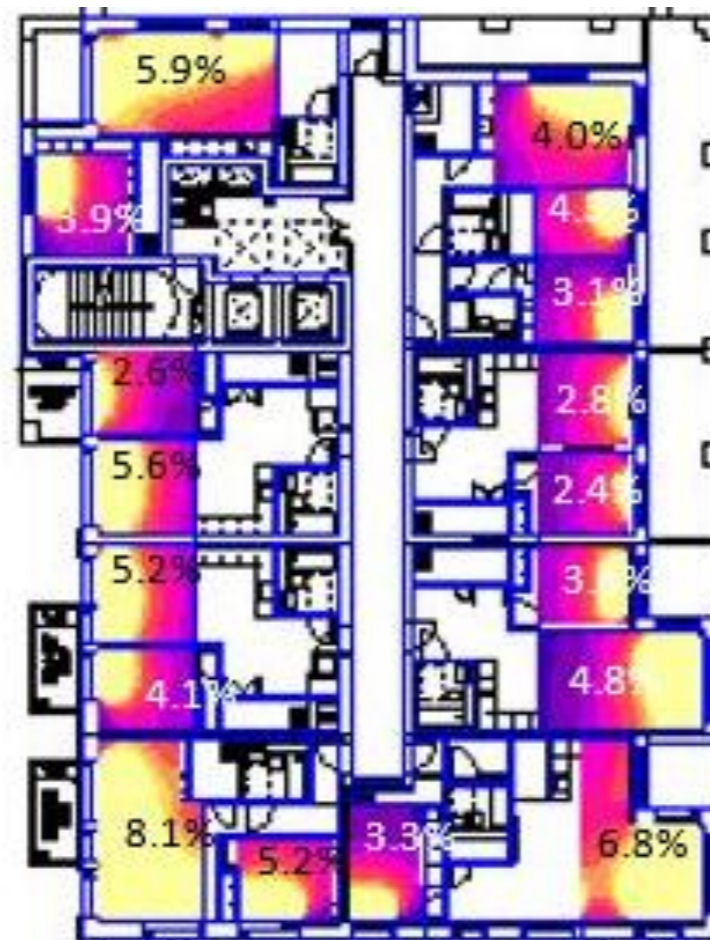
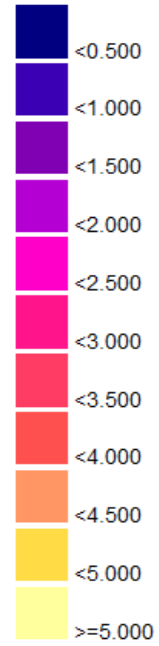
Thirteenth Floor

Daylight Factors (<)



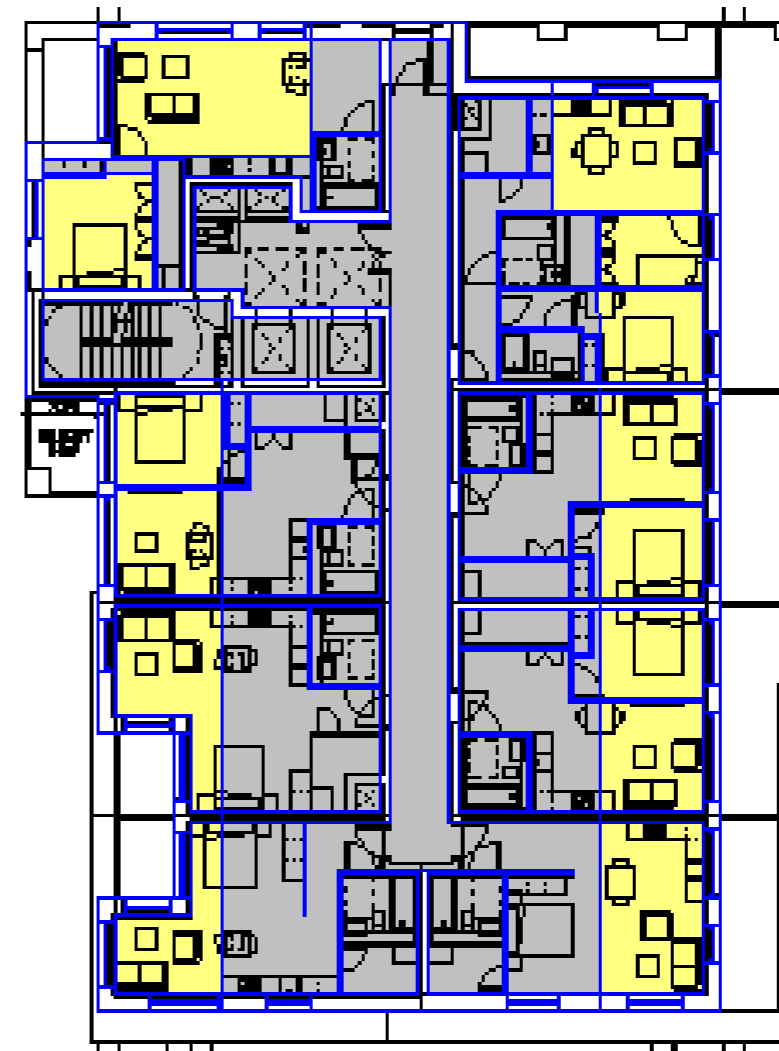
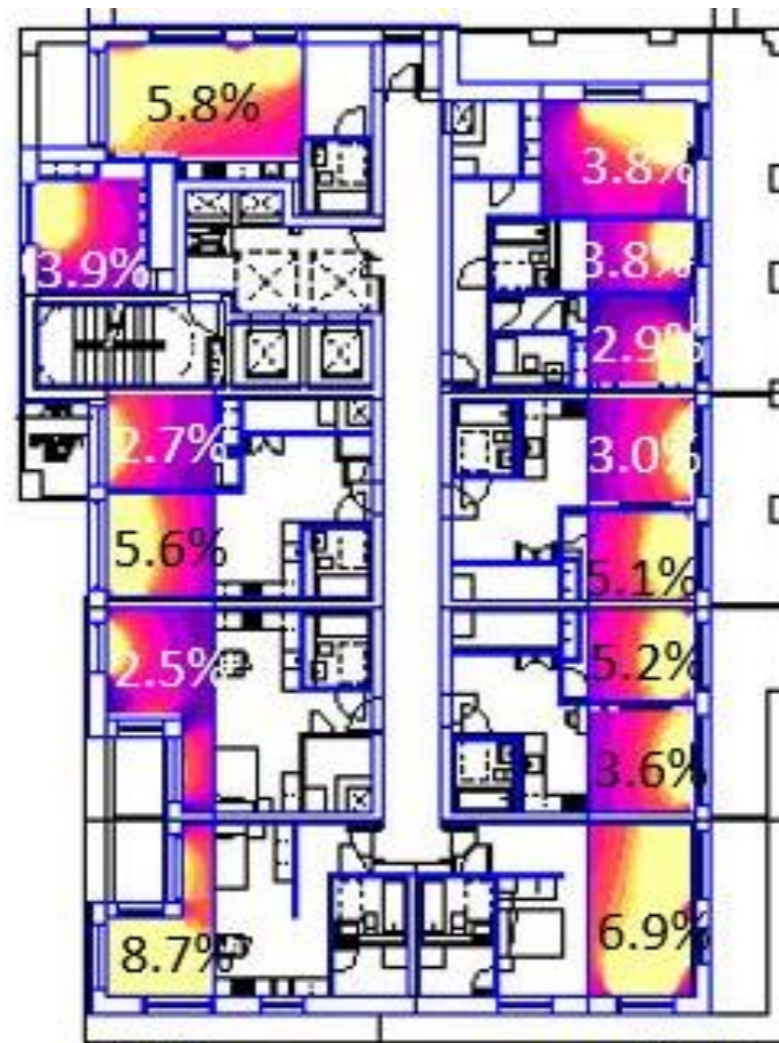
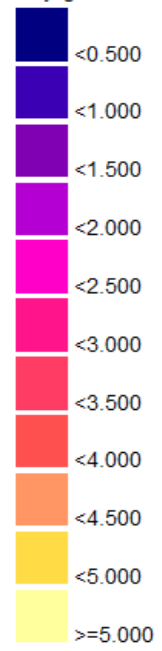
Fourteenth Floor

Daylight Factors (<)



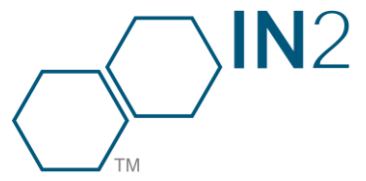
Fifteenth Floor

Daylight Factors (<)



Sixteenth Floor





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