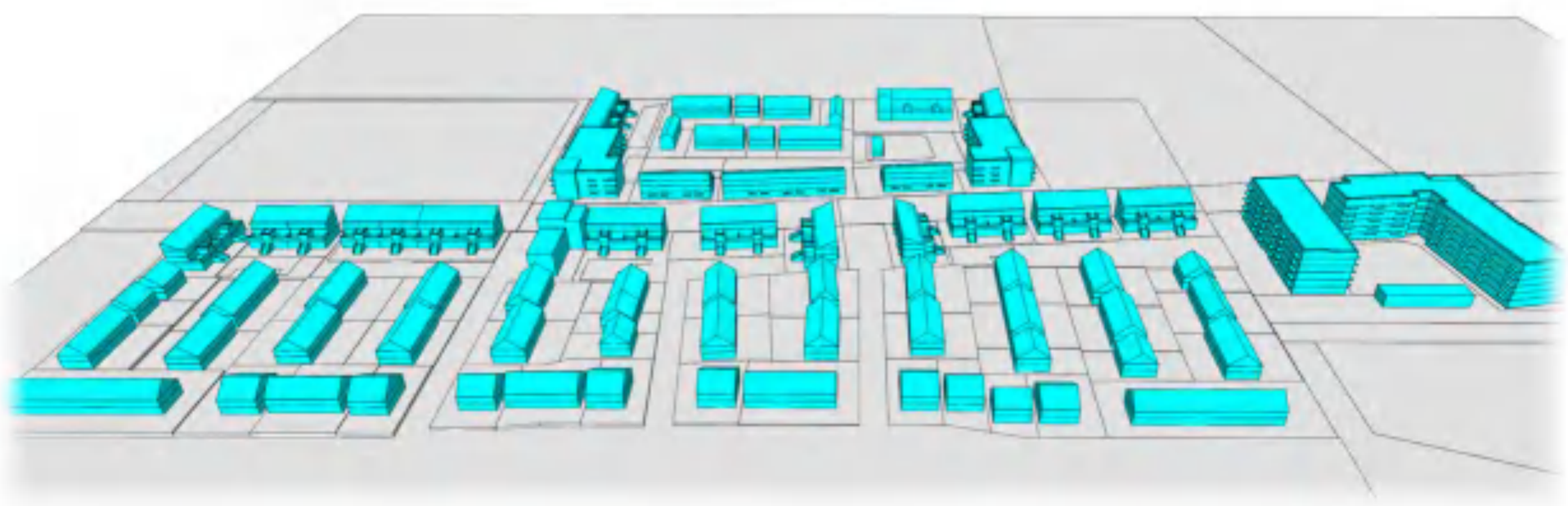
Clonburris, Co. Dublin

Daylight, Sunlight and Overshadowing Study



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International Sustainability Consulting Developers of the IES **<Virtual Environment>**

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1 Executive Summary

This report details the analysis undertaken to quantify the Sunlight and Daylight performance of the proposed Clonburris Phase 1A development located in Co. Dublin. The report focuses on measuring the daylight impact to the surrounding dwellings when compared to the existing situation. It also considers the impact to daylight and sunlight when considering the proposed design itself.

1.1 Planning Authority Guidelines

The Sustainable Urban Housing: Design Standards for New Apartments December 2020 states the following in Section 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."

However, there is a new standard for the assessment of daylight access within buildings titled "*EN 17037:2018: Daylight in Buildings*" which has been adopted in Ireland as IS EN 17037:2018. This new standard is not directly referred to within the latest Planning Authority Guidelines whereas the BRE Guide and BS 8206-2:2008 are referred to.

Furthermore, the EN 17037:2018 standard has already been adopted in the UK to inform the BS EN 17037:2018 standard which supersedes BS 8206-2:2008 which is now withdrawn. It is important to note that BS EN 17037:2018 includes a National Annex which specifically addresses daylight provision in residential dwellings in the UK. A similar annex is not included in the IS EN 17037:2018 standard.

Therefore, for the avoidance of all doubt, the requirements in the following standards have been addressed in this report:

- BRE Guide – 2nd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- BS 8206-2:2008 – Lighting for Buildings – Part 2: Code of Practice for Daylighting
- IS EN 17037:2018 – Daylight in Buildings
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1.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Shadow Analysis**
  - Assessed using shadow images cast at key times throughout the year, i.e. March 21st, June 21st and December 21st
- **Sunlight to Amenity Spaces**
  - Assessed using annual Solar Exposure calculations
- **Sunlight to Existing Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BRE Guide / BS 8206-2:2008
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  - Assessed using the Vertical Sky Component (VSC) method in accordance with the BRE Guide / BS 8206-2:2008
- **Daylight to Proposed Development**
  - Assessed using the Average Daylight Factor (ADF) method in accordance with the BRE Guide / BS 8206-2:2008
  - Assessed in accordance with IS EN 17037:2018 Method 2
  - Assessed in accordance with BS EN 17037:2018 National Annex Method 2
- **View Out**
  - Assessed in accordance with IS EN 17037:2018
- **Glare**
  - Assessed in accordance with IS EN 17037:2018

The following can be concluded based on the assessments undertaken:

1.3 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Existing Situation and the Proposed Scheme. The images indicate that the existing buildings located at 50-58B Cappaghmore Road will receive no additional shading as a result of the proposed development. Taking this into account, the overall impact of overshadowing can be classed as a negligible impact.

1.4 Sunlight to Existing and Proposed Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide, for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on March 21st.

Proposed Public Amenity Areas

On the 21st of March, all of the proposed public amenity areas would receive over 2 hours of sunlight on at least 57% of their area. Overall when combined, 99% of the proposed public amenity area will received at least 2 hours of sunlight on March 21st, thus exceeding BRE recommendations.

Proposed Private Gardens

On the 21st of March, 52 of the 78 (66%) tested proposed private gardens within the development would receive over 2 hours of sunlight on at least 50% of their area. These are typical results for a housing scheme development such as this where not all properties can be provided with a south/east/west facing amenity space.

Existing Gardens Adjacent to the Proposed Development.

The existing communal and private amenity spaces in the adjacent properties have been analysed and the results demonstrate that they will continue to receive the same level of sunlight even with the proposed development in place on March 21st, thus exceeding the recommendations in the BRE Guide.

1.5 Sunlight to Existing Buildings - APSH

Based on the criteria outlined in the BRE guide, none of the existing buildings need to be analysed for Annual Probable Sunlight Hours (APSH). The buildings do not have living room windows that face within 90 degrees of south, and they are also too far away from the proposed development by the 25-degree rule. (see section 7.2 APSH Exclusions for further information)

1.6 Sunlight to Proposed Development - APSH

For the sunlight to proposed development assessment, two standards have been analysed: BRE Guide / BS 8206-2:2008 and IS EN 17037:2018. The results under each standard are summarised below.

BRE Guide / BS 8206-2:2008

Within the BS 8206-2:2008 standard, when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

"The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

This is also reflected in the BRE Guide which states:

"The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 418 no. points tested, 295 no. points (71%) meet the BRE recommended values over the annual period. The compliance rate increases to 80% (335 no. points) during the winter period when sunlight is most valuable. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* e.g. Block 1 View 5, Block 4 View 1 etc., or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with BRE Guide/BS 8206-2:2008 are considered satisfactory in the context of an urban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

IS EN 17037:2018

As the sunlight exposure assessment in accordance with IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide / BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 418 no. points tested, 332 no. points (79%) meet the IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* e.g. Block 1 View 5, Block 4 View 1 etc., or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered satisfactory in the context of an urban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

1.7 Daylight to Existing Buildings

This study considers the Proposed Scheme and tests if the VSC results are greater than 27% or not less than 0.8 times the value of the Existing Situation.

When compared to the Existing Situation, of the 54 no. points tested, 100% (54 points) have a Proposed VSC value greater than 27% or not less than 0.8 times their former value compared to the Existing Situation.

1.8 Daylight to Proposed Development

For the daylight to proposed development assessment, three standards have been analysed: BRE Guide / BS 8206-2:2008, IS EN 17037:2018 and BS EN 17037:2018 National Annex. The results under each standard are summarised below.

BRE Guide / BS 8206-2:2008

Across the proposed development, 85% of the tested rooms are achieving Average Daylight Factors (ADF) in accordance with the BRE Guide / BS 8206-2:2008 when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target and Bedrooms against a 1% ADF target. The majority of rooms that are failing are located on the lower floors. However, overall the quality of daylight provision across the development can be considered high.

For combined Living/Kitchen/Dining areas, the living area is typically treated as the main area of activity, with the kitchen being placed at the back of the space. This design decision is understandable as the kitchen area is typically a transient space as its primary functional purpose is to serve as a food preparation area. Additionally, not every space within a commercially viable apartment development can be in direct connection with an exterior elevation, making the kitchen the obvious choice for this position given that it is a transient space that will require supplementary electric lighting.

Having regard for the need to comply with additional requirements of the Design Standards for New Apartments (Dec 2020) such as the provision of balconies (which reduce daylight within apartments as noted within the BRE Guide) as well as the layout of the apartments with respect to Kitchens as discussed above, achieving a 1.5% ADF design value can be considered reasonable for Living/Kitchen/Dining areas. Although the design value is lower, this is compensated by the provision of a valued outdoor private amenity for occupants along with oversized apartments provided within this development.

Therefore, when Living/Kitchen/Dining spaces are assessed as whole rooms against an alternative 1.5% ADF design value, a 95% compliance rate is achieved across all tested rooms within the proposed development.

IS EN 17037:2018

It is important to note that IS EN 17037:2018 does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 of IS EN 17037:2018 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1 (refer to Section 10.1.2 of this report). The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4 of the standard, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

Across the proposed development, 99% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037:2018 using Method 2. The

majority of rooms that are failing are located on the lower floors, however, overall the quality of daylight provision across the development can be considered high.

BS EN 17037:2018 National Annex

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". However, a National Annex was included which states:

"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."

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 10.1.3 of this report). It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

The BS National Annex also states:

"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx."

Therefore, combined LKDs were assessed using a 200 lux target illuminance (E_T).

Across the proposed development, 99.9% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037:2018 using Method 2. The majority of rooms that are failing are located on the lower floors, however, overall the quality of daylight provision across the development can be considered extremely high under this standard.

Compensatory Measures

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2020, states the following:

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

Furthermore, Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities December 2018, states the following:

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.

Based on the above statements, compensatory measures have been incorporated into the design of the proposed development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. The compensatory measures are summarised as follows:

- 60% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (Dec 2020). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 61.36% of the apartment units (including duplex units) are dual aspect which is above the 50% minimum as required by the Design Standards (Dec 2020). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- 2.5 times in excess of the minimum required open space of the SDZ Plan for this development sector 3 is provided in additional residential amenity.

- Furthermore, an additional 80% overall of communal open space above the minimum requirements required by the Design Standards (Dec 2020) is proposed across the development. Block 1 is providing 60% more than the minimum requirements.
- All apartment blocks are immediately adjacent to a significant local park or urban space as described either in this application or in future phases as set out in the SDZ planning scheme.

There is also a need to create a high-quality urban streetscape along the main street, requiring increased height along this road to create an appropriate presence. The daylight results achieved are to a high standard having regard to the fact that the above referenced factors (increased height and larger apartment sizes) render it more difficult to achieve target values for daylight performance.

1.9 View Out

The View Out assessment is related to buildings such as offices or schools where seating layouts are more fixed compared to domestic settings where an occupant can move around the space a lot more freely. Therefore, on this basis a View Out assessment for the proposed development has not been carried out.

1.10 Glare

A Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

1.11 Observations

It is important to note that the recommendations within the BRE Guide are not mandatory and the guide itself states "*although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design*".

Whilst the results shown relate to the criteria as laid out in the BRE Guide, it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites. Taking this onboard, the site performs well in relation to the metrics considered in this report.

In addition, the foreword of BS 8206-2:2008 also states "*The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects*

of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement needs to be exercised when using the criteria given in the standard for other purposes, particularly town planning control."

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide / BS 8206-2:2008, IS EN 17037:2018 and BS EN 17037:2018 National Annex.

2 Introduction

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Clonburris Phase 1A development located in Co. Dublin. The report focuses on quantifying the daylight and sunlight impact to the surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

2.1 Development Description

The development will consist of the construction of 569 dwellings, a creche, innovation hub and open space in the Clonburris South West Development Area of the Clonburris SDZ Planning Scheme 2019 as follows:

A) 173 no. houses comprising 8 no. 2 bedroom houses, 153 no. 3 bedroom houses and 12 no. 4 bedroom houses (147 no. dwellings in CSW-S4 consisting of 8 no. 2 bedroom houses, 127 no. 3 bedroom houses & 12 no. 4 bedroom houses & 26 no. 3 bedroom dwellings in CSW-S3); all 2 no. storey comprising semi-detached, terraced, end terrace units (with parking and private open space);
B) 148 no. duplex apartments/apartments (88 no. in CSW-S4 & 60 no. in CSW-S3) comprising 74 no. 2 bedroom units and 74 no. 3 bedroom units, in 16 no. 3 no. storey buildings. In CSW-S4 Duplex Blocks A,B,C,D,E,F,G,J,K, comprise 8 no. units (4 no. 2 bed & 4 no. 3 bed units), Duplex Block H comprises 16 no. units (8 no. 2 bed & 8 no. 3 bed units); In CSW-S3 Blocks L, N & O comprise 8 no. units (4 no. 2 bed & 4 no. 3 bed units), Block M comprises 14 no. units (7 no. 2 bed & 7 no. 3 bed units), Block P comprises 10 no. units (5 no. 2 bed & 5 no. 3 bed units), Block Q comprises 12 no. units (6 no. 2 bed & 6 no. 3 bed units), all to have terraces/pitched roof;
C) 396 no. apartments as follows: within CSW-S4, Block 1 consists of 172 no. apartments (76 no. 1 bedroom, 91 no. 2 bedroom and 5 no. 3 bedroom apartments), in a 2-building arrangement both 6 no. storeys in height. Within CSW-S3, Block 2 (4 storeys) comprises 16 no. 1 bedroom apartments and 22 no. 2 bedroom apartments, Block 3 (4 storeys) comprises 16 no. 1 bedroom apartments and 22 no. 2 bedroom apartments (all apartments to have terrace or balcony).
D) Provision of an innovation hub (626 sq. m) and creche (c. 547 sq. m) in a part 3/4 storey *'local node'* building in CSW-S4;
E) Vehicular access will be from the permitted Clonburris Southern Link Street and R113 to the east (along with provision of internal haul routes (for construction) to connect to the R136 to the west);
F) Public Open Space/landscaping of c. 4.1 hectares (to include Local Park and MUGA in CSW-S3, Grand Canal Park, along the southern and eastern boundaries of the site to

connect to existing Grand Canal towpath) as well as a series of communal open spaces to serve apartments and duplex units (c. 0.39 ha).

G) All ancillary development works including footpaths, landscaping boundary treatments, public, private open space areas, car parking (656 no. spaces) and bicycle parking (672 no. spaces), single storey ESB substations/bike/bin stores, 'Gateway' entrance signage (2 no.), solar panels at roof level of apartments, and all ancillary site development/construction works;

H) Permission is also sought for revisions to attenuation permitted under SDZ20A/0021 as well as connection to water supply, and provision of foul drainage infrastructure.

3 BRE – Site Layout Planning for Daylight and Sunlight (2nd Edition)

Access to daylight and sunlight is a vital part of a healthy environment. Sensitive design should provide sufficient daylight and sunlight to new residential developments while not obstructing light to existing homes nearby.

The 2nd Edition of the BR 209 BRE Site Layout Planning for Daylight and Sunlight, henceforth referred to as the "BRE Guide", advises on planning developments for good access to daylight and sunlight and is widely used by local authorities to help determine the performance of new developments.

3.1 Impact Classification Discussion

BRE guidance in Appendix I – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria summarised in the table below.

Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide, the impact is assessed as negligible or minor adverse. Where the loss of skylight or sunlight does not meet the BRE guidelines, the impact is assessed as minor, moderate or major adverse.

Impact	Description
Negligible adverse impact	• *Loss of light well within guidelines,* ***or*** • *only a small number of windows losing light (within the guidelines)* ***or*** *limited area of open space losing light (within the guidelines)*

Minor adverse impact (a)	• *Loss of light only just within guidelines* ***and***
	  ○ *a larger number of windows are affected* ***or***
	  ○ *larger area of open space is affected (within the guidelines)*

Minor adverse impact (b)	• *only a small number of windows or limited open space areas are affected* • *the loss of light is only marginally outside the guidelines* • *an affected room has other sources of skylight or sunlight* • *the affected building or open space only has a low-level requirement for skylight or sunlight* • *there are particular reasons why an alternative, less stringent, guideline should be applied*
Major adverse impact	• *large number of windows or large open space areas are affected* • *the loss of light is substantially outside the guidelines* • *all the windows in a particular property are affected* • *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)*

4 Methodology

4.1 Planning Authority Guidelines

The Sustainable Urban Housing: Design Standards for New Apartments December 2020 states the following in Section 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."

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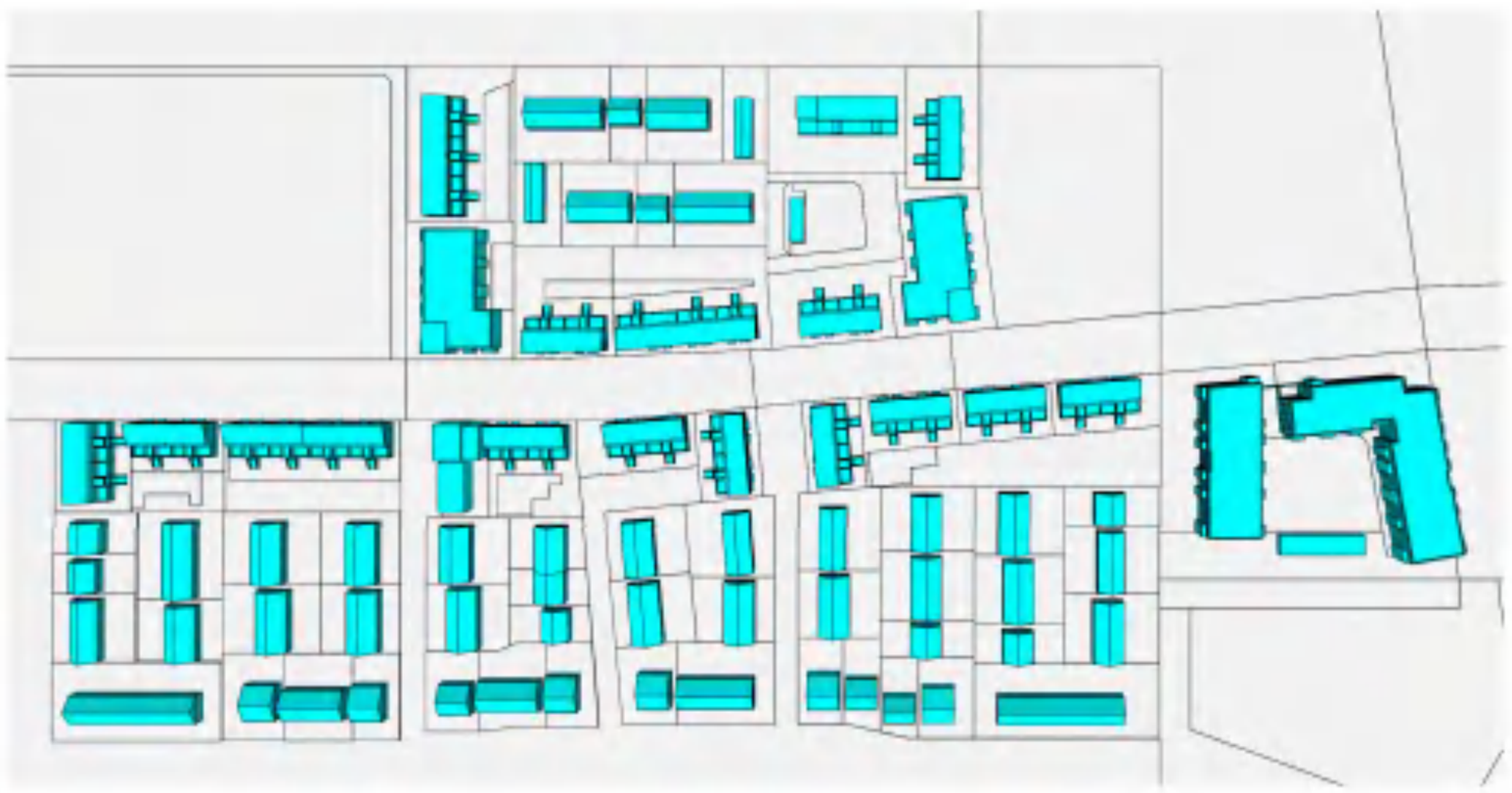
- **View Out**
    - Assessed in accordance with IS EN 17037:2018
- **Glare**
    - Assessed in accordance with IS EN 17037:2018

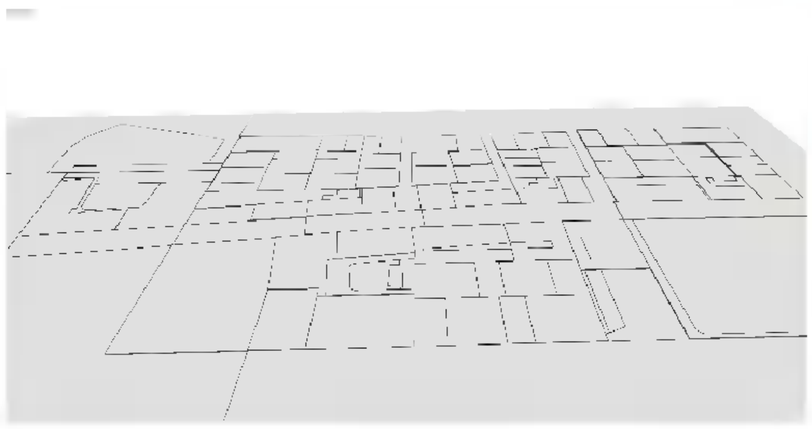
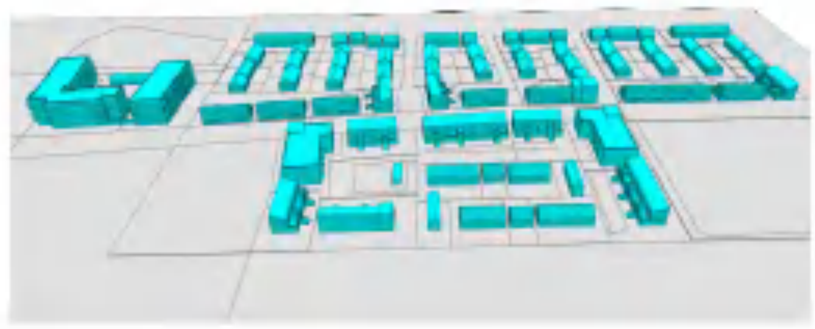
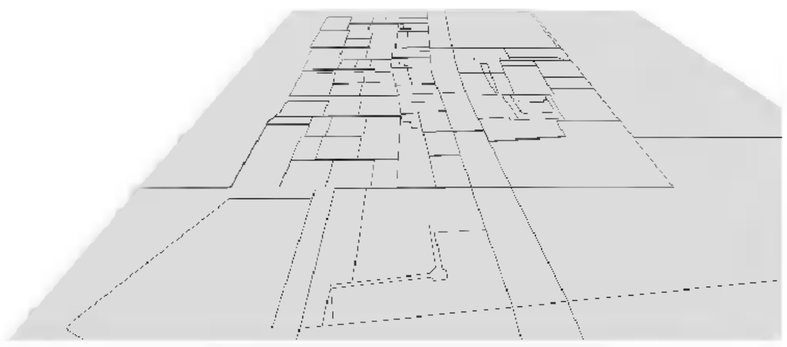
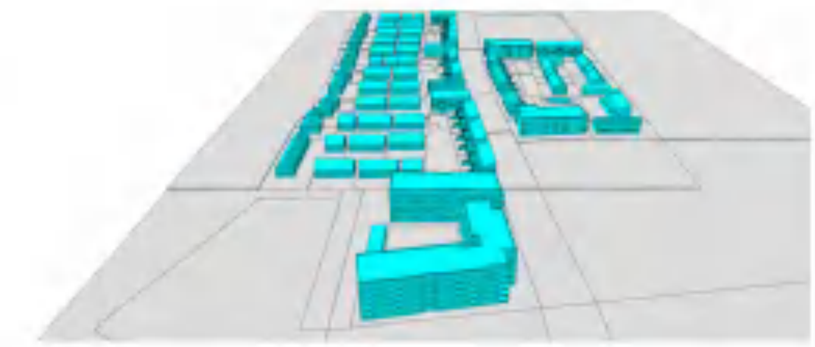
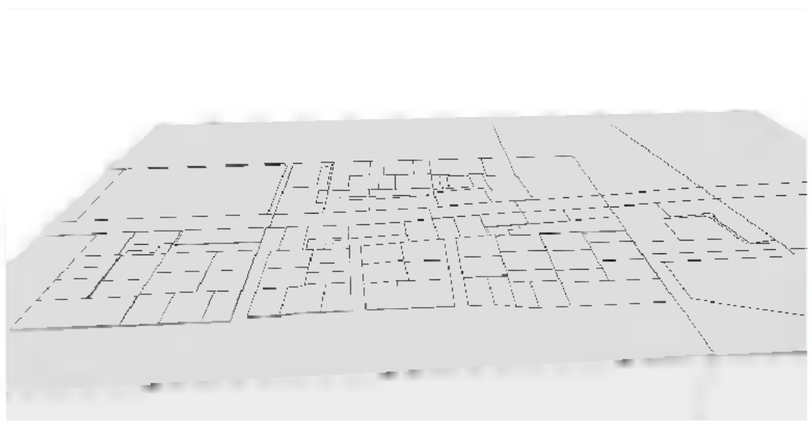
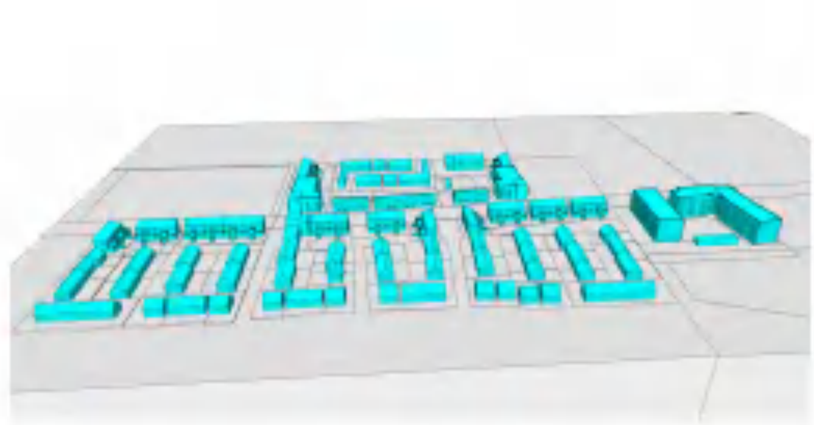
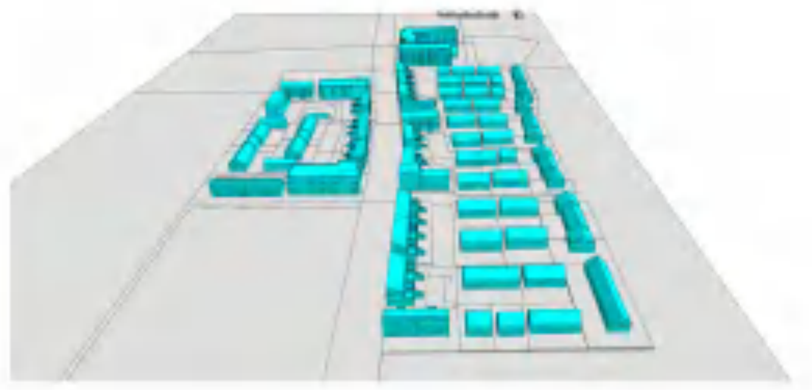
4.3 Orientation

The model orientation has been taken from the drawings provided by the Architect, with the resulting angle shown below used in the analysis.



4.4 Proposed Model

The following images illustrate the models created from the architectural information provided and the use of Google/Bing maps where information was absent.

	Existing Development	Proposed Development
View looking from North of Site		
View looking from East of Site		
View looking from South of Site		
View looking from West of Site		

4.5 Potential Sensitive Receptors

To help understand the proposed development's impact on surrounding buildings, potential sensitive receptors were identified as illustrated below.

	Approx. Site Boundary
	50-58B Cappaghmore Road

5 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that the sunniest months in Ireland are May and June, based on 1981-2010 averages or latest: https://www.met.ie/climate/30-year-averages.

The following can also be shown:

- During December a mean daily duration of 1.7 hours of sunlight out of a potential 7.3 hours sunlight each day is received (i.e. only 23% of potential sunlight hours).
- During June a mean daily duration of 5.8 hours of sunlight out of a potential 15.9 hours sunlight each day is received (i.e. only 36% of potential sunlight hours).

Therefore, the impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months.

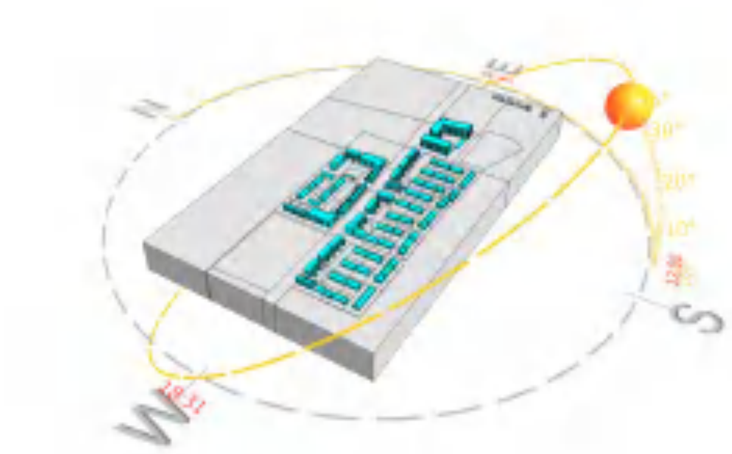
This section will consider the shadows cast by the proposed development on the following dates:

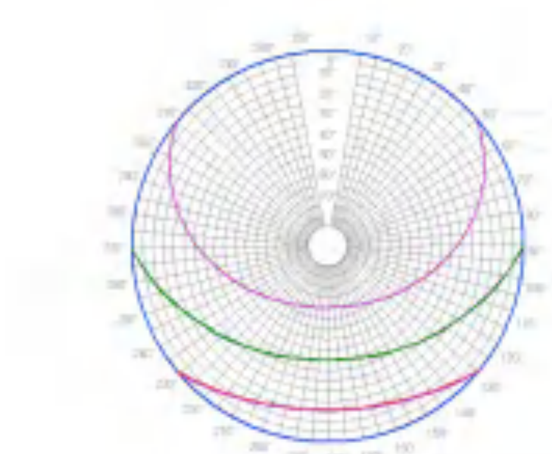
- March 21st / September 21st (Equinox)
- June 21st (Summer Solstice)
- December 21st (Winter Solstice)

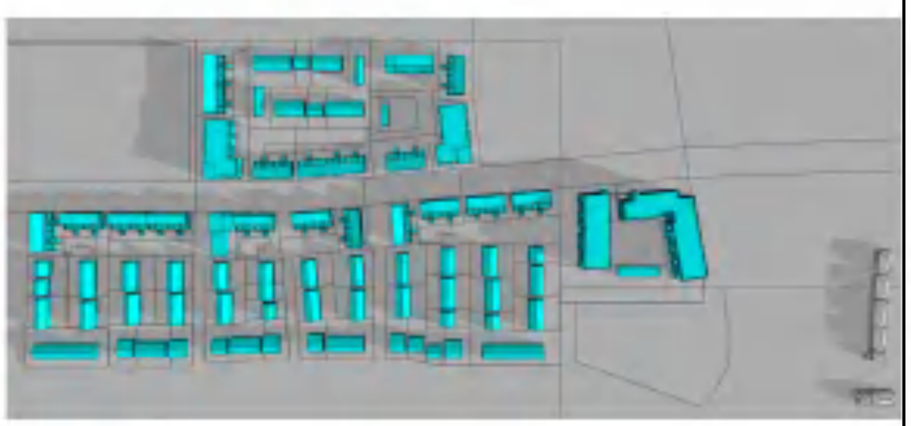
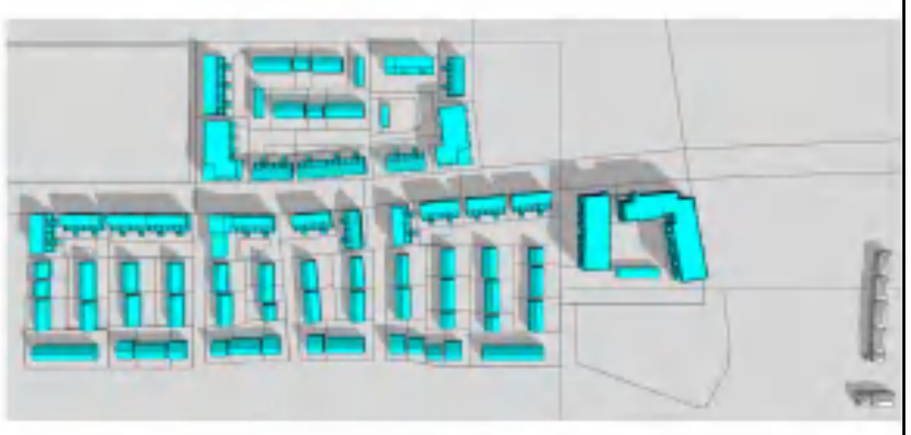
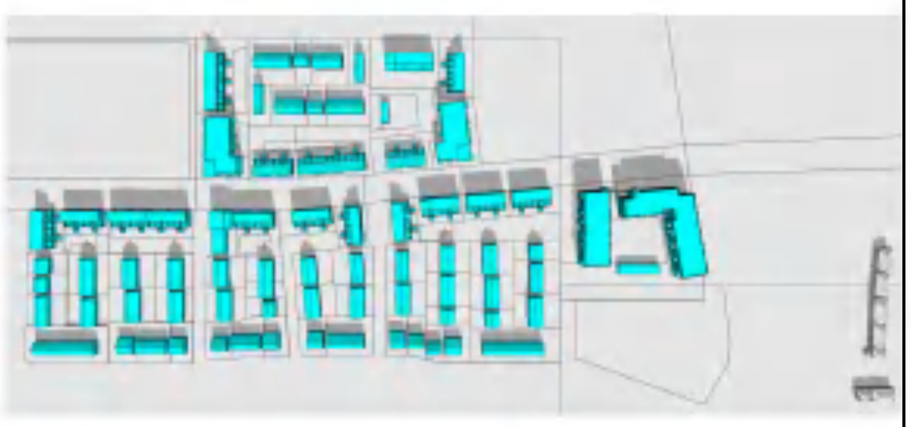
These images illustrate shadows cast for 'perfect sunny' conditions with no clouds and assumed that the sun is shining for every hour shown. Given the discussion above it is important to remember that this is not always going to be the case.

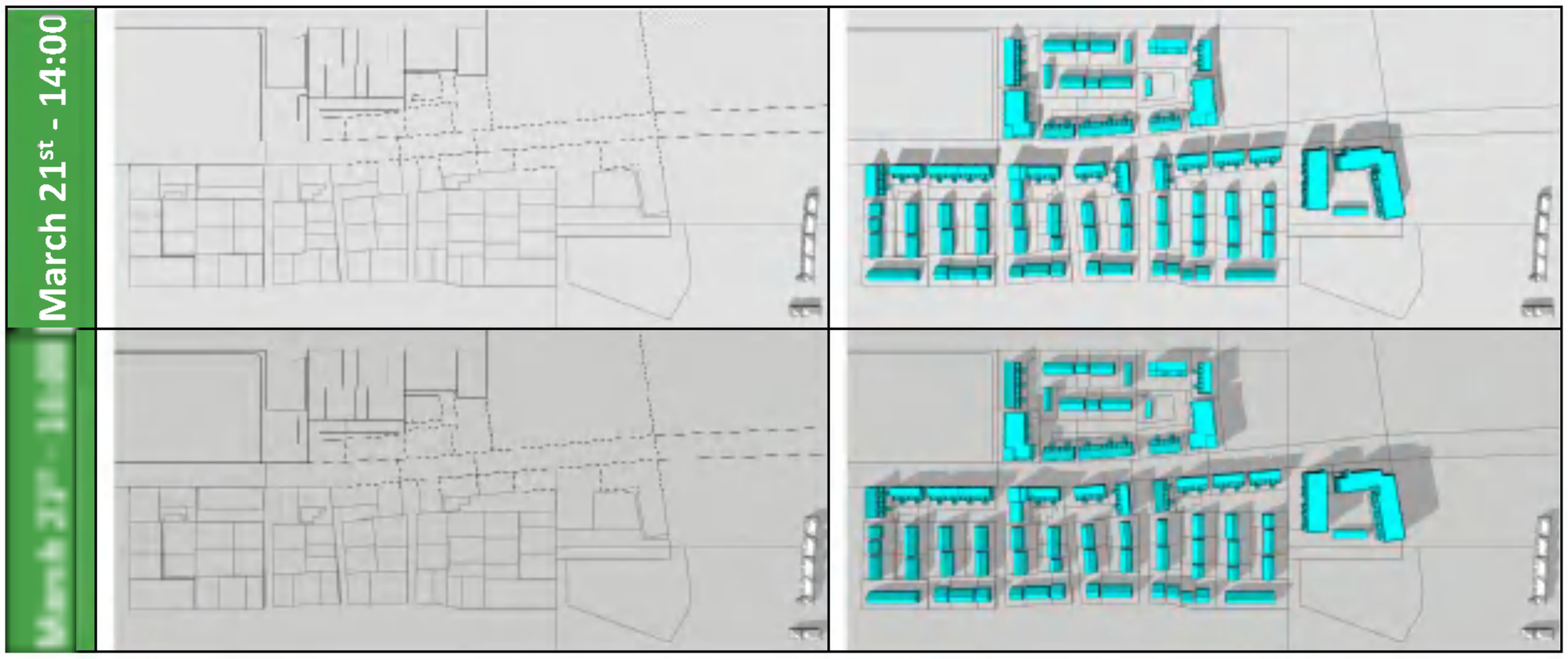
5.1 Plan View

5.1.1 March 21st

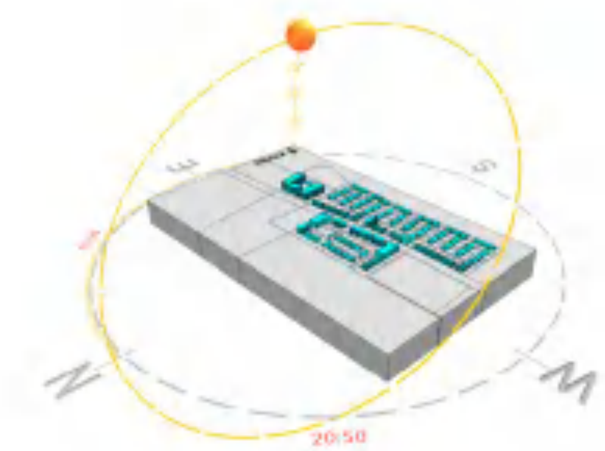


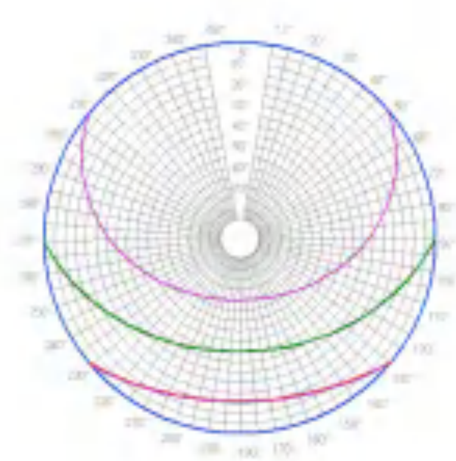


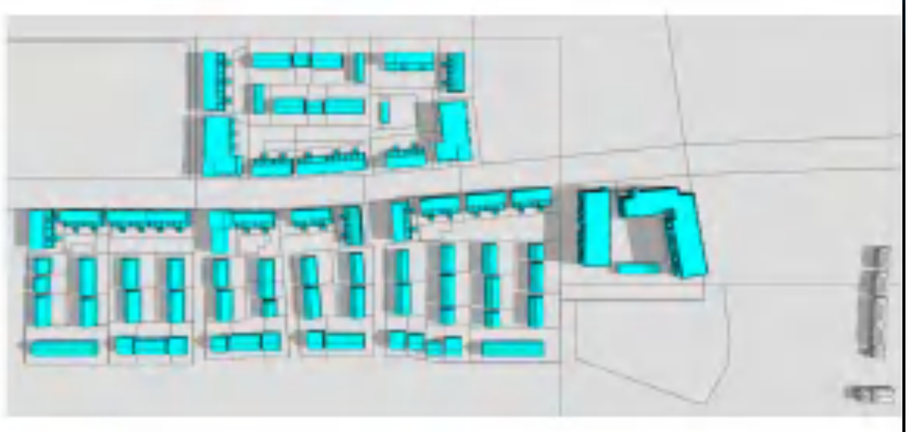
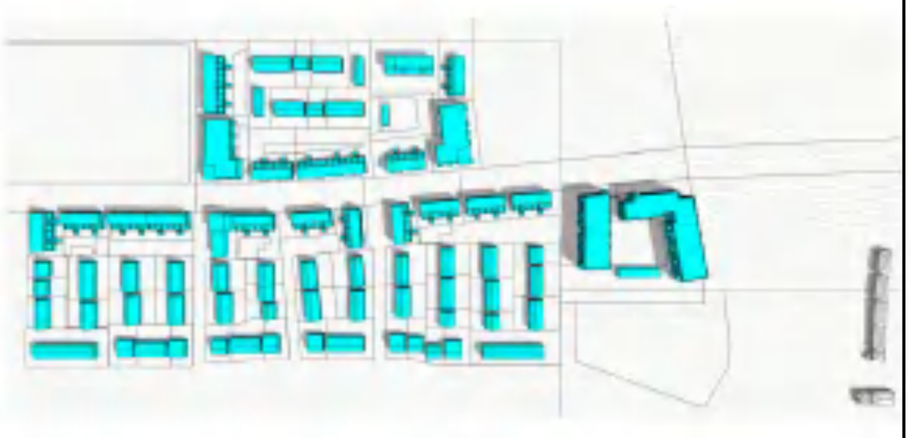
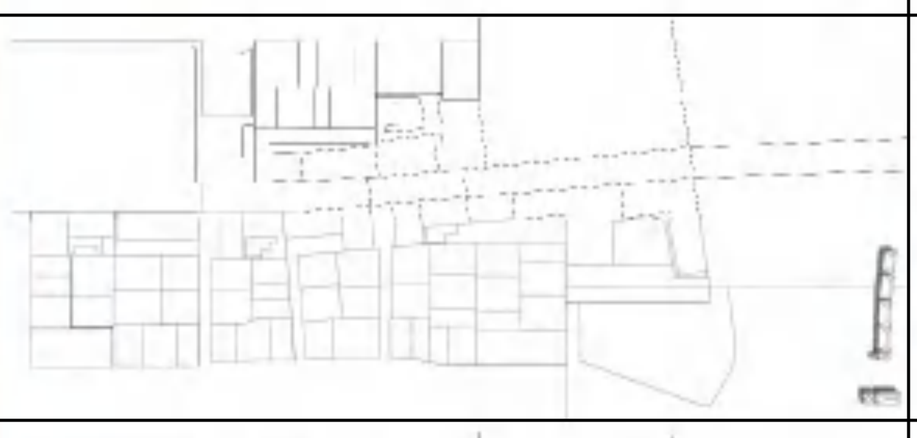
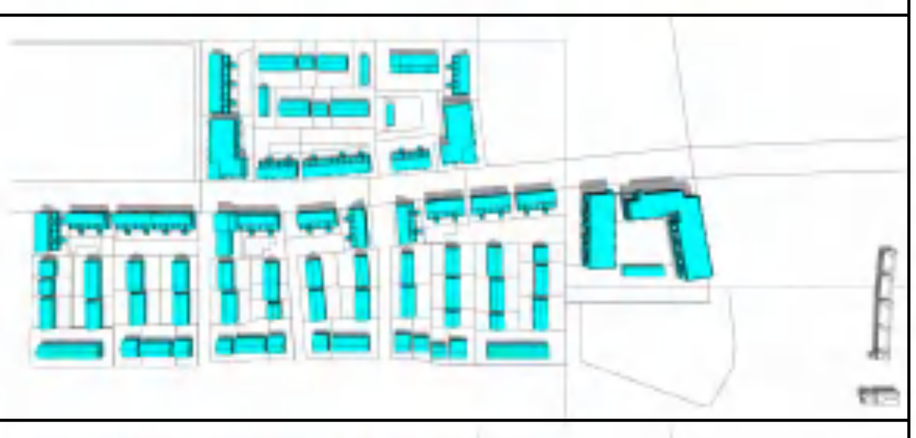
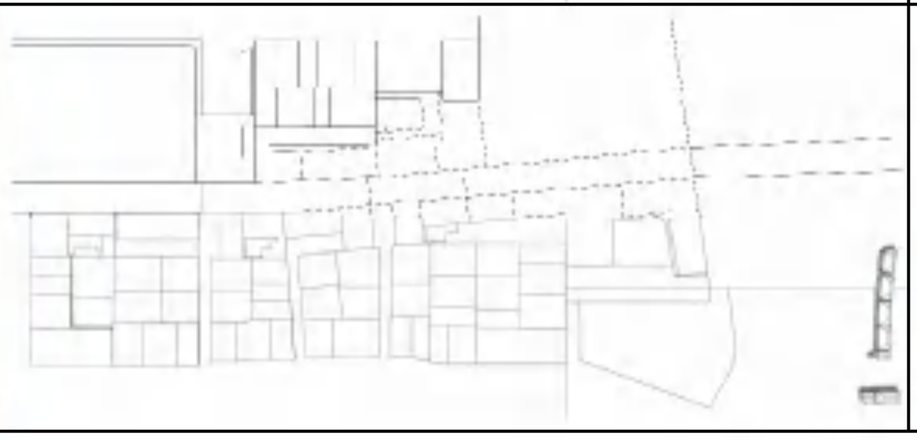
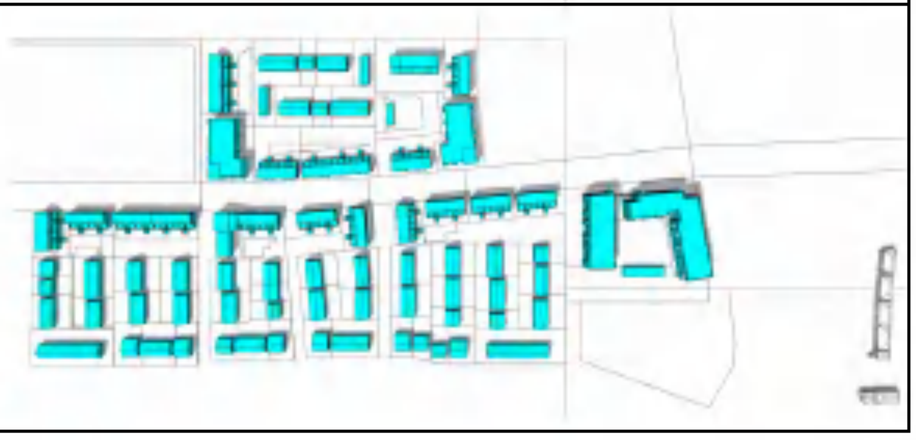
	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		
March 21st - 12:00		

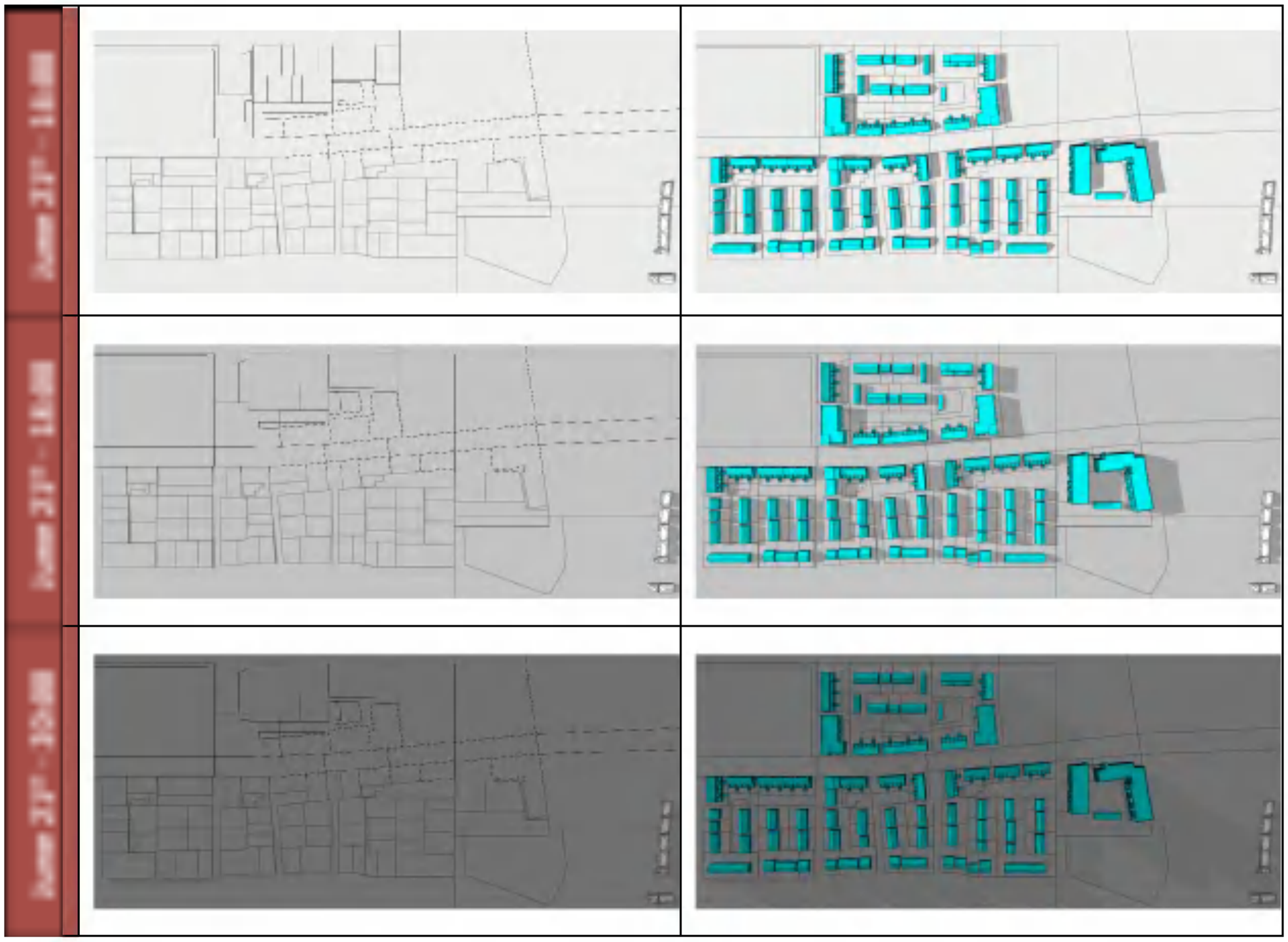

March 21st - 14:00

5.1.2 June 21st

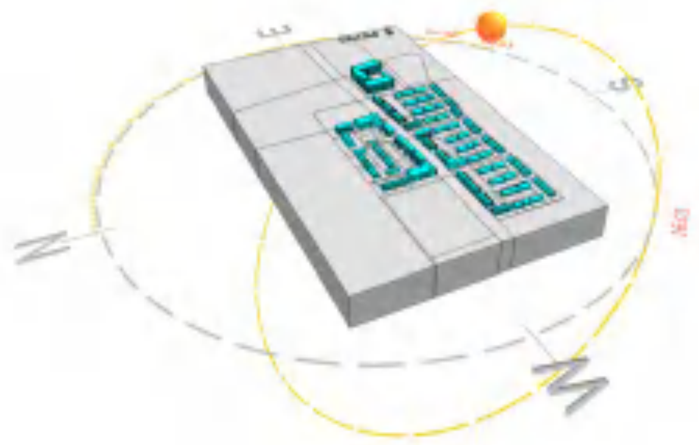


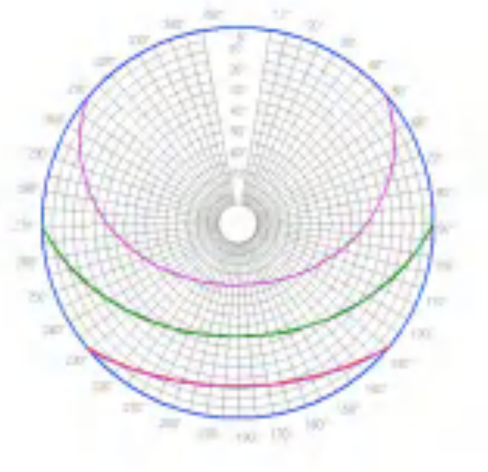


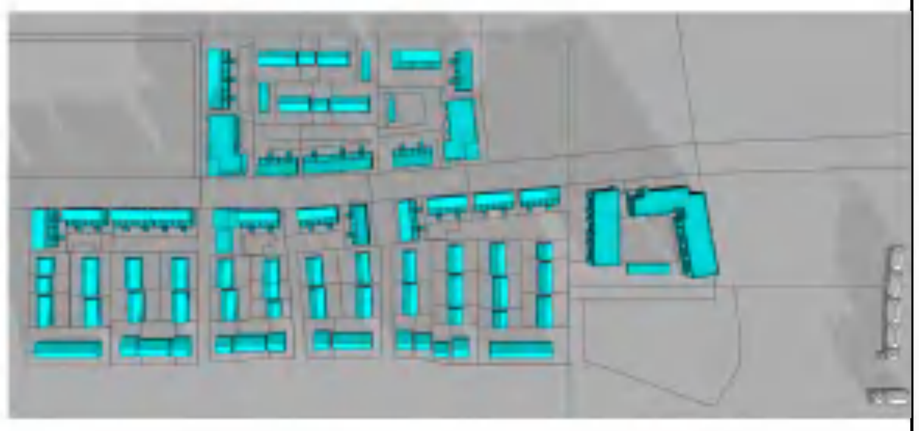
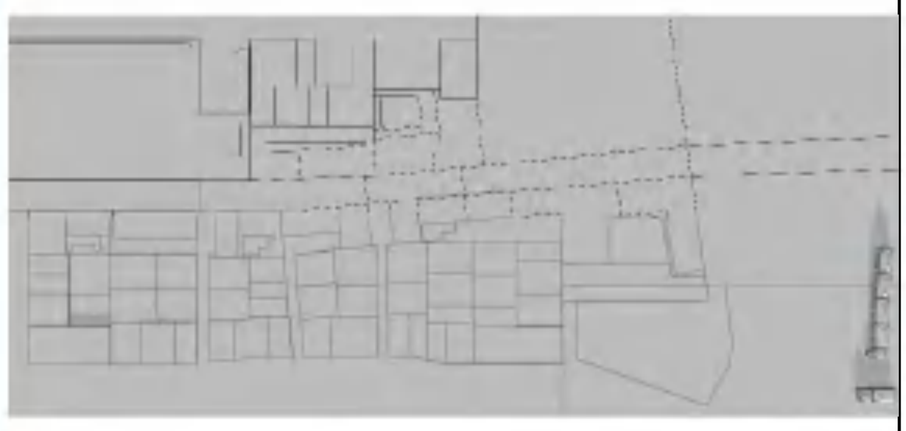
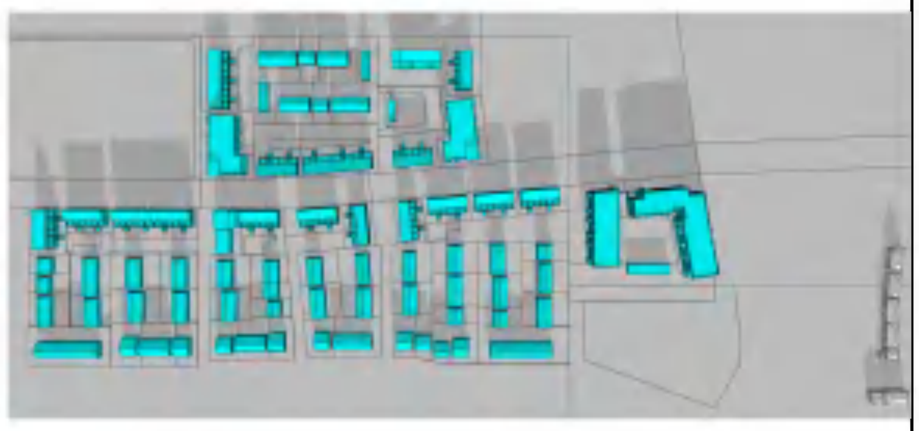
	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		
June 21st - 12:00		
June 21st - 14:00		

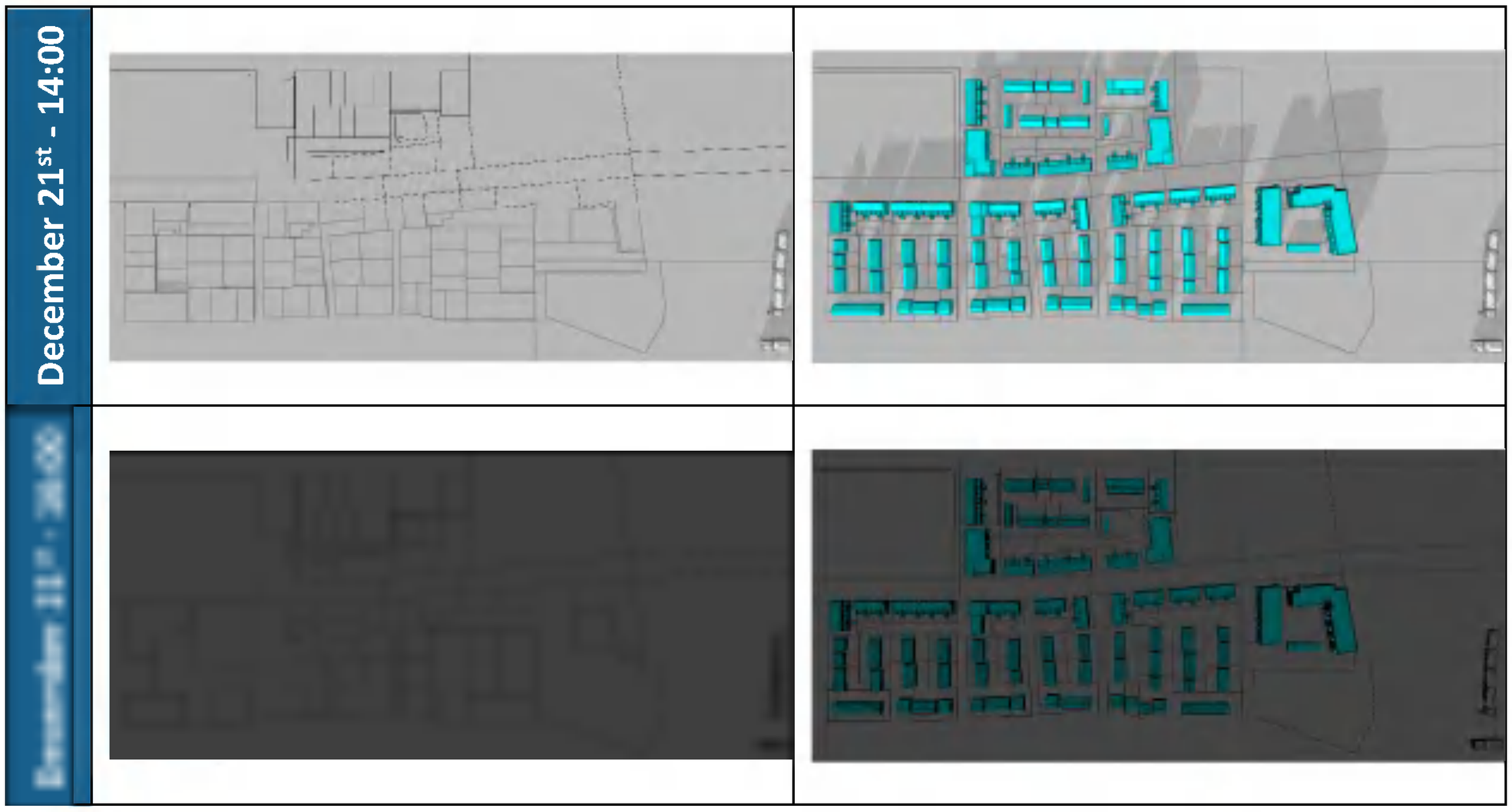


5.1.3 December 21st



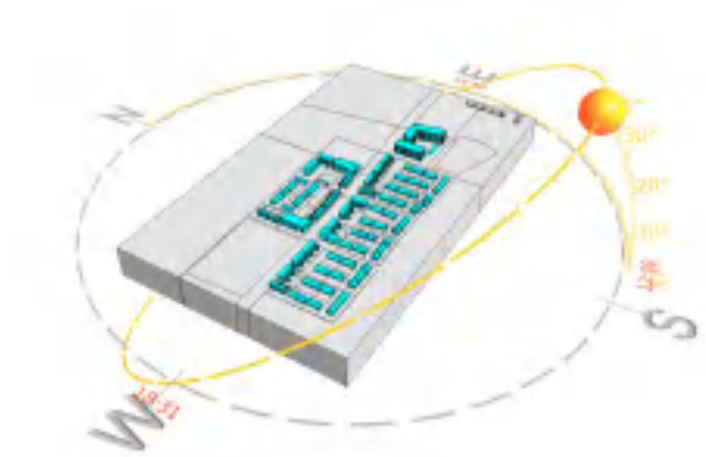


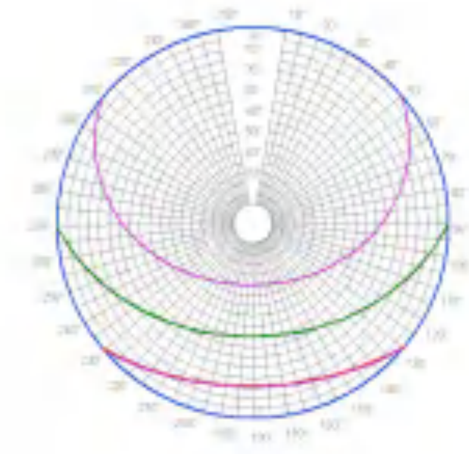
	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		

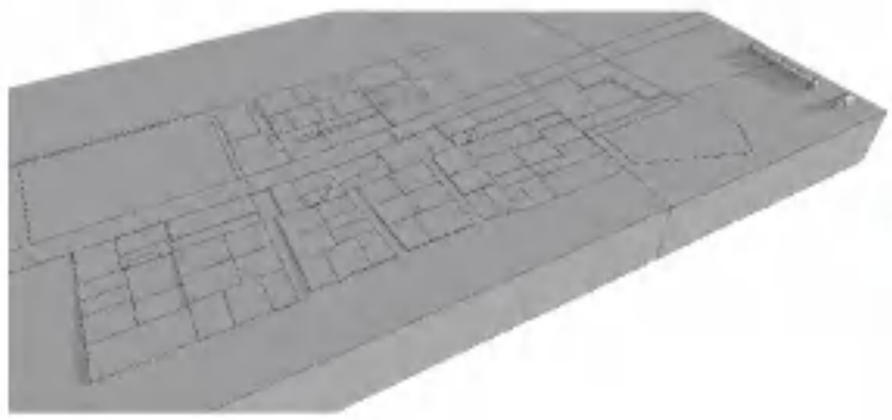
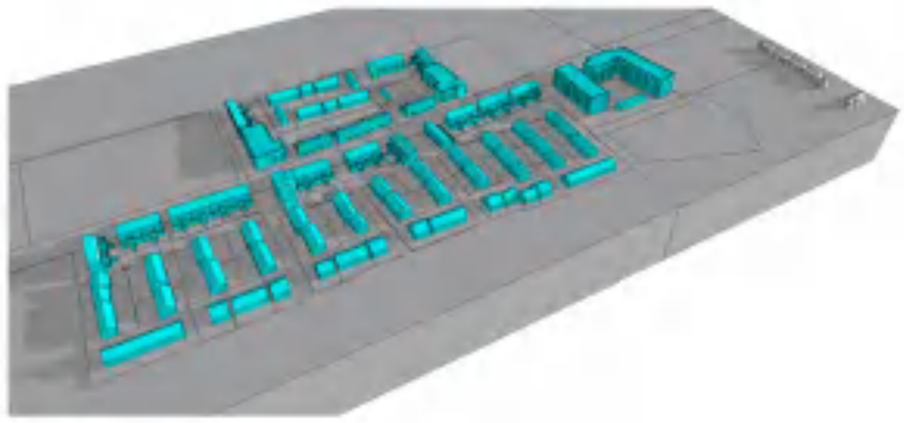
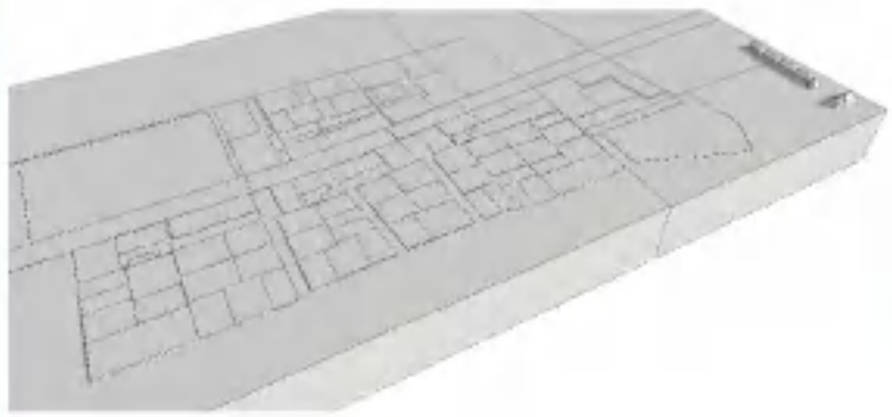
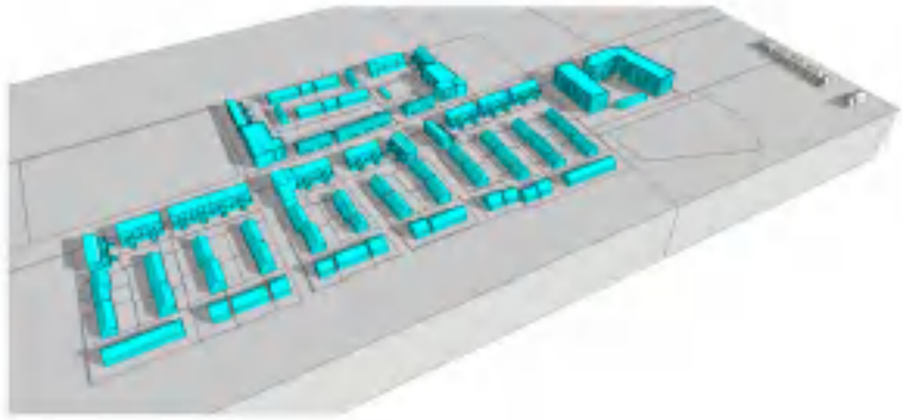
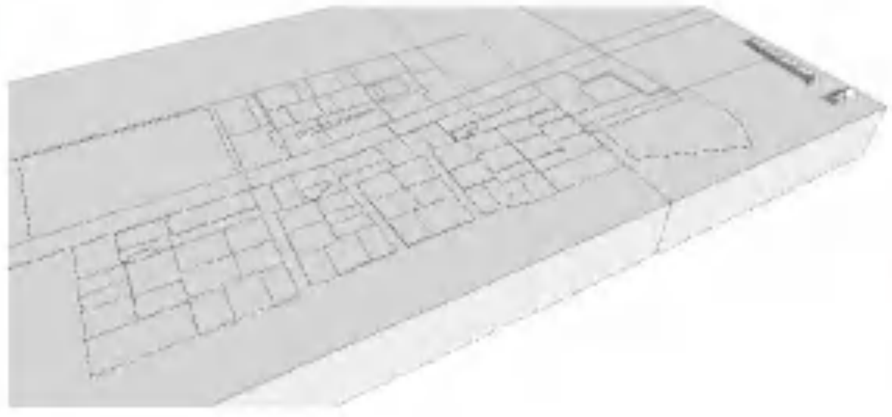
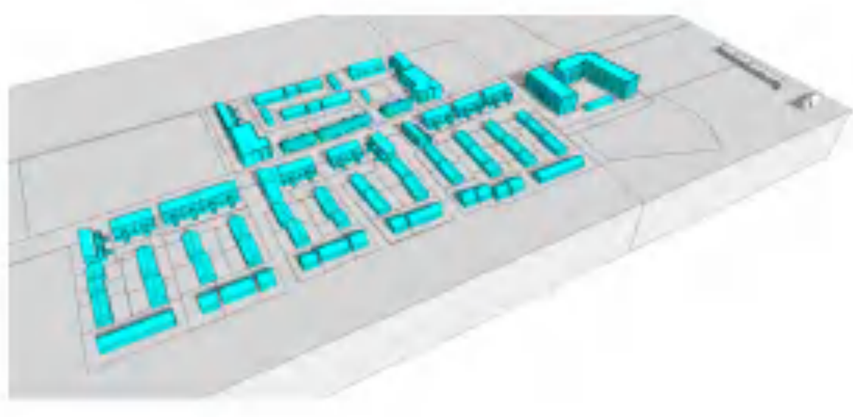

December 21st - 14:00
December 11th - 14:00

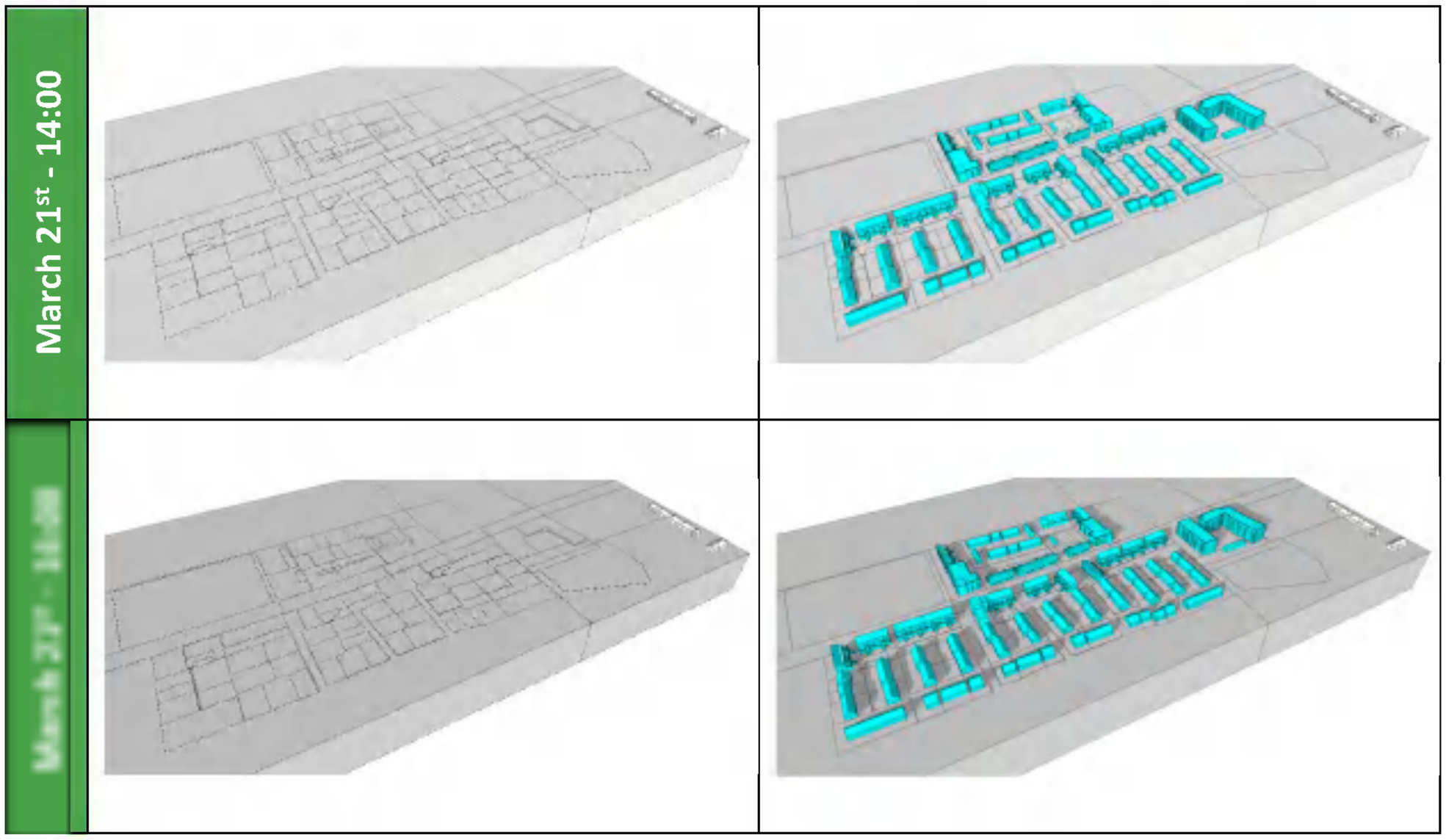
5.2 3D View

5.2.1 March 21st

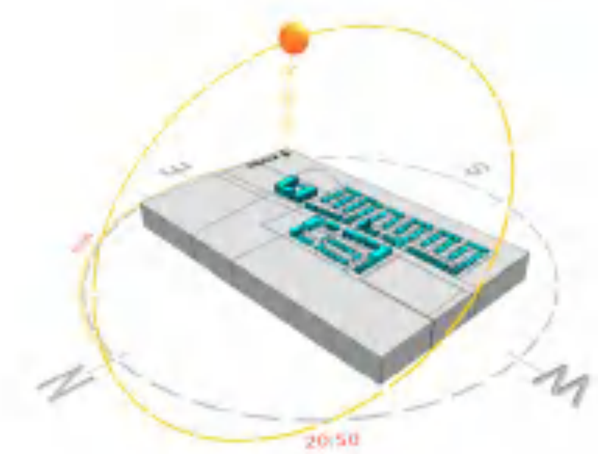


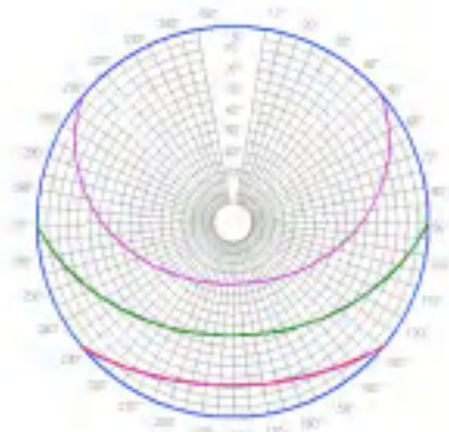


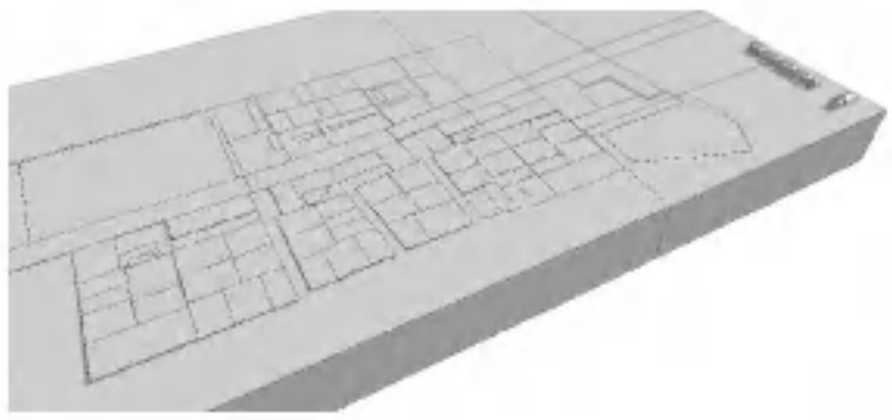
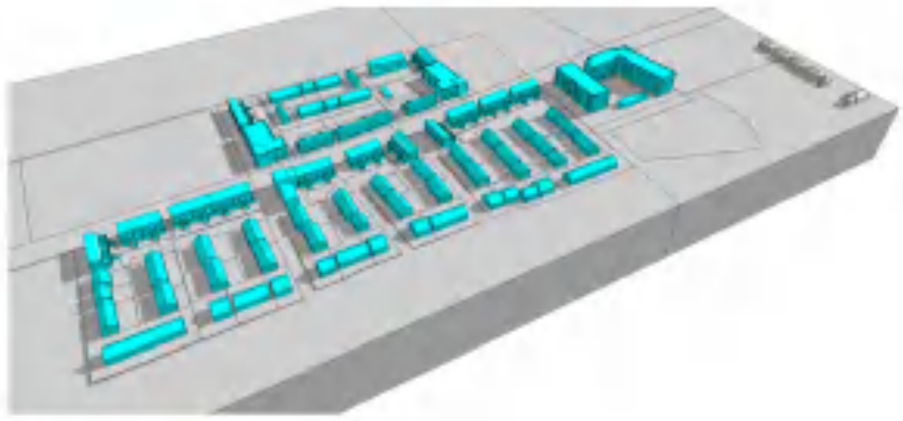
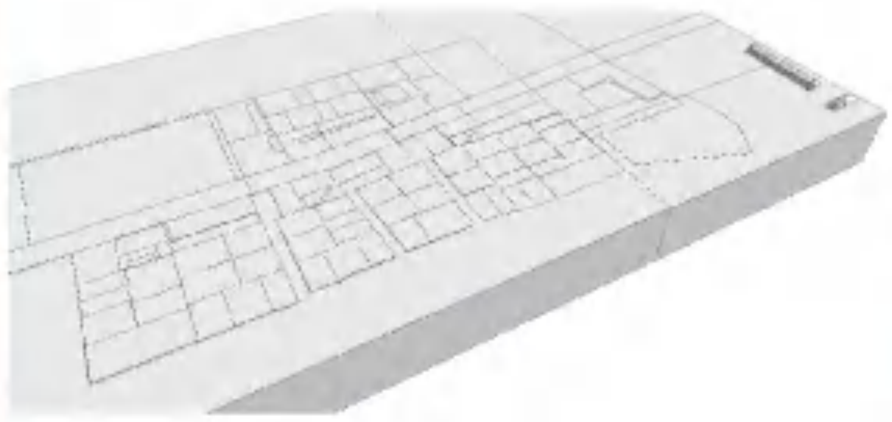
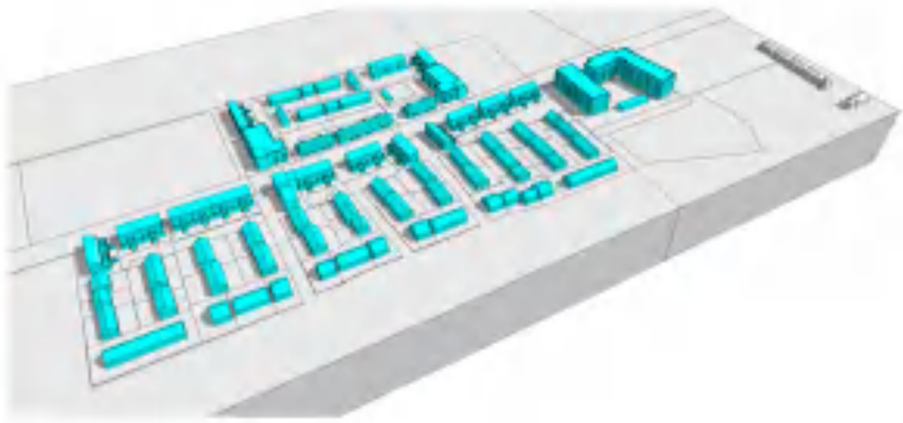
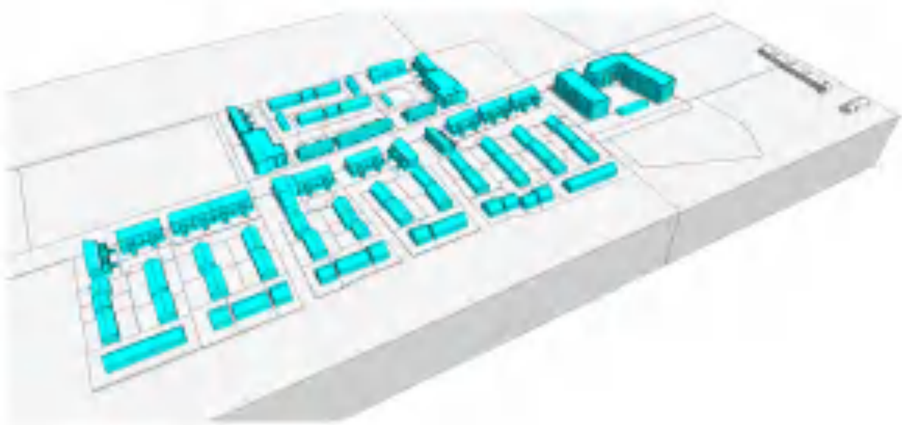
	Existing	Proposed
March 21st - 10:00		
March 21st - 13:00		
March 21st - 16:00		

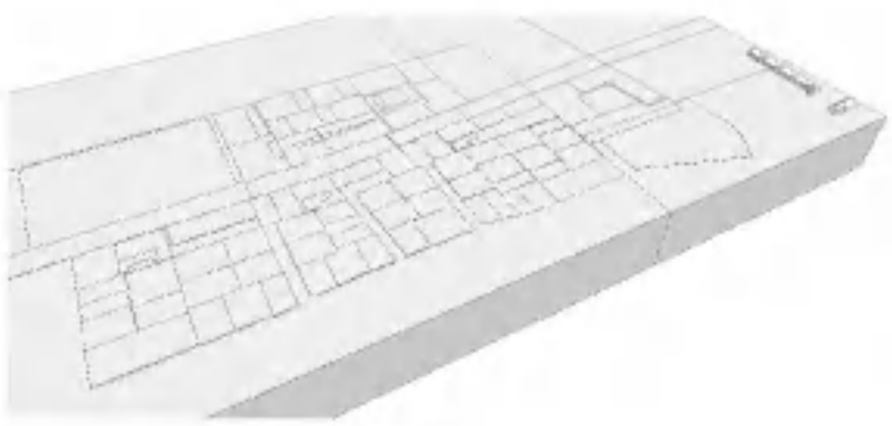
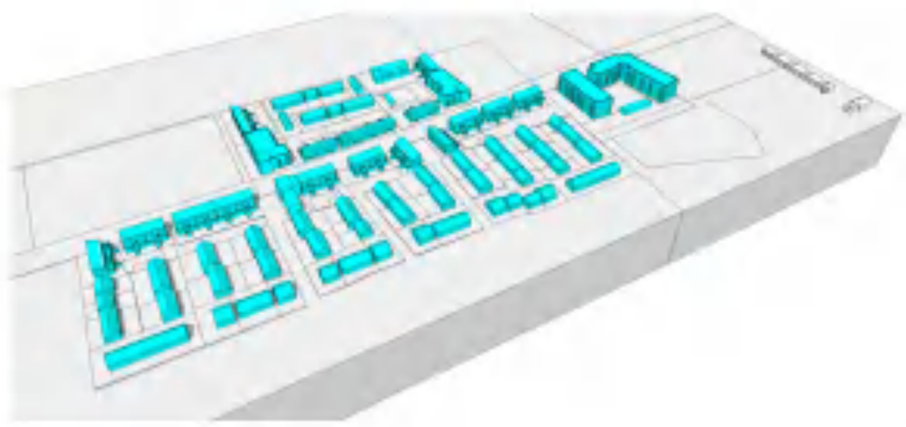

March 21st - 14:00

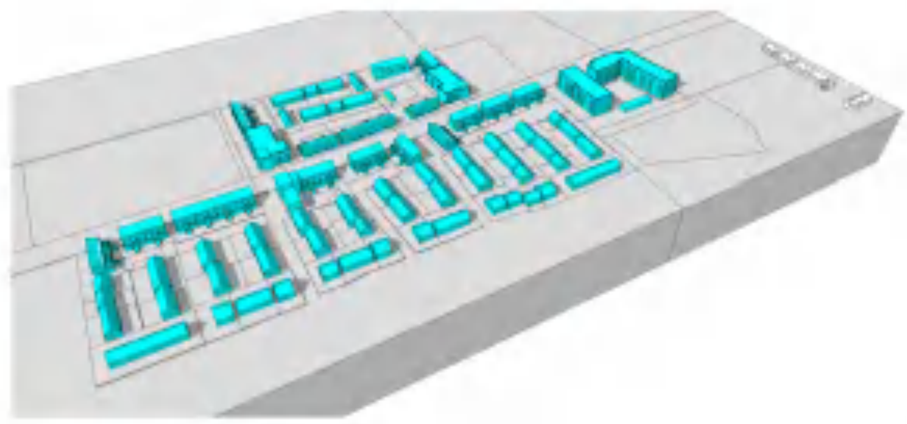
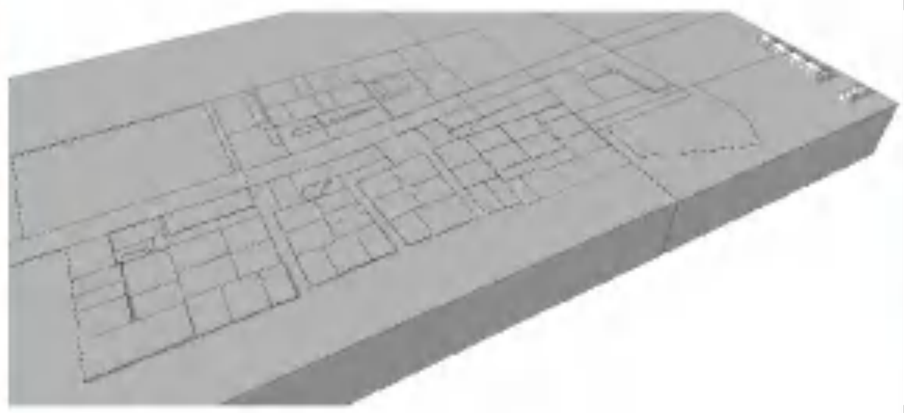
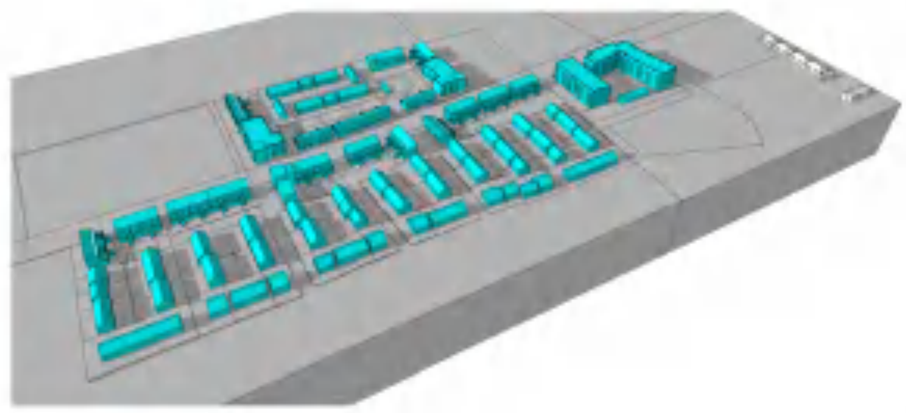
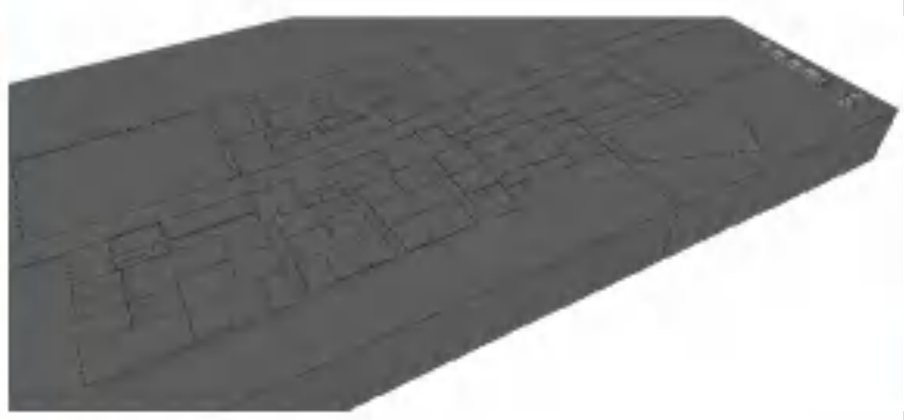
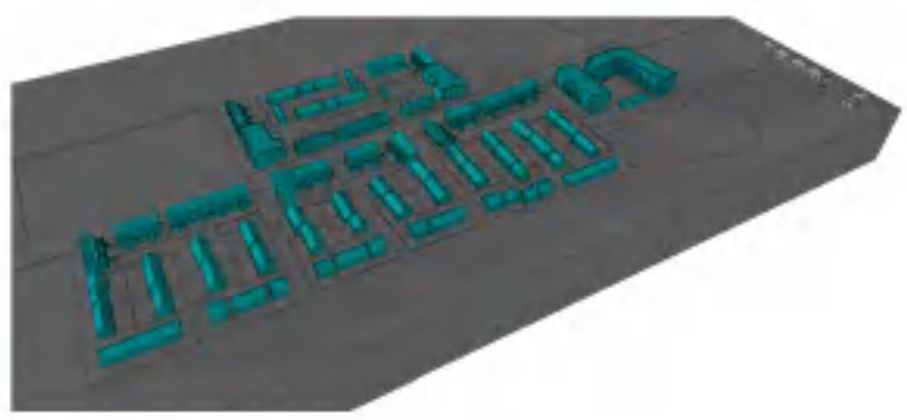
5.2.2 June 21st



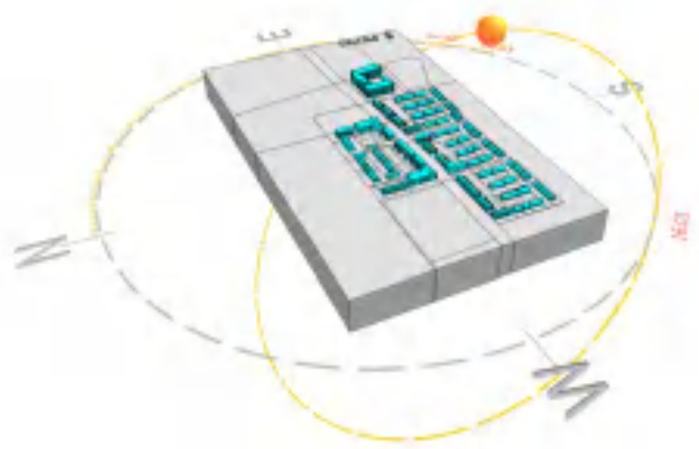


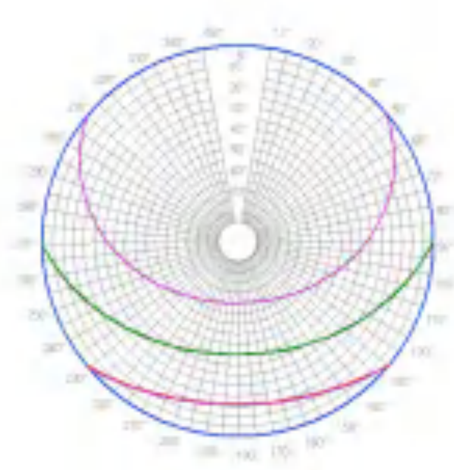
	Existing	Proposed
09:00		
12:00		
15:00		

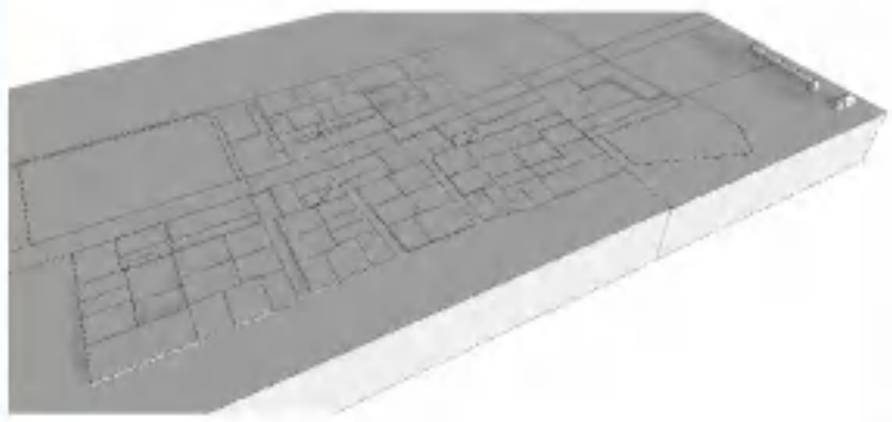
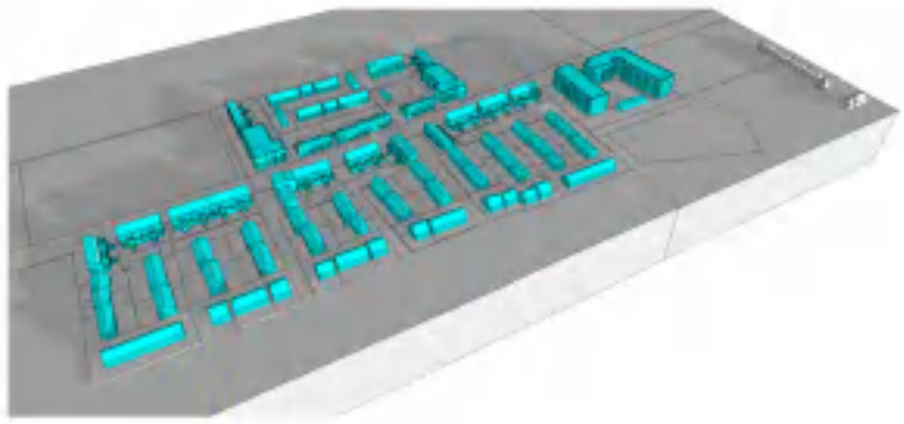
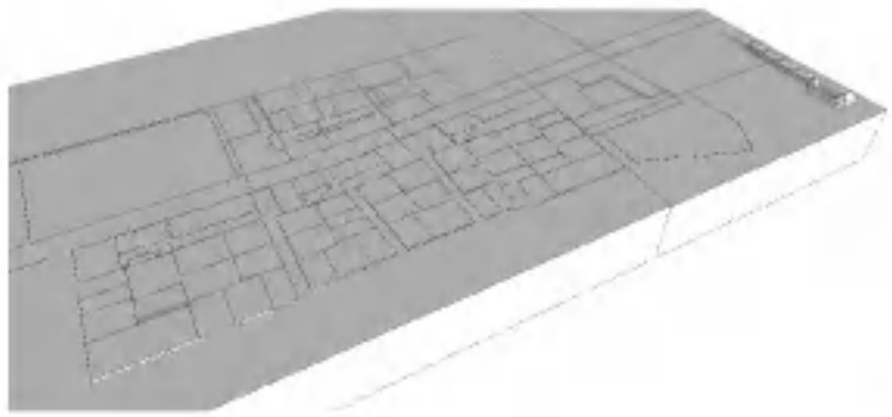
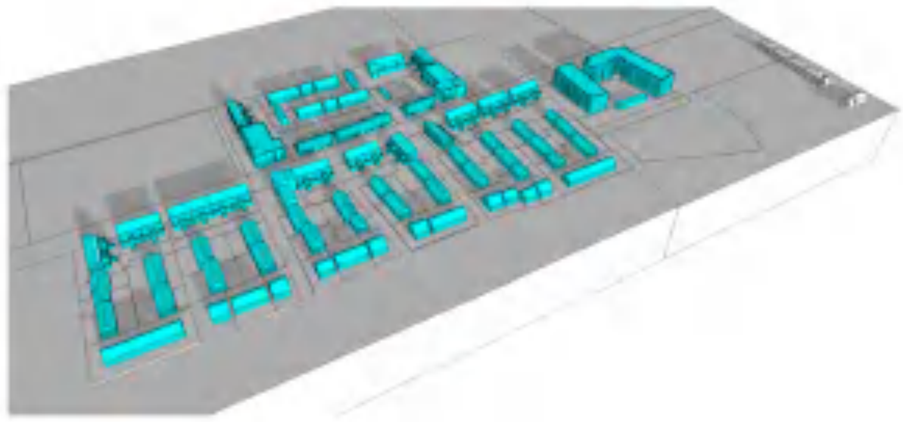



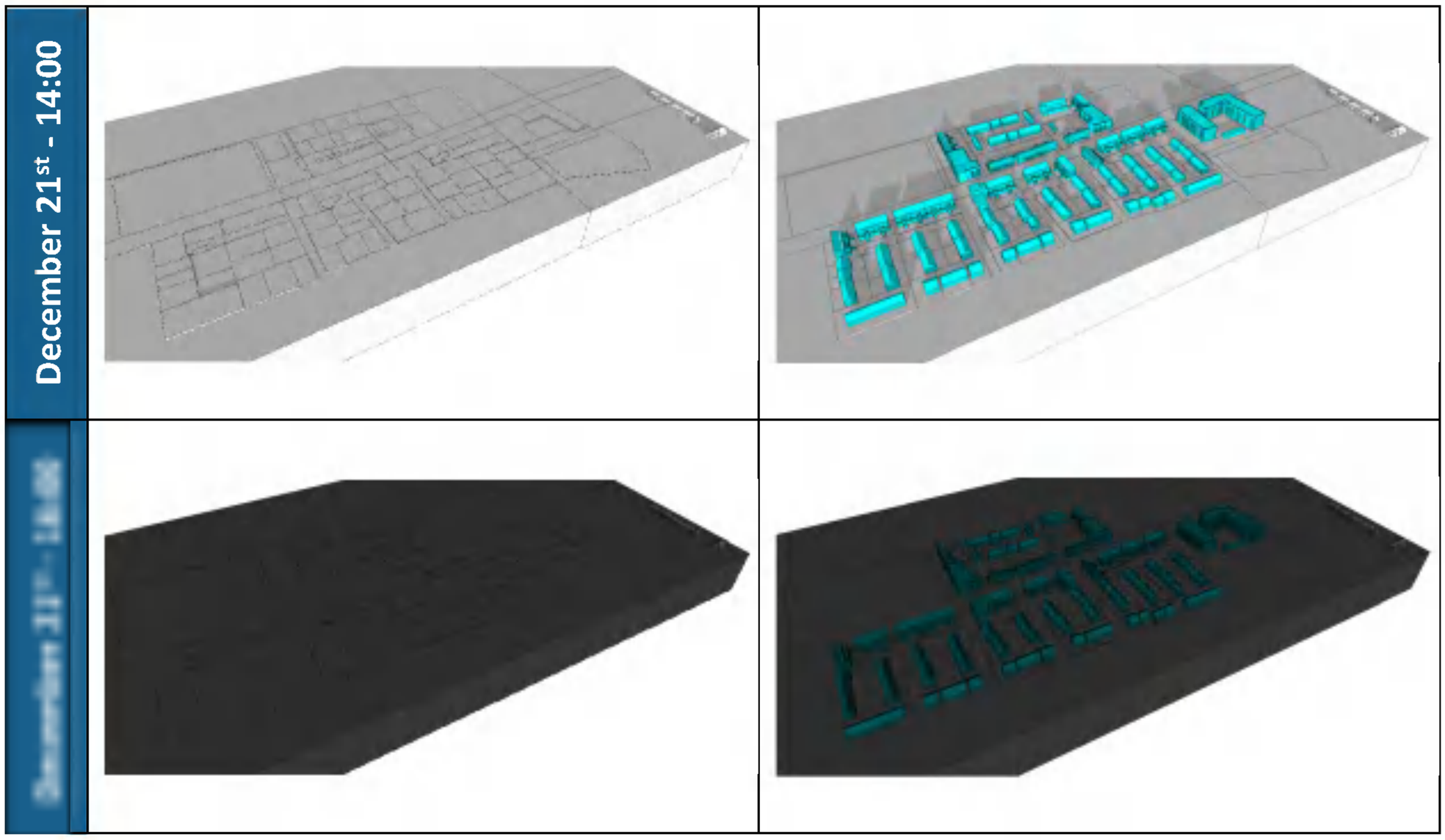






5.2.3 December 21st





	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		


December 21st - 14:00

5.3 Discussion

The shadow analysis illustrates different shadows being cast at three key times of the year (March 21st, June 21st and December 21st) for the existing scenario and with the proposed development in place. The images indicate that the existing buildings 50-58B Cappaghmore Road are receiving no additional shading from the proposed development.

Taking this into account the overall impact of overshadowing can be classed as negligible.

The proposed development's performance is further quantified within the daylight analysis to the existing buildings and sunlight to existing amenities sections of this report.

6 Sunlight to Amenity Spaces

6.1 Guidance Requirements

The impact of the proposed development on the sunlight availability to the amenity spaces will be considered to determine how the amenity spaces perform when assessed against the BRE Guide which states the following in Section 3.3.17:

> **Summary**
>
> 3.3.17 It is recommended 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 21 March. 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.

The BRE Guide states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st.

6.2 Amenity Areas

As stated previously, for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on March 21st. This analysis will be performed on the amenity spaces illustrated in the image below.

Proposed and Existing Amenity Areas

Proposed Public Amenity Areas

Proposed Private Gardens

Existing Amenity Areas

6.3 Proposed Public Amenity Areas

The following images illustrate the proposed public amenity areas that are receiving at least 2 hours of sunlight on 21st March.

Absolute Scale Illustrating all Hours of Sunlight Received
Proposed Public Amenity Areas

Hours of Sunlight > 2 Illustrated in Red
Proposed Public Amenity Areas

■ Receives more than 2 hours of sunlight

□ Receives less than 2 hours of sunlight

The results illustrated above are summarised in the following table.

Proposed Public Amenity Areas	

Proposed Public Amenity Areas

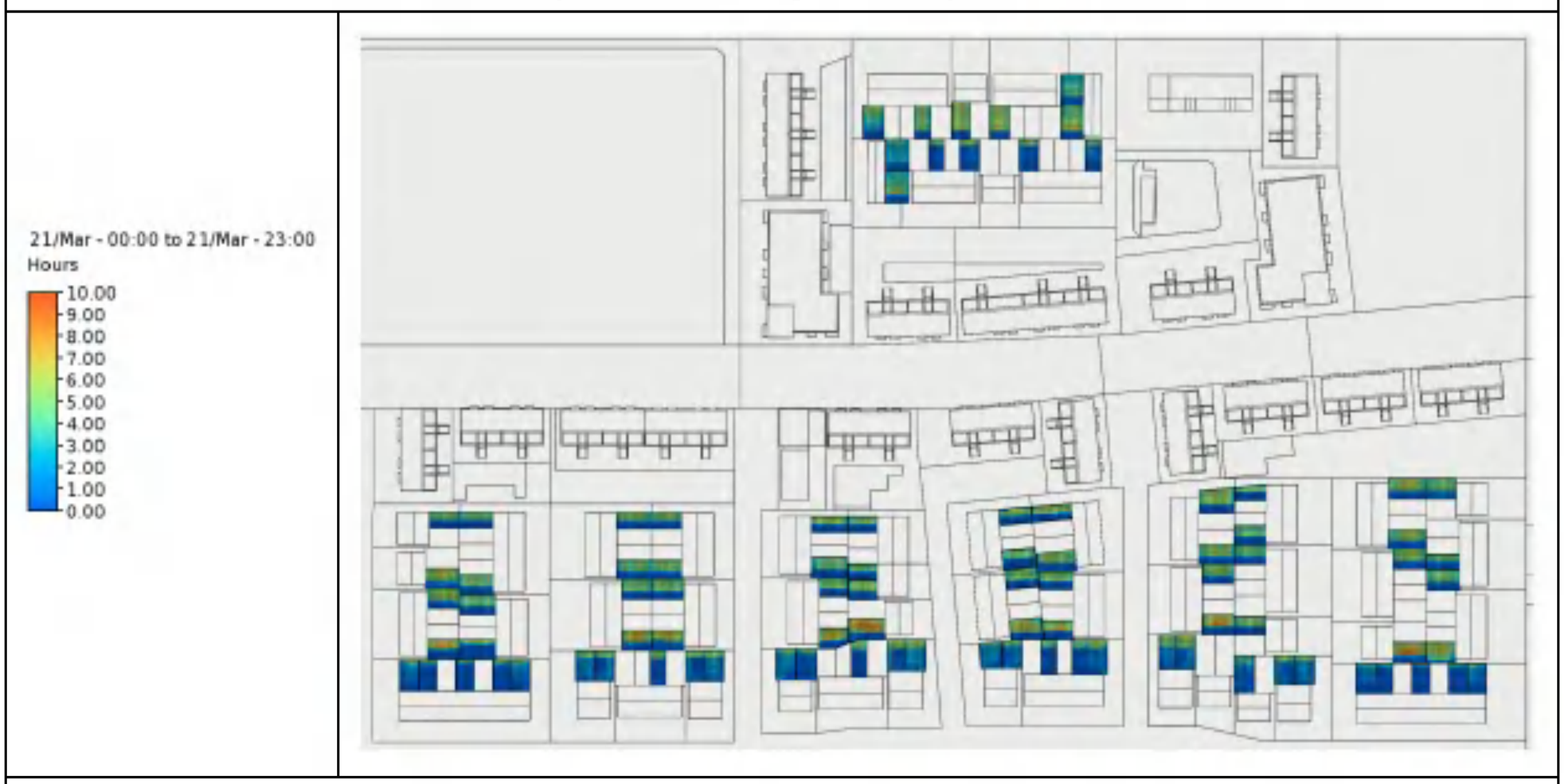
[illegible]	[illegible] (m^2)	[illegible] >2h (m^2)	[illegible] >2h	[illegible]
1	16,060	15,900	99%	✓
2	445	440	99%	✓
3	466	266	57%	✓
4	499	499	100%	✓
5	289	289	100%	✓
6	299	299	100%	✓
7	257	257	100%	✓
8	1,686	1,587	94%	✓
9	13,273	13,273	100%	✓
10	12,458	12,458	100%	✓
Total	45,732	45,268	99%	✓

✓ The proposed amenity space will receive at least 2 hours of sunlight on over 50% of its area, exceeding the BRE guidelines.

6.4 Proposed Private Gardens

The following images illustrate the proposed amenity areas that are receiving at least 2 hours of sunlight on 21st March. A sampling of gardens including the worst case north facing amenities have been included. Those that have not been assessed will have similar if not identical results as they are in the same orientation to those that have been sampled.

Absolute Scale Illustrating all Hours of Sunlight Received
Proposed Building Amenity Areas

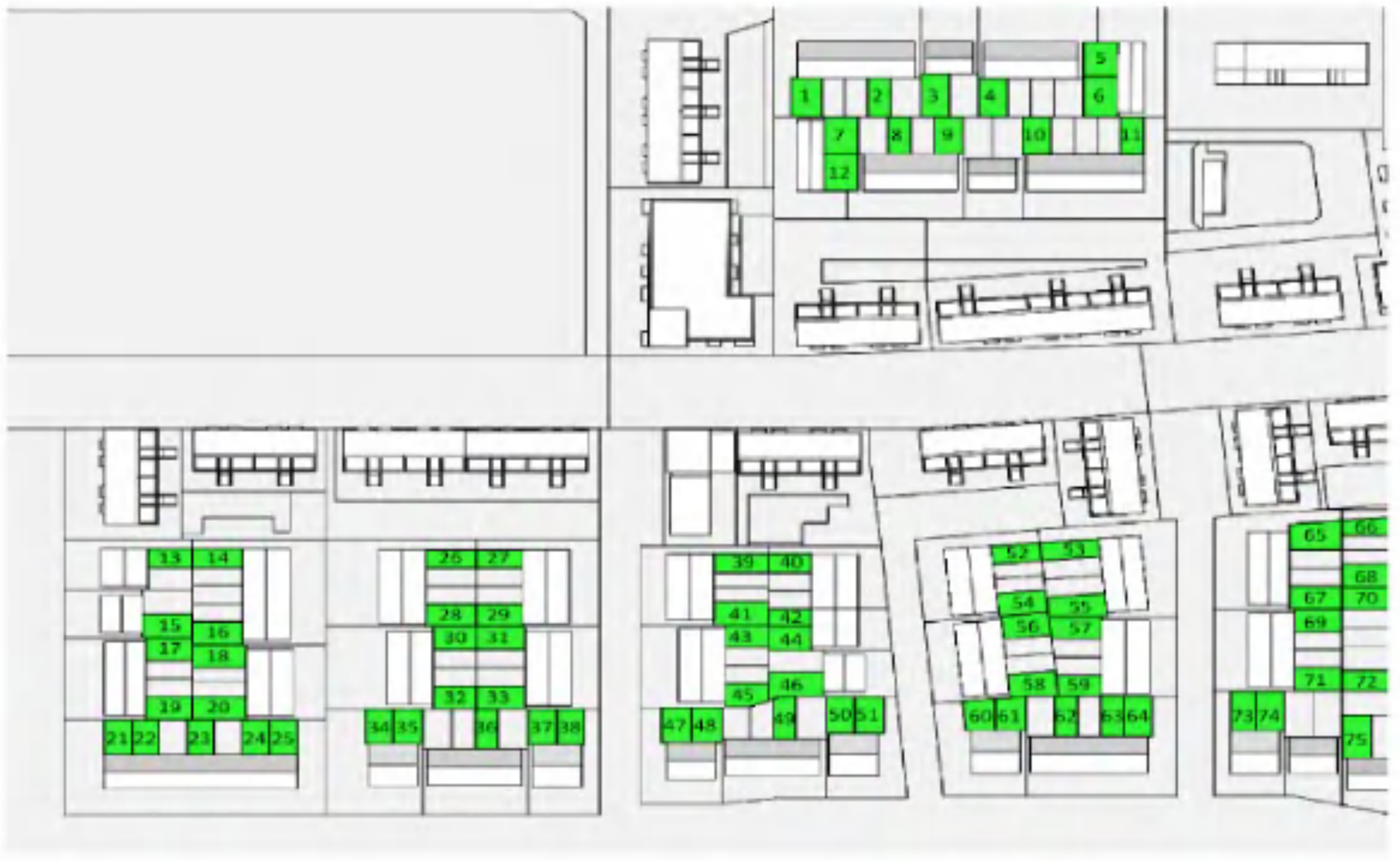


Hours of Sunlight > 2 Illustrated in Red
Proposed Building Amenity Areas

■ Receives more than 2 hours of sunlight

□ Receives less than 2 hours of sunlight

The results illustrated above are summarised in the following table.

Proposed Private Gardens	

Proposed Private Gardens				
Reference #	Total Area (m^2)	Area Receiving >2h (m^2)	% Receiving >2h	Comment
1	88	67	76%	✓
2	89	63	71%	✓
3	67	53	79%	✓
4	88	71	81%	✓
5	83	64	77%	✓
6	100	76	76%	✓
7	94	70	74%	✓
8	61	13	21%	x
9	79	17	22%	x
10	80	18	23%	x
11	65	17	26%	x
12	93	71	76%	✓
13	61	32	52%	✓
14	69	36	52%	✓
15	87	55	63%	✓
16	85	51	60%	✓
17	79	30	38%	x
18	92	47	51%	✓
19	79	45	57%	✓
20	91	27	30%	x
21	74	25	34%	x
22	71	26	37%	x
23	71	22	31%	x

[Reference]	Total Area (m^2)	Area Receiving >2h (m^2)	% Receiving >2h	[Comment]
24	71	23	32%	x
25	74	38	51%	✓
26	70	37	53%	✓
27	63	35	56%	✓
28	84	49	58%	✓
29	75	46	61%	✓
30	74	38	51%	✓
31	84	43	51%	✓
32	73	45	62%	✓
33	82	48	59%	✓
34	69	29	42%	x
35	75	27	36%	x
36	67	25	37%	x
37	75	26	35%	x
38	71	37	52%	✓
39	76	41	54%	✓
40	60	34	57%	✓
41	95	66	69%	✓
42	57	35	61%	✓
43	69	34	49%	x
44	76	33	43%	x
45	71	46	65%	✓
46	101	69	68%	✓
47	78	26	33%	x
48	80	25	31%	x
49	70	31	44%	x
50	75	35	47%	x
51	78	46	59%	✓
52	67	35	52%	✓
53	79	47	59%	✓
54	82	51	62%	✓
55	95	55	58%	✓
56	81	32	40%	x
57	82	38	46%	x
58	85	54	64%	✓
59	71	43	61%	✓
60	70	27	39%	x
61	75	23	31%	x
62	68	20	29%	x
63	68	20	29%	x
64	84	43	51%	✓
65	108	73	68%	✓
66	57	31	54%	✓
67	88	46	52%	✓
68	78	55	71%	✓
69	78	29	37%	x
70	77	29	38%	x
71	81	54	67%	✓

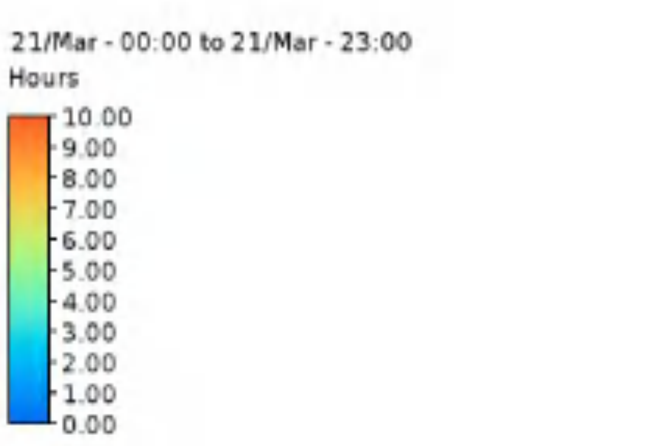
[illegible]	Total Area (m²)	Area Receiving >2h (m²)	% Receiving >2h	Comment
72	71	42	59%	✓
73	72	27	38%	x
74	86	43	50%	✓
75	94	25	27%	x
76	72	21	29%	x
77	70	26	37%	x
78	101	64	63%	✓
79	77	47	61%	✓
80	91	56	62%	✓
81	88	55	63%	✓
82	85	33	39%	x
83	64	33	52%	✓
84	88	55	63%	✓
85	75	53	71%	✓
86	72	17	24%	x
87	68	10	15%	x
88	69	6	9%	x
89	71	11	15%	x
90	71	18	25%	x
Total	**6998**	**3510**	**50%**	✓

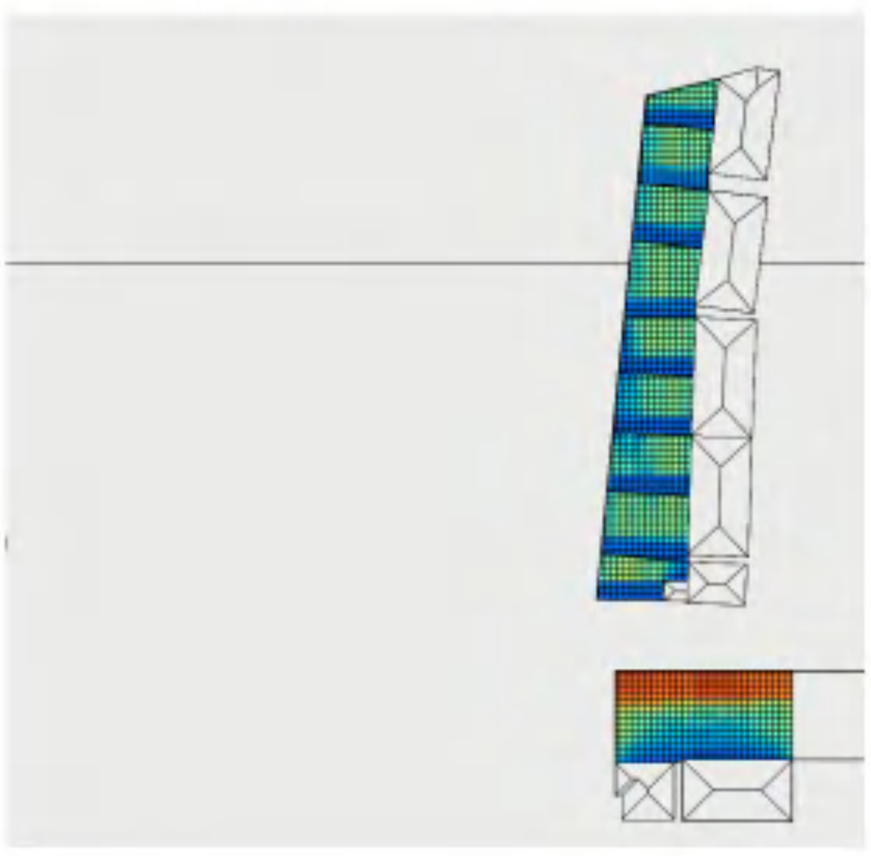
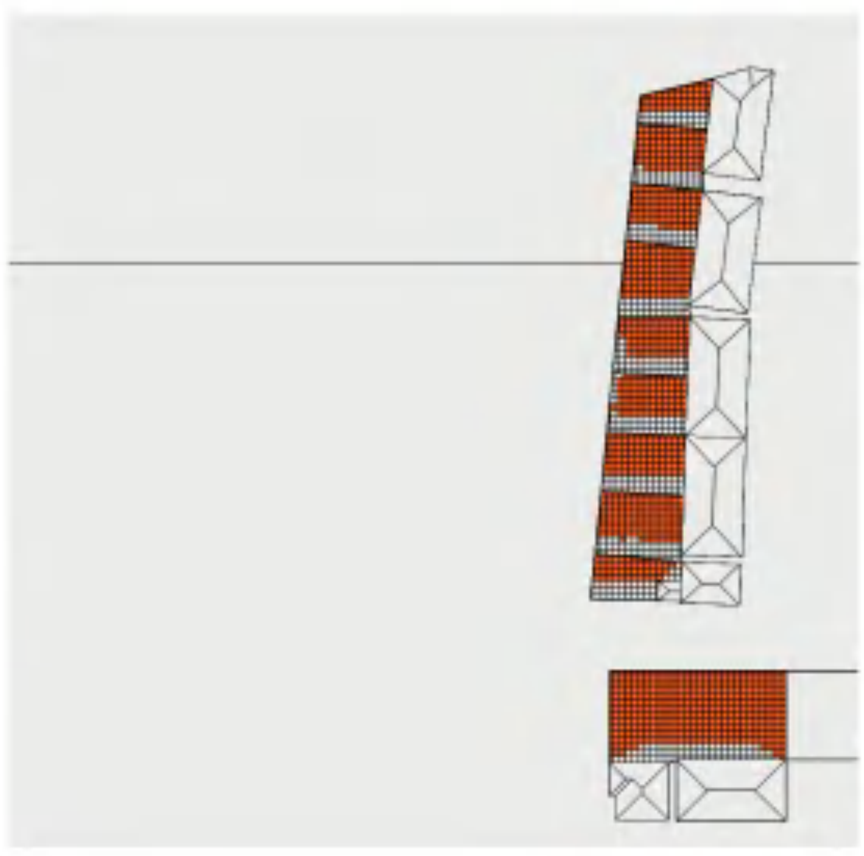
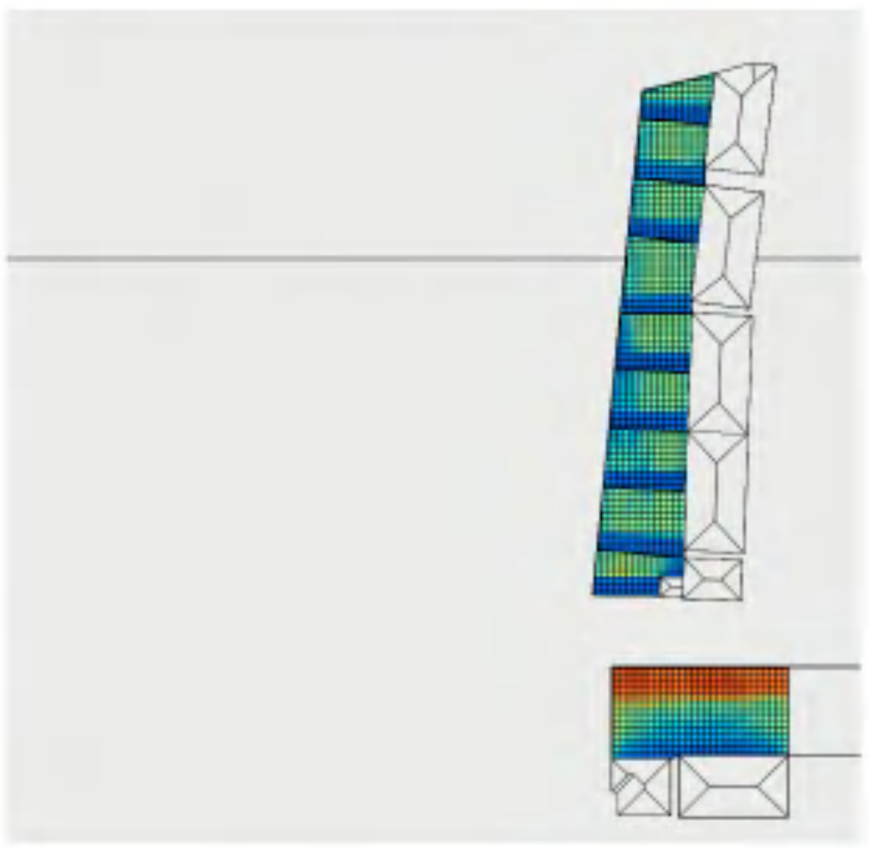
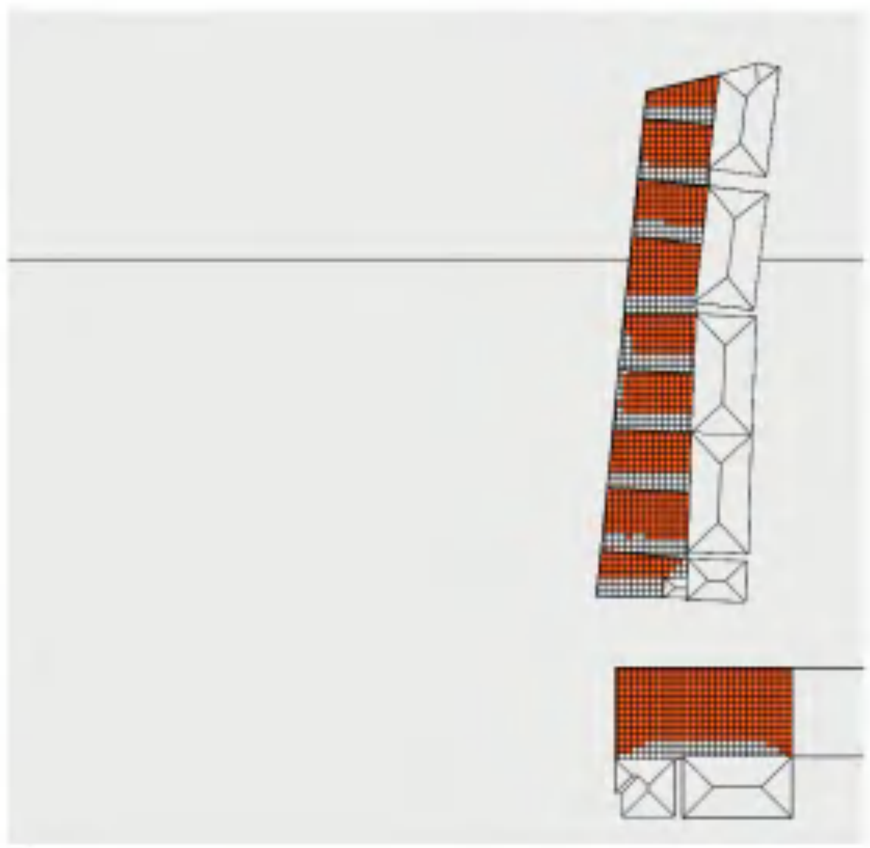
✓ The proposed amenity space will receive at least 2 hours of sunlight on over 50% of its area, exceeding the BRE guidelines.

x The proposed amenity space will receive at least 2 hours of sunlight on less than 50% of its area.

6.5 Existing Amenity Areas - Cappaghmore Road

The following images illustrate the existing neighbouring amenity areas that are receiving at least 2 hours of sunlight on 21st March.

<table>
<tr><td></td><td> 
</td><td>Receives more than 2 hours of sunlight

Receives less than 2 hours of sunlight</td></tr>
<tr><td>Existing Scheme</td><td>  </td><td>  </td></tr>
<tr><td>Proposed Scheme</td><td>  </td><td>  </td></tr>
</table>

The results illustrated above are summarised in the following table.

Existing Amenity Areas

Ref	Area (m^2)	Existing Area Receiving >2 hrs		Existing Area with Proposed Development in Place >2 hrs		Proposed vs Existing (%)	Comment
		(m^2)	(%)	(m^2)	(%)		
1	68	41	60%	41	60%	100%	✓
2	103	75	73%	75	73%	100%	✓
3	99	69	70%	69	70%	100%	✓
4	128	94	73%	94	73%	100%	✓
5	101	65	64%	65	64%	100%	✓
6	112	71	63%	71	63%	100%	✓
7	116	82	71%	82	71%	100%	✓
8	132	96	73%	96	73%	100%	✓
9	78	43	55%	43	55%	100%	✓
10	386	326	84%	326	84%	100%	✓

Based on the results in the able above, on March 21st the existing private amenity spaces will continue to receive the same level of sunlight even with the proposed development in place, thus exceeding the recommendations in the BRE Guide.

6.6 Solar Amenity Discussion

As outlined in Section 3.3.17 of the BRE Guide, for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on March 21st.

Proposed Public Amenity Areas

On the 21st of March, all of the proposed public amenity areas would receive over 2 hours of sunlight on at least 57% of their area. Overall, 99% of the proposed public amenity area will received at least 2 hours of sunlight on March 21st, thus exceeding BRE recommendations.

Proposed Private Gardens

On the 21st of March, 52 of the 78 tested proposed private gardens within the development would receive over 2 hours of sunlight on at least 50% of their area. Overall, 50% of the proposed private garden area will received at least 2 hours of sunlight on March 21st, thus exceeding BRE recommendations.

Existing Gardens Adjacent to the Proposed Development.

The existing communal and private amenity spaces in the adjacent properties have been analysed and the results demonstrate that they will continue to receive the same level of sunlight even with the proposed development in place on March 21st, thus exceeding the recommendations in the BRE Guide.

7 Sunlight to Existing Buildings

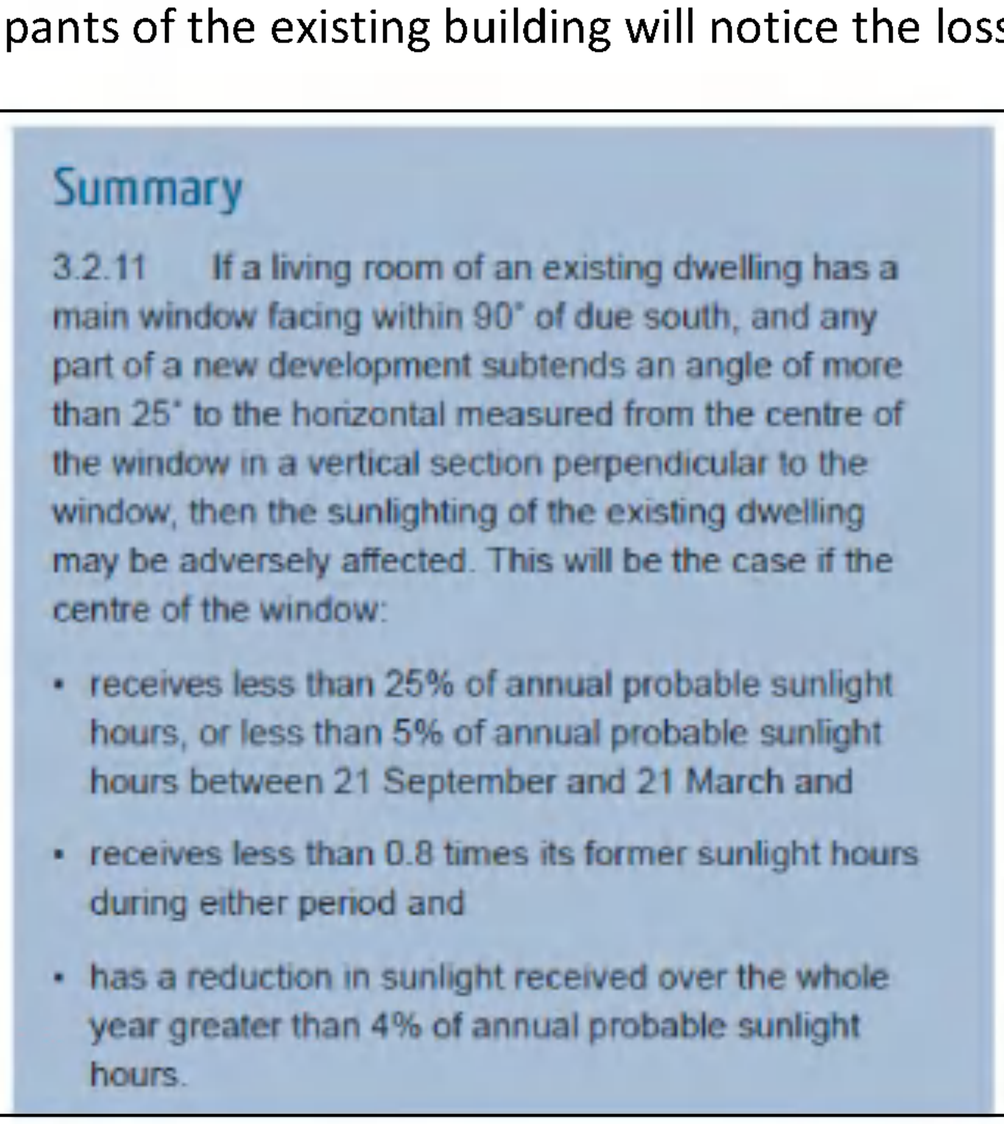
7.1 Guidance – BRE Guide / BS 8206-2:2008

The British Standard BS 8206-2:2008 recommends that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months, between 21st September and 21st March.

Here 'probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

If a window reference point can receive more than 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months between 21st September and 21st March, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

If the available sunlight hours are both less than the amount given and less than 0.8 times their former value, either over the whole year or just during the winter months (21st September to 21st March) and reduction in sunlight across the year has a greater reduction than 4%, then the occupants of the existing building will notice the loss of sunlight.



Extract from the BRE Guide

As such this study will compare the Existing Scheme and Proposed Schemes and consider if the values on the existing buildings meet the requirements outlined above when compared to their former value (that of the Existing scheme), i.e. Scenario 1.

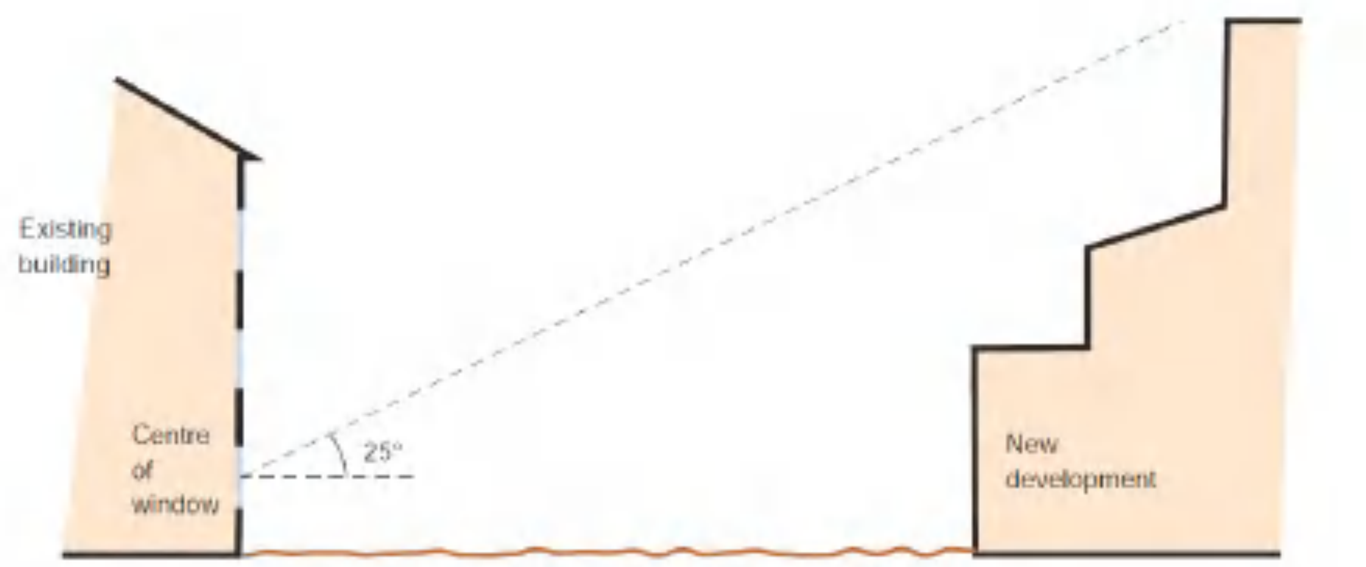
The proposed development has also been assessed against a scheme previously permitted on the subject site, i.e. Scenario 2. This scheme was granted permission in 2004 under DCC Reg. Ref. 4315/03 and has now expired. Although the permission has expired, the proposed site is zoned Z14 for development and as such the previously permitted scheme forms a good baseline to assess how the proposed development performs with respect to daylight and sunlight provision and its impact on adjacent properties. Note, the previously permitted scheme has been altered along the northern boundary to consider the more recent completed development on the Phase 5A lands to the north east of the application site.

7.2 APSH Exclusions

The BRE recommendations note that if a new development sits within 90° of due south of any main living room window of an existing dwelling, then these should be assessed for APSH. However, there are several exceptional cases in which APSH is not required to be calculated, as indicated below:

3.2.7 It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either of the following is true:

- If the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window (NB obstructions within 90° of due north of the existing window need not count here).
- The window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal (Figure 14 in Section 2.2). Again, obstructions within 90° of due north of the existing window need not be counted.
- The window wall faces within 20° of due south and the reference point has a VSC (section 2.1) of 27% or more.



Extract from the BRE Guide

Consequently, APSH will only be calculated for adjacent windows which meet the following conditions:

1. The existing building has living room with a main window which faces within 90 degrees of due south.
2. Existing building is located to the North, East, or West of the Proposed Development.
3. The VSC of the existing window is less than 27%, if the window faces within 20 degrees of south.

Based on the criteria outlined in the BRE guide, none of the existing buildings need to be analysed for Annual Probable Sunlight Hours (APSH). The buildings do not have living room windows that face within 90 degrees of south, and they are also too far away from the proposed development by the 25 degree rule.

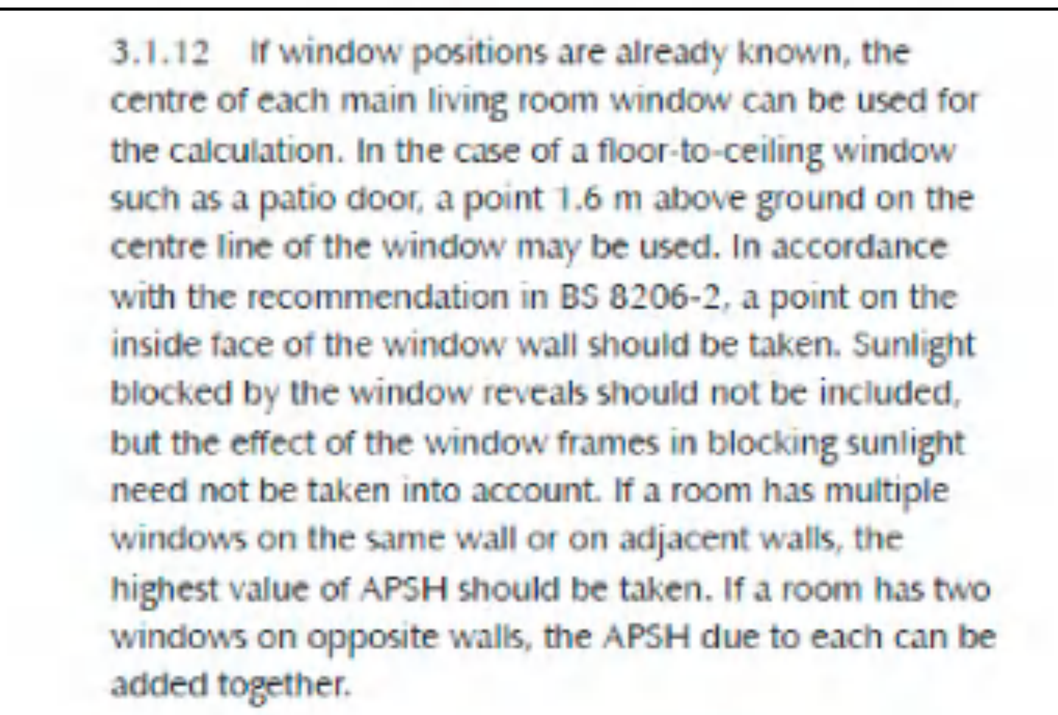
8 Sunlight to Proposed Development

8.1 Guidance – BRE Guide / BS8206-2:2008

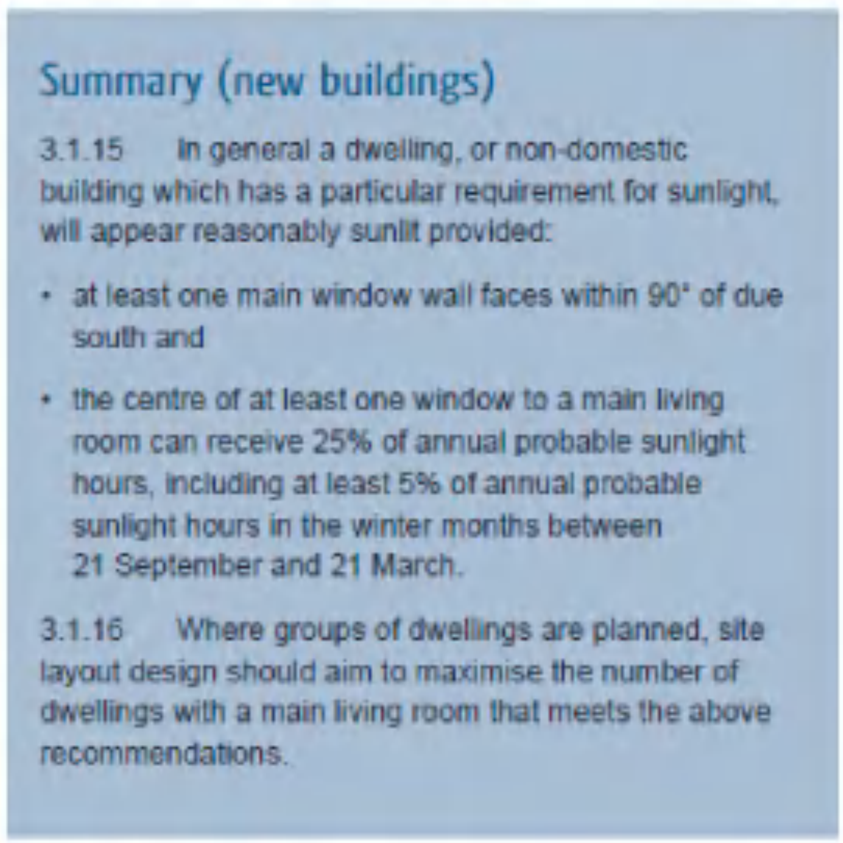
The British Standard BS 8206-2:2008 recommends that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months, between 21st September and 21st March. Here 'probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

If a window reference point can receive more than one quarter of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months between 21st September and 21st March, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

As stated in Section 3.1.12 of the BRE Guide, "If window positions are already known, the centre of each main living room window can be used for the calculation".



3.1.12 If window positions are already known, the centre of each main living room window can be used for the calculation. In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground on the centre line of the window may be used. In accordance with the recommendation in BS 8206-2, a point on the inside face of the window wall should be taken. Sunlight blocked by the window reveals should not be included, but the effect of the window frames in blocking sunlight need not be taken into account. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken. If a room has two windows on opposite walls, the APSH due to each can be added together.



Summary (new buildings)

3.1.15 In general a dwelling, or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided:

- at least one main window wall faces within 90° of due south and
- the centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March.

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

Extract from the BRE Guide

8.2 Guidance – IS EN 17037:2018

Section 5.3.1 of IS EN 17037:2018 states that *"exposure to sunlight is an important quality criterion of an interior space and can contribute to human well-being."* Table A.6 from IS EN 17037:2018 summarises the recommendation for daily sunlight exposure.

Table A.6 — Recommendation for daily sunlight exposure

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1,5 h
Medium	3,0 h
High	4,0 h

Within the context of a domestic property, IS EN 17037:2018 states that at least one habitable space within a dwelling should receive the recommended minimum value of 1.5 hours of sunlight on the 21st of March. The test is carried out on a clear, cloud free day.

8.3 APSH & Sunlight Exposure Assessment

Based on the above criteria for both the BRE Guide/BS8206-2:2008 and IS EN 17037:2018, all main living room windows within the proposed development have been assessed with the results included in the following sections.

Please note, the "Comment" symbol in each of the tables represents the following:

<u>BRE Guide / BS 8206-2:2008</u>

✓/✓ For these locations, both the annual and winter APSH results are greater than 25% and 5% respectively.

x /✓ For these locations, the annual APSH results are less than the recommended values, however, the winter APSH results are greater than 5%.

✓ / x For these locations, the winter APSH results are less than the recommended values, however, the annual APSH results are greater than 25%.

x / x For these locations, both the annual and winter APSH results are less than the recommended values.

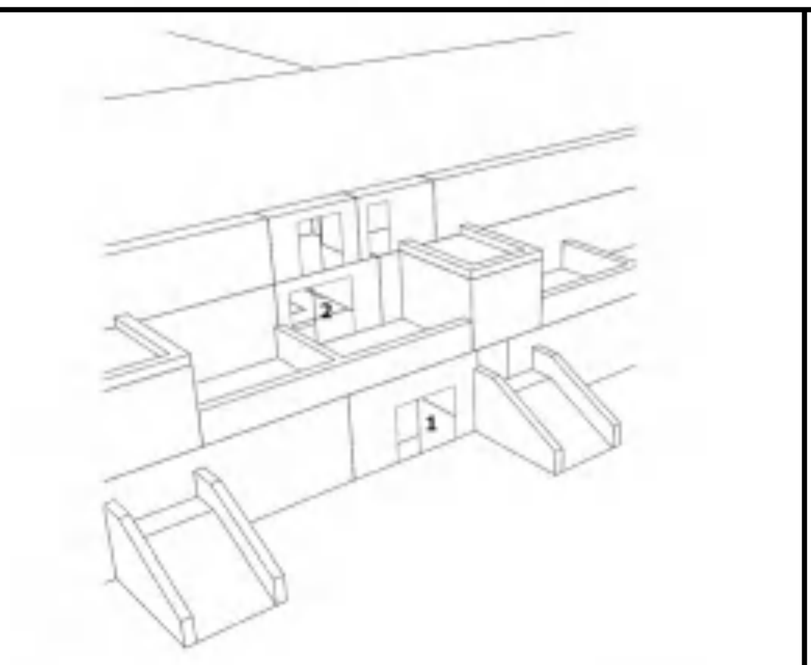
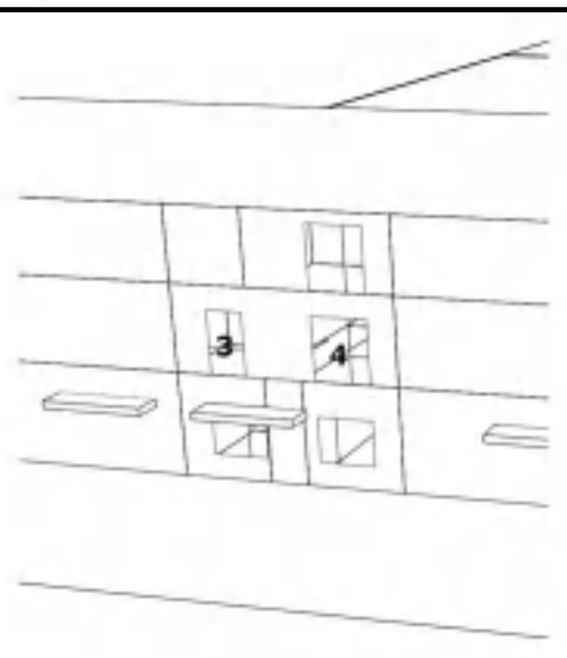
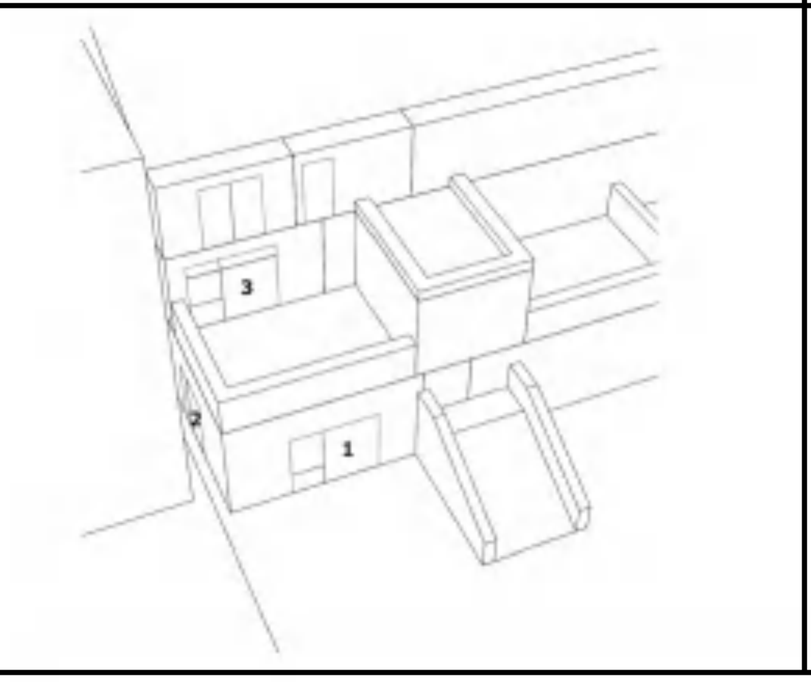
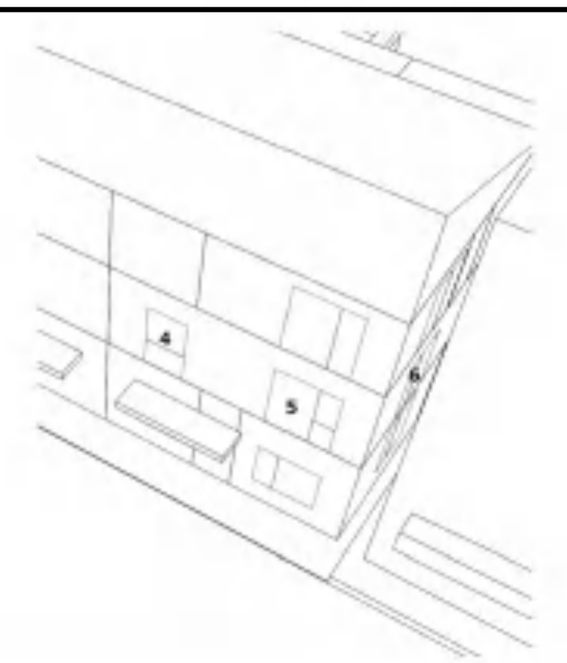
<u>IS EN 17037:2018</u>

✓ These rooms achieve the minimum 1.5 hours of recommended sunlight exposure on March 21st.

x These rooms do not achieve the minimum 1.5 hours of recommended sunlight exposure on March 21st.

8.3.1 Duplexes

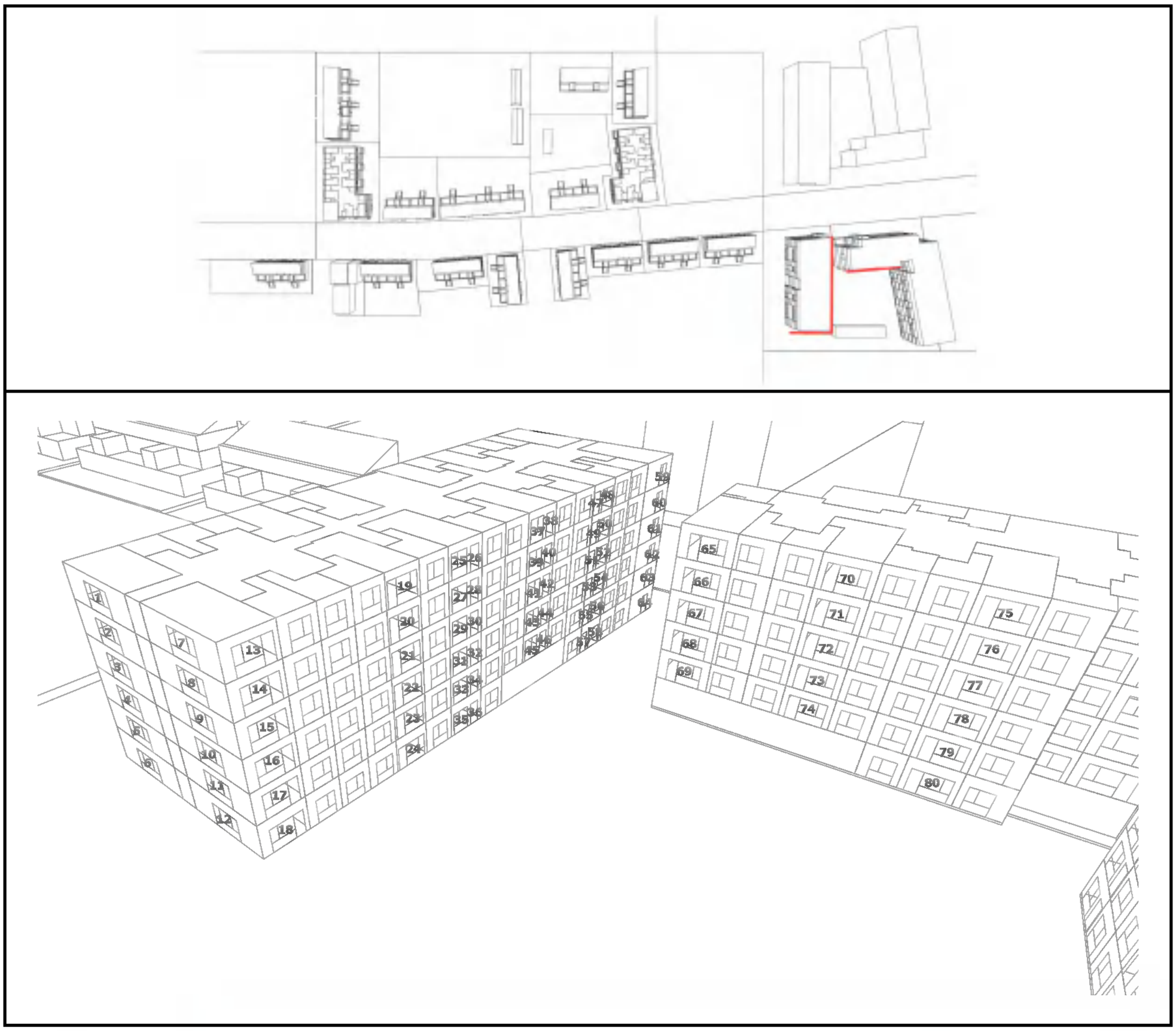
It should be noted that a sampling of Duplexes has been chosen to assess their performance. Specific duplexes were chosen based on worst case locations, in the middle of a terraced row and/or opposite another terrace of duplexes or one of the apartment buildings.

Duplexes 1, 2, 3, 4, 5 and 7		
Duplex 6		

[illegible]		APSH Assessment			Sunlight Exposure > 1.5 hrs
		Annual (%)	Winter (%)	[illegible]	[illegible]
Duplex 1	1	40.61	11.65	✓/✓	✓
	2	38.75	10.06	✓/✓	✓
	3	49.65	18.88	✓/✓	✓

		APSH Assessment			Sunlight Exposure > 1.5 hrs
		Annual (%)	Winter (%)		
	4	49.65	18.88	✓ / ✓	✓
Duplex 2	1	64.31	28.73	✓ / ✓	✓
	2	60.66	24.38	✓ / ✓	✓
	3	15.72	0.00	x / x	x
Duplex 2	4	15.08	0.00	x / x	x
Duplex 3	1	6.40	0.00	x / x	x
	2	4.17	0.00	x / x	x
	3	65.57	22.52	✓ / ✓	✓
	4	67.71	24.36	✓ / ✓	✓
Duplex 4	1	4.72	0.00	x / x	x
	2	3.12	0.00	x / x	x
	3	69.42	26.77	✓ / ✓	✓
	4	70.40	28.44	✓ / ✓	✓
Duplex 5	1	39.95	15.48	✓ / ✓	✓
	2	39.89	13.30	✓ / ✓	✓
	3	40.33	16.78	✓ / ✓	✓
	4	38.74	15.89	✓ / ✓	✓
Duplex 6	1	54.96	19.62	✓ / ✓	✓
	2	8.44	4.24	x / x	x
	3	14.29	0.00	x / x	x
	4	13.14	0.00	x / x	x
	5	0.62	0.00	x / x	x
	6	45.50	20.76	✓ / ✓	✓
Duplex 7	1	60.70	27.38	✓ / ✓	✓
	2	69.98	30.47	✓ / ✓	✓
	3	13.29	0.00	x / x	x
	4	13.29	0.00	x / x	x

8.3.2 Block 1 View 1

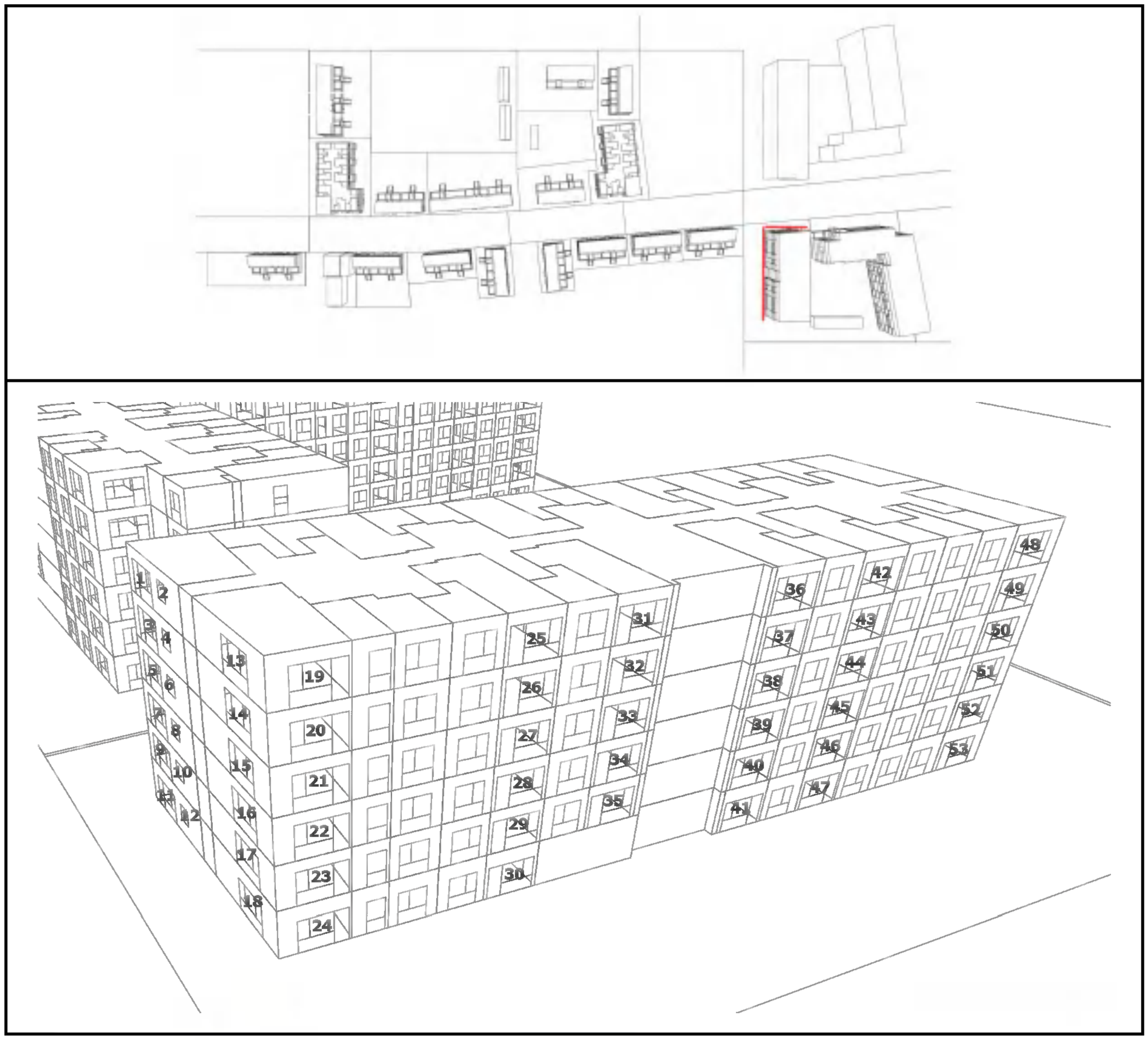


Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comment
1	80.92	36.87	✓/ ✓	✓
2	80.45	36.39	✓/ ✓	✓
3	81.22	37.17	✓/ ✓	✓
4	80.46	37.11	✓/ ✓	✓
5	81.05	37.74	✓/ ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
6	79.73	37.06	✓/ ✓	✓
7	81.21	37.15	✓/ ✓	✓
8	80.30	36.25	✓/ ✓	✓
9	81.08	37.60	✓/ ✓	✓
10	80.70	37.34	✓/ ✓	✓
11	80.42	37.76	✓/ ✓	✓
12	79.02	36.36	✓/ ✓	✓
13	49.65	18.88	✓/ ✓	✓
14	29.66	16.16	✓/ ✓	✓
15	27.57	16.16	✓/ ✓	✓
16	26.44	16.16	✓/ ✓	✓
17	24.38	16.16	x / ✓	✓
18	28.26	17.68	✓/ ✓	✓
19	48.97	18.18	✓/ ✓	✓
20	31.17	16.73	✓/ ✓	✓
21	28.61	16.01	✓/ ✓	✓
22	25.64	14.76	✓/ ✓	✓
23	23.54	14.76	x / ✓	✓
24	27.22	16.02	✓/ ✓	✓
25	48.51	18.18	✓/ ✓	✓
26	47.58	18.18	✓/ ✓	✓
27	44.58	16.84	✓/ ✓	✓
28	41.43	17.17	✓/ ✓	✓
29	41.38	15.41	✓/ ✓	✓
30	38.47	15.53	✓/ ✓	✓
31	36.70	14.22	✓/ ✓	✓
32	34.28	14.50	✓/ ✓	✓
33	32.80	13.83	✓/ ✓	✓
34	31.10	14.22	✓/ ✓	✓
35	31.46	13.52	✓/ ✓	✓
36	30.93	14.17	✓/ ✓	✓
37	46.21	18.18	✓/ ✓	✓
38	44.57	18.18	✓/ ✓	✓
39	42.16	16.98	✓/ ✓	✓
40	38.29	17.02	✓/ ✓	✓
41	38.63	14,66	✓/ ✓	✓
42	35.24	14.76	✓/ ✓	✓
43	34.44	13.12	✓/ ✓	✓
44	31.57	13.45	✓/ ✓	✓
45	31.52	12.67	✓/ ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
46	28.75	13.13	✓ / ✓	✓
47	42.14	17.05	✓ / ✓	✓
48	43.15	17.30	✓ / ✓	✓
49	19.46	8.64	x / ✓	✓
50	23.43	12.34	x / ✓	x
51	15.70	8.52	x / ✓	✓
52	16.34	11.20	x / ✓	x
53	13.78	7.83	x / ✓	✓
54	13.29	10.44	x / ✓	x
55	13.78	7.83	x / ✓	✓
56	13.19	10.44	x / ✓	x
57	15.52	8.85	x / ✓	✓
58	13.40	11.13	x / ✓	x
59	45.31	14.88	✓ / ✓	✓
60	39.02	10.72	✓ / ✓	✓
61	33.24	8.31	✓ / ✓	✓
62	27.25	7.74	✓ / ✓	✓
63	22.74	7.69	✓ / ✓	✓
64	9.16	0.00	x / x	x
65	73.34	32.08	✓ / ✓	✓
66	53.14	25.38	✓ / ✓	✓
67	46.05	20.07	✓ / ✓	✓
68	42.14	18.87	✓ / ✓	✓
69	39.28	17.15	✓ / ✓	✓
70	72.74	33.28	✓ / ✓	✓
71	53.52	26.13	✓ / ✓	✓
72	46.07	21.48	✓ / ✓	✓
73	41.65	18.77	✓ / ✓	✓
74	38.25	17.73	✓ / ✓	✓
75	70.78	32.48	✓ / ✓	✓
76	48.16	22.71	✓ / ✓	✓
77	41.72	21.01	✓ / ✓	✓
78	36.04	18.20	✓ / ✓	✓
79	32.87	17.74	✓ / ✓	✓
80	32.12	17.86	✓ / ✓	✓

8.3.3 Block 1 View 2

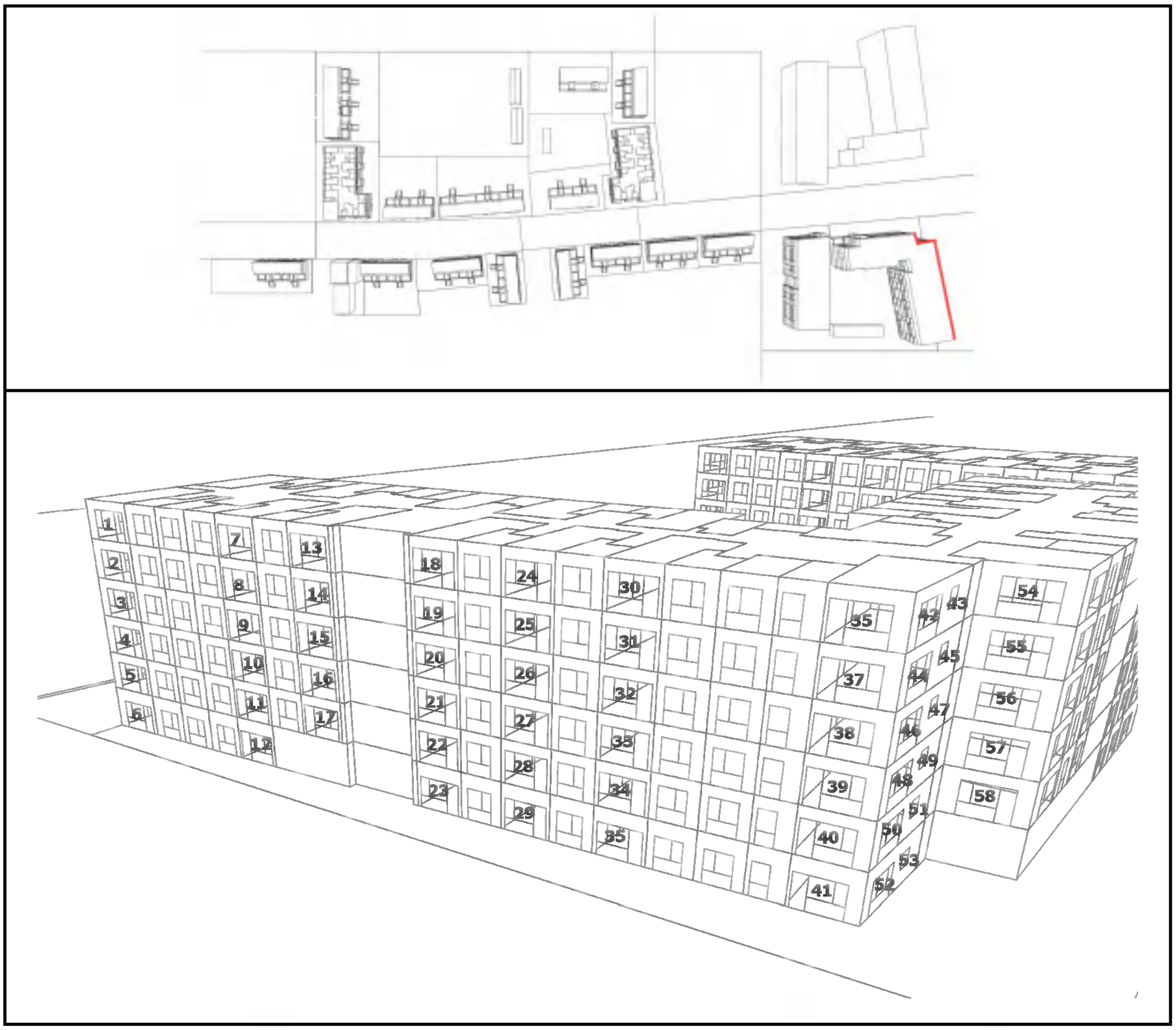


Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comments
1	17.35	0.00	x / x	x
2	17.39	0.00	x / x	x
3	16.10	0.00	x / x	x
4	14.51	0.00	x / x	x
5	15.44	0.00	x / x	x
6	13.91	0.00	x / x	x
7	14.05	0.00	x / x	x
8	12.39	0.00	x / x	x
9	12.89	0.00	x / x	x
10	10.96	0.00	x / x	x

Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comment
11	12.37	0.00	x / x	x
12	10.32	0.00	x / x	x
13	17.46	0.00	x / x	x
14	17.20	0.00	x / x	x
15	15.55	0.00	x / x	x
16	13.59	0.00	x / x	x
17	12.16	0.00	x / x	x
18	11.02	0.00	x / x	x
19	48.59	18.18	✓ / ✓	✓
20	32.14	16.00	✓ / ✓	✓
21	30.24	15.49	✓ / ✓	✓
22	28.07	14.10	✓ / ✓	✓
23	25.70	13.66	✓ / ✓	✓
24	27.01	15.26	✓ / ✓	✓
25	48.34	18.18	✓ / ✓	✓
26	33.21	15.84	✓ / ✓	✓
27	31.57	15.23	✓ / ✓	✓
28	27.80	13.52	✓ / ✓	✓
29	26.71	13.55	✓ / ✓	✓
30	28.08	14.06	✓ / ✓	✓
31	48.32	18.01	✓ / ✓	✓
32	34.78	17.02	✓ / ✓	✓
33	33.37	16.14	✓ / ✓	✓
34	29.76	14.58	✓ / ✓	✓
35	30.08	14.93	✓ / ✓	✓
36	48.50	17.87	✓ / ✓	✓
37	32.34	15.22	✓ / ✓	✓
38	30.83	14.57	✓ / ✓	✓
39	29.39	14.15	✓ / ✓	✓
40	28.21	14.43	✓ / ✓	✓
41	31.15	14.66	✓ / ✓	✓
42	48.59	17.83	✓ / ✓	✓
43	33.73	16.44	✓ / ✓	✓
44	31.85	15.22	✓ / ✓	✓
45	31.46	14.87	✓ / ✓	✓
46	30.02	15.53	✓ / ✓	✓
47	33.30	15.55	✓ / ✓	✓
48	48.59	17.82	✓ / ✓	✓
49	31.18	14.95	✓ / ✓	✓
50	30.68	14.84	✓ / ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
51	30.27	14.74	✓/ ✓	✓
52	30.21	15.76	✓/ ✓	✓
53	31.57	15.46	✓/ ✓	✓

8.3.4 Block 1 View 3

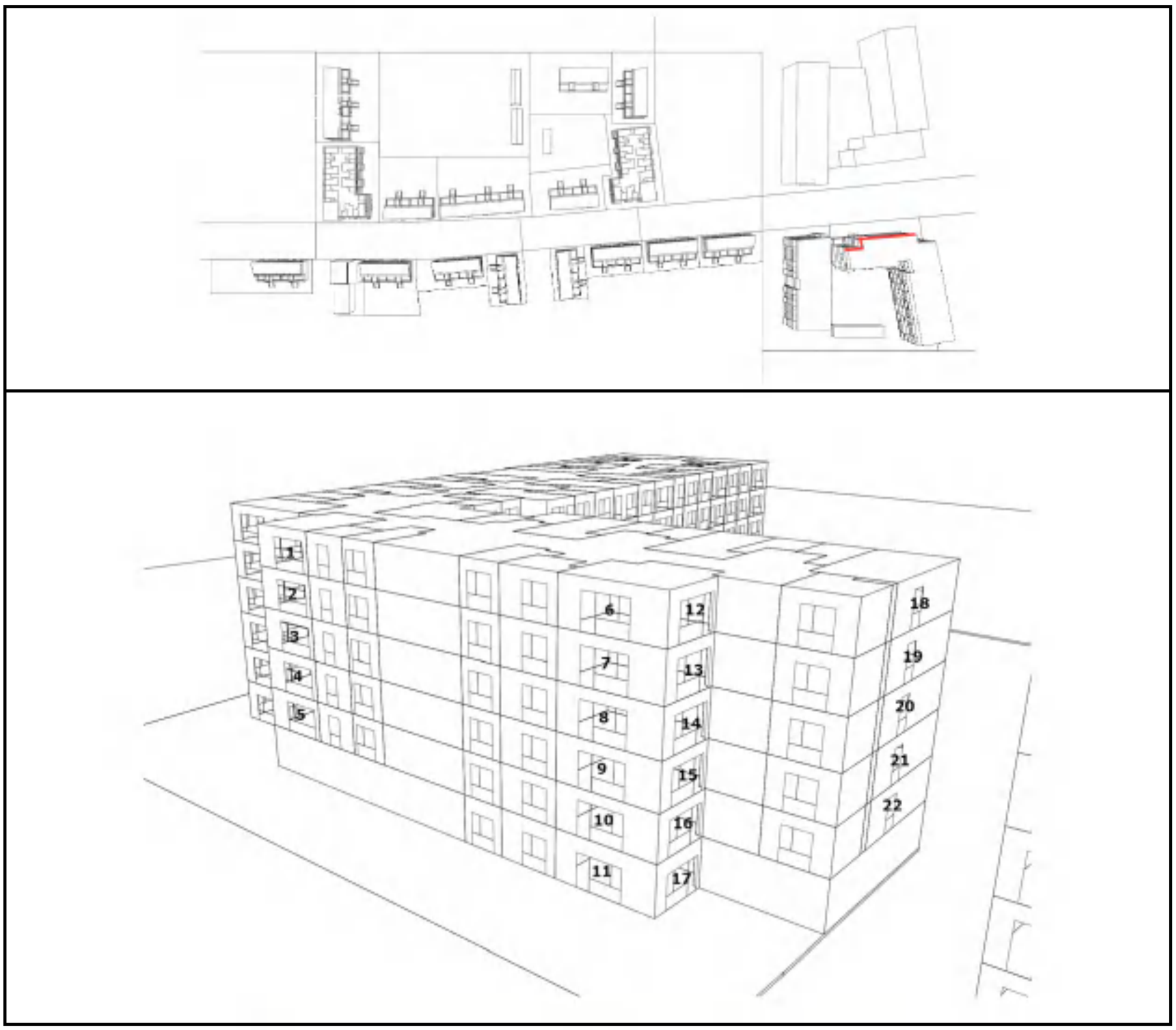


[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
1	42.66	15.38	✓/ ✓	✓
2	28.47	13.75	✓/ ✓	✓
3	28.47	13.75	✓/ ✓	✓
4	28.47	13.75	✓/ ✓	✓
5	28.47	13.75	✓/ ✓	✓
6	31.88	14.77	✓/ ✓	✓
7	42.66	15.38	✓/ ✓	✓
8	40.69	15.09	✓/ ✓	✓
9	40.42	14.83	✓/ ✓	✓
10	40.42	14.83	✓/ ✓	✓
11	40.42	14.83	✓/ ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	40.96	15.04	✓/ ✓	✓
13	42.66	15.38	✓/ ✓	✓
14	40.49	14.89	✓/ ✓	✓
15	40.29	14.80	✓/ ✓	✓
16	40.29	14.80	✓/ ✓	✓
17	40.29	14.80	✓/ ✓	✓
18	42.66	15.38	✓/ ✓	✓
19	32.36	14.97	✓/ ✓	✓
20	32.36	14.97	✓/ ✓	✓
21	32.36	14.97	✓/ ✓	✓
22	32.36	14.97	✓/ ✓	✓
23	35.62	15.13	✓/ ✓	✓
24	42.66	15.38	✓/ ✓	✓
25	30.75	13.63	✓/ ✓	✓
26	30.01	13.51	✓/ ✓	✓
27	30.01	13.51	✓/ ✓	✓
28	30.01	13.51	✓/ ✓	✓
29	32.69	13.61	✓/ ✓	✓
30	42.66	15.38	✓/ ✓	✓
31	31.04	13.65	✓/ ✓	✓
32	30.03	13.27	✓/ ✓	✓
33	30.03	13.27	✓/ ✓	✓
34	30.03	13.27	✓/ ✓	✓
35	33.19	13.48	✓/ ✓	✓
36	42.69	15.38	✓/ ✓	✓
37	40.56	14.91	✓/ ✓	✓
38	40.13	14.68	✓/ ✓	✓
39	40.13	14.68	✓/ ✓	✓
40	40.13	14.68	✓/ ✓	✓
41	40.77	14.84	✓/ ✓	✓
42	10.74	0.00	x / x	x
43	7.58	0.00	x / x	x
44	8.25	0.00	x / x	x
45	6.99	0.00	x / x	x
46	7.00	0.00	x / x	x
47	6.99	0.00	x / x	x
48	7.00	0.00	x / x	x
49	6.99	0.00	x / x	x
50	7.00	0.00	x / x	x
51	6.99	0.00	x / x	x

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
52	7.00	0.00	x / x	x
53	6.99	0.00	x / x	x
54	20.70	0.48	x / x	x
55	11.27	0.48	x / x	x
56	11.20	0.48	x / x	x
57	11.14	0.48	x / x	x
58	11.14	0.48	x / x	x

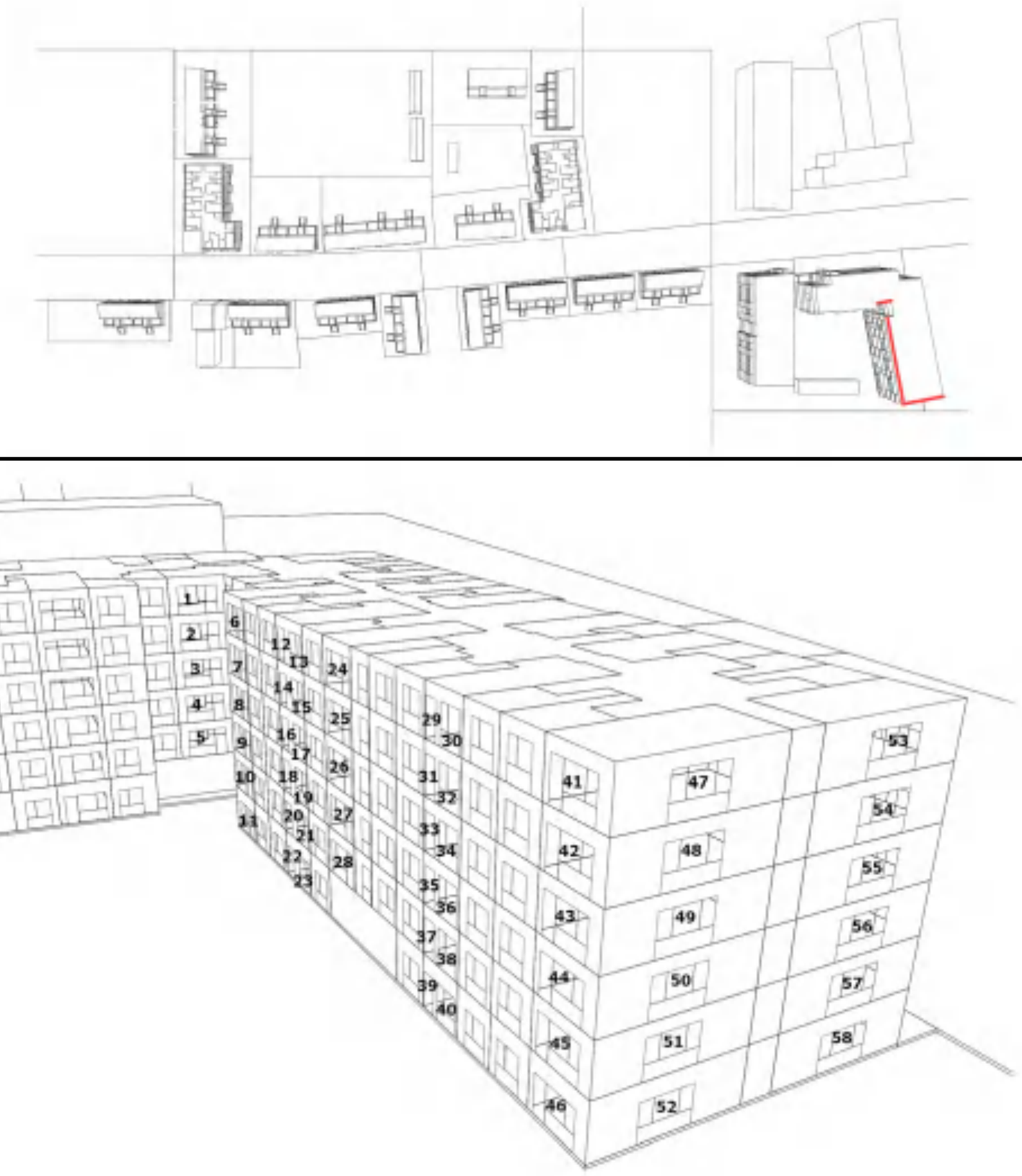
8.3.5 Block 1 View 4



[illegible]	[illegible] APSH Assessment			Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
1	17.62	0.00	x / x	x
2	16.48	0.00	x / x	x
3	15.53	0.00	x / x	x
4	15.47	0.00	x / x	x
5	15.27	0.00	x / x	x
6	16.94	0.00	x / x	x
7	14.95	0.00	x / x	x
8	14.22	0.00	x / x	x
9	12.70	0.00	x / x	x
10	12.37	0.00	x / x	x
11	13.10	0.00	x / x	x

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	28.05	0.85	✓ / x	x
13	14.47	0.00	x / x	x
14	9.86	0.00	x / x	x
15	7.17	0.00	x / x	x
16	5.46	0.00	x / x	x
17	0.14	0.00	x / x	x
18	40.98	16.15	✓ / ✓	✓
19	30.45	12.15	✓ / ✓	✓
20	21.50	8.52	x / ✓	✓
21	17.14	6.99	x / ✓	✓
22	14.69	6.29	x / ✓	✓

8.3.6 Block 1 View 5

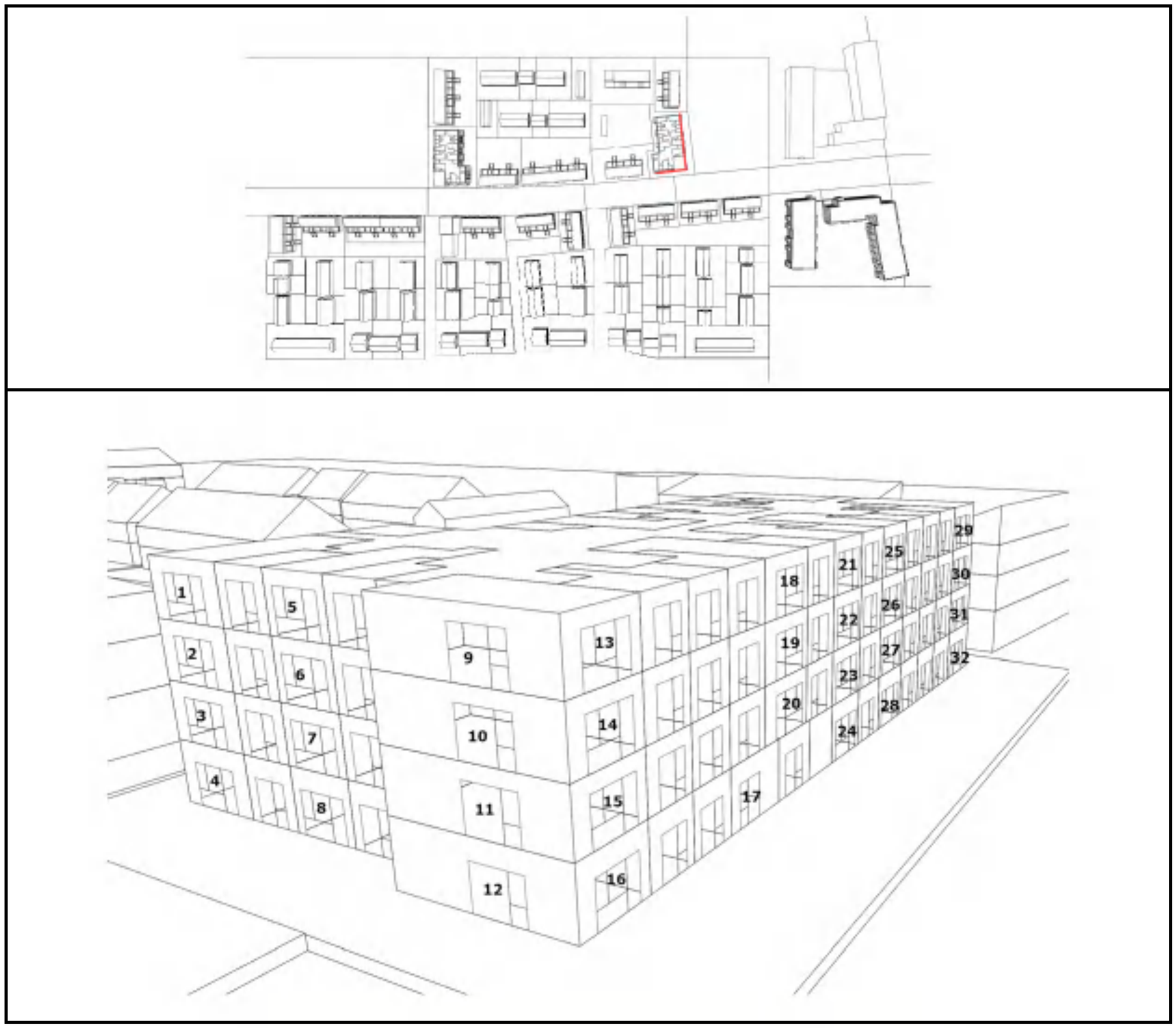


Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comments
1	53.94	22.76	✓/ ✓	✓
2	27.06	14.71	✓/ ✓	✓
3	22.67	13.29	x / ✓	✓
4	20.48	12.87	x / ✓	✓
5	18.27	12.91	x / ✓	✓
6	50.35	21.19	✓/ ✓	✓
7	34.16	11.53	✓/ ✓	✓
8	29.72	11.26	✓/ ✓	✓
9	25.38	10.80	✓/ ✓	✓
10	23.16	9.95	x / ✓	✓
11	24.63	10.38	x / ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	52.36	21.28	✓/ ✓	✓
13	53.47	21.68	✓/ ✓	✓
14	42.62	18.49	✓/ ✓	✓
15	46.80	18.02	✓/ ✓	✓
16	40.49	17.76	✓/ ✓	✓
17	44.67	17.38	✓/ ✓	✓
18	37.18	17.70	✓/ ✓	✓
19	41.65	17.78	✓/ ✓	✓
20	34.16	17.00	✓/ ✓	✓
21	39.40	17.35	✓/ ✓	✓
22	35.45	16.47	✓/ ✓	✓
23	37.60	15.92	✓/ ✓	✓
24	53.11	21.68	✓/ ✓	✓
25	28.08	16.13	✓/ ✓	✓
26	27.70	16.14	✓/ ✓	✓
27	27.05	16.83	✓/ ✓	✓
28	24.26	16.83	x / ✓	✓
29	52.62	21.36	✓/ ✓	✓
30	52.64	21.39	✓/ ✓	✓
31	44.56	20.50	✓/ ✓	✓
32	51.99	20.87	✓/ ✓	✓
33	43.14	21.03	✓/ ✓	✓
34	49.39	21.36	✓/ ✓	✓
35	41.56	20.96	✓/ ✓	✓
36	48.14	21.45	✓/ ✓	✓
37	38.96	20.40	✓/ ✓	✓
38	46.19	20.92	✓/ ✓	✓
39	40.64	20.66	✓/ ✓	✓
40	44.96	20.98	✓/ ✓	✓
41	53.62	21.25	✓/ ✓	✓
42	40.23	19.30	✓/ ✓	✓
43	38.19	19.63	✓/ ✓	✓
44	37.41	19.90	✓/ ✓	✓
45	35.85	19.03	✓/ ✓	✓
46	38.69	19.57	✓/ ✓	✓
47	81.07	37.71	✓/ ✓	✓
48	80.94	37.76	✓/ ✓	✓
49	81.12	37.76	✓/ ✓	✓
50	80.91	37.76	✓/ ✓	✓
51	79.29	37.76	✓/ ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
52	80.12	36.76	✓/ ✓	✓
53	81.12	37.76	✓/ ✓	✓
54	81.12	37.76	✓/ ✓	✓
55	81.12	37.76	✓/ ✓	✓
56	81.12	37.76	✓/ ✓	✓
57	81.12	37.76	✓/ ✓	✓
58	81.12	37.76	✓/ ✓	✓

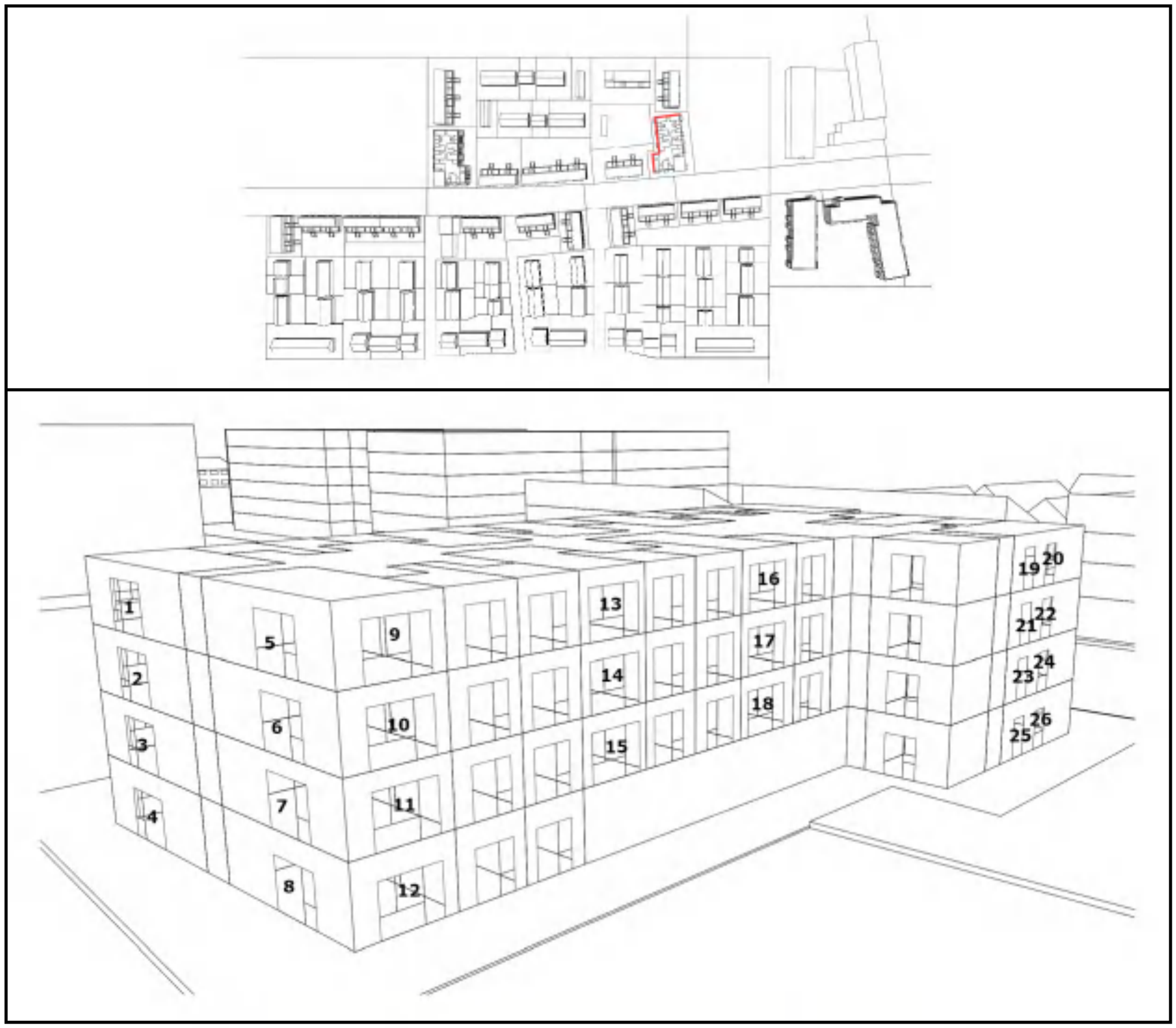
8.3.7 Block 2 View 1



Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	[illegible]	[illegible]
1	78.84	36.26	✓/ ✓	✓
2	34.88	28.96	✓/ ✓	✓
3	24.60	19.52	x / ✓	✓
4	24.64	15.34	x / ✓	✓
5	76.39	36.38	✓/ ✓	✓
6	35.40	27.12	✓/ ✓	✓
7	25.96	18.97	✓/ ✓	✓
8	26.49	16.10	✓/ ✓	✓
9	79.60	36.37	✓/ ✓	✓
10	74.84	32.19	✓/ ✓	✓
11	65.27	22.61	✓/ ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	57.84	15.18	✓/ ✓	✓
13	44.01	16.09	✓/ ✓	✓
14	23.27	12.29	x / ✓	✓
15	18.75	8.78	x / ✓	✓
16	18.73	6.06	x / ✓	✓
17	34.50	8.23	✓/ ✓	✓
18	43.36	15.38	✓/ ✓	✓
19	21.89	10.99	x / ✓	✓
20	19.39	9.59	x / ✓	✓
21	43.36	14.69	✓/ ✓	✓
22	22.85	11.07	x / ✓	✓
23	20.55	10.61	x / ✓	✓
24	21.59	8.60	x / ✓	✓
25	43.36	14.69	✓/ ✓	✓
26	23.32	11.39	x / ✓	✓
27	20.65	10.62	x / ✓	✓
28	22.24	9.05	x / ✓	✓
29	44.20	14.69	✓/ ✓	✓
30	36.44	12.04	✓/ ✓	✓
31	33.24	11.65	✓/ ✓	✓
32	31.94	10.52	✓/ ✓	✓

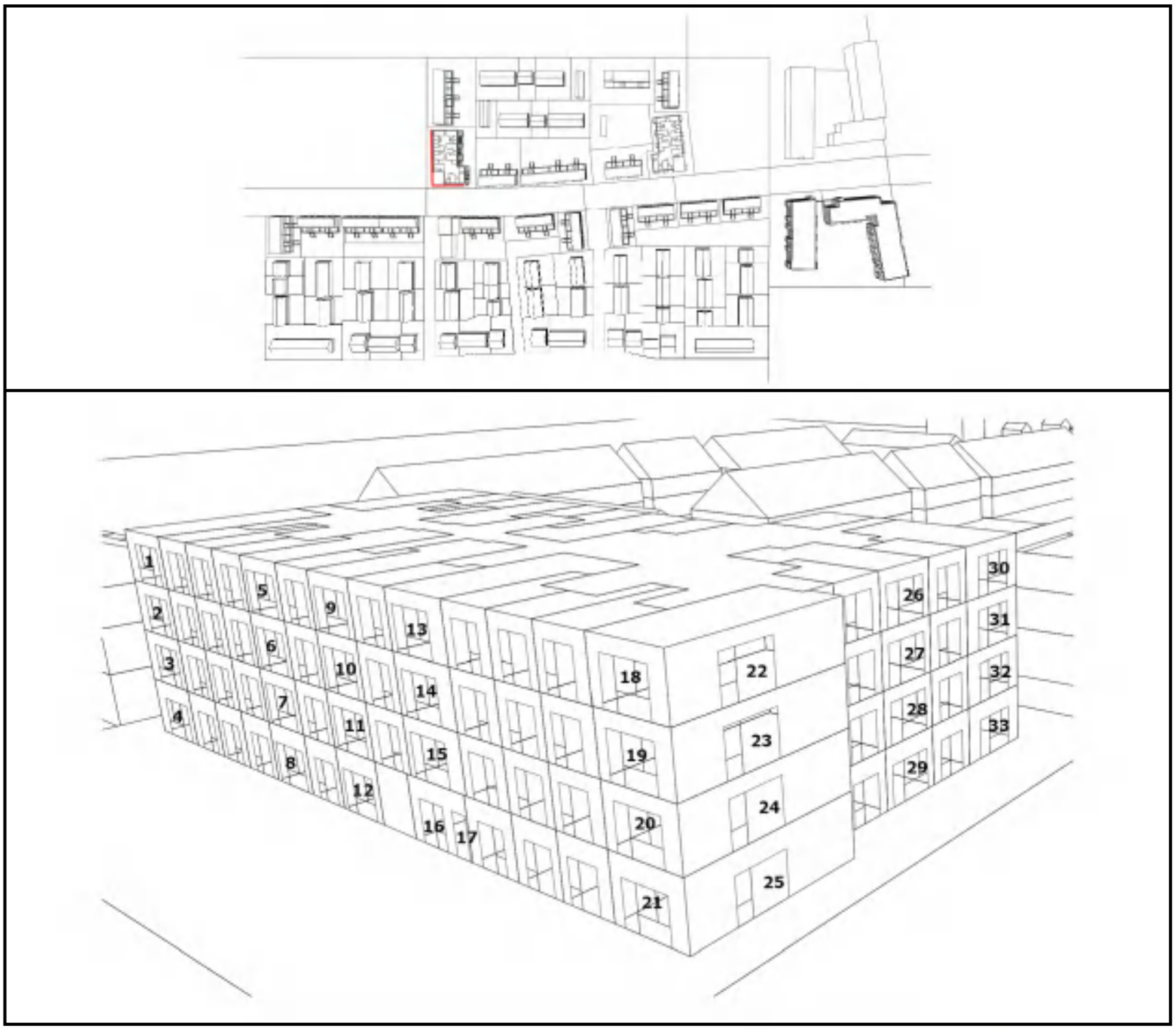
8.3.8 Block 2 View 2



Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comments
1	19.25	0.07	x / x	x
2	18.02	0.11	x / x	x
3	15.91	0.00	x / x	x
4	13.96	0.00	x / x	x
5	18.04	0.00	x / x	x
6	16.79	0.00	x / x	x
7	15.44	0.00	x / x	x
8	13.76	0.00	x / x	x
9	51.10	20.14	✓/ ✓	✓
10	29.23	14.59	✓/ ✓	✓
11	26.17	12.24	✓/ ✓	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	25.09	9.92	✓/ ✓	✓
13	51.05	20.28	✓/ ✓	✓
14	41.14	15.20	✓/ ✓	✓
15	32.56	8.84	✓/ ✓	✓
16	47.86	17.09	✓/ ✓	✓
17	34.09	7.37	✓/ ✓	✓
18	27.16	5.72	✓/ ✓	✓
19	49.39	18.62	✓/ ✓	✓
20	49.37	18.60	✓/ ✓	✓
21	44.63	14.59	✓/ ✓	✓
22	44.45	15.20	✓/ ✓	✓
23	36.46	11.77	✓/ ✓	✓
24	34.68	13.34	✓/ ✓	✓
25	22.50	8.31	x / ✓	✓
26	20.65	8.89	x / ✓	✓

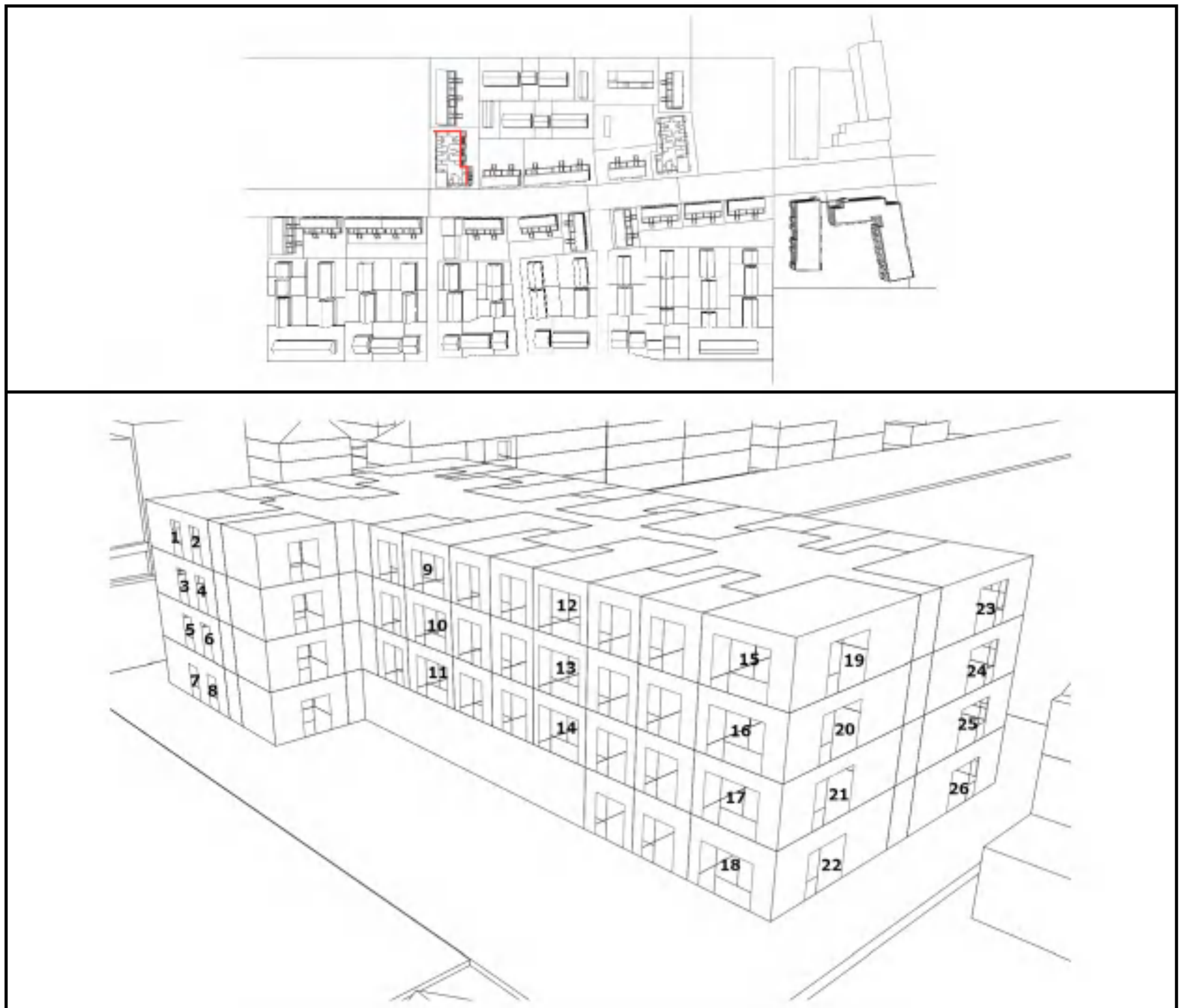
8.3.9 Block 3 View 1



Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comments
1	49.65	18.88	✓/ ✓	✓
2	29.35	14.92	✓/ ✓	✓
3	28.16	13.72	✓/ ✓	✓
4	31.26	14.00	✓/ ✓	✓
5	49.65	18.88	✓/ ✓	✓
6	42.95	16.17	✓/ ✓	✓
7	40.81	14.13	✓/ ✓	✓
8	40.82	13.65	✓/ ✓	✓
9	49.65	18.88	✓/ ✓	✓
10	41.27	14.50	✓/ ✓	✓
11	39.78	13.58	✓/ ✓	✓

[illegible]	APSH Assessment			Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	38.32	12.91	✓/✓	✓
13	49.65	18.88	✓/✓	✓
14	27.25	12.93	✓/✓	✓
15	38.89	12.60	✓/✓	✓
16	39.60	11.11	✓/✓	✓
17	40.27	11.59	✓/✓	✓
18	49.47	18.71	✓/✓	✓
19	40.86	13.42	✓/✓	✓
20	38.64	11.71	✓/✓	✓
21	37.14	9.53	✓/✓	✓
22	80.40	36.34	✓/✓	✓
23	72.82	28.76	✓/✓	✓
24	66.73	22.69	✓/✓	✓
25	61.64	17.57	✓/✓	✓
26	78.85	36.86	✓/✓	✓
27	51.63	27.62	✓/✓	✓
28	42.95	20.61	✓/✓	✓
29	40.10	16.23	✓/✓	✓
30	80.27	37.42	✓/✓	✓
31	55.39	29.72	✓/✓	✓
32	45.47	21.56	✓/✓	✓
33	41.00	16.47	✓/✓	✓

8.3.10 Block 3 View 2



Ref.	APSH Assessment			Sunlight Exposure > 1.5 hrs
	Annual (%)	Winter (%)	Comments	Comments
1	49.37	18.60	✓/ ✓	✓
2	48.96	18..19	✓/ ✓	✓
3	45.34	16.37	✓/ ✓	✓
4	44.82	14.72	✓/ ✓	✓
5	36.62	13.55	✓/ ✓	✓
6	37.24	12.17	✓/ ✓	✓
7	22.30	8.57	x / ✓	✓
8	25.18	7.28	x / ✓	✓
9	45.37	14.60	✓/ ✓	✓
10	17.65	4.02	x / x	✓
11	15.21	2.53	x / x	✓

[illegible]	[illegible] APSH Assessment			[illegible] Sunlight Exposure > 1.5 hrs
	[illegible] Annual (%)	[illegible] Winter (%)	[illegible]	[illegible]
12	50.02	19.25	✓ / ✓	✓
13	27.30	12.47	✓ / ✓	✓
14	21.35	8.22	x / ✓	✓
15	50.32	19.55	✓ / ✓	✓
16	27.37	13.47	✓ / ✓	✓
17	21.29	10.39	x / ✓	✓
18	20.77	9.67	x / ✓	✓
19	16.15	0.09	x / x	x
20	13.19	0.00	x / x	x
21	9.51	0.00	x / x	x
22	7.27	0.00	x / x	x
23	17.35	0.74	x / x	x
24	16.79	0.00	x / x	x
25	14.85	0.00	x / x	x
26	13.16	0.00	x / x	x

8.4 Discussion

BRE Guide / BS 8206-2:2008

Within the BS 8206-2:2008 standard, when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

"The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

This is also reflected in the BRE Guide which states:

"The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 418 no. points tested, 295 no. points (71%) meet the BRE recommended values over the annual period. The compliance rate increases to 80% (335 no. points) during the winter period when sunlight is most valuable. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* e.g. Block 1 View 5, Block 4 View 1 etc., or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with BRE Guide/BS 8206-2:2008 are considered satisfactory in the context of an urban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

IS EN 17037:2018

As the sunlight exposure assessment in accordance with IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide / BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 418 no. points tested, 332 no. points (79%) meet the IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* e.g. Block 1 View 5, Block 4 View 1 etc., or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered satisfactory in the context of an urban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

Note, the sunlight exposure results are visually represented in Appendix B.

9 Daylight to Existing Buildings

9.1 Guidance – BRE Guide / BS 8206-2:2008

When designing a new development, it is important to safeguard the daylight to nearby buildings. The BRE Guide provides numerical values that are purely advisory. Different criteria may be used based on the requirements for daylighting in an area viewed against other site layout constraints. Another issue is whether the existing building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light. Any reduction in the total amount of skylight can be calculated by determining the vertical sky component at the centre of key reference points. The vertical sky component definition from the BRE guide is described below:

Vertical sky component (VSC)	Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.

The maximum possible VSC value for an opening in a vertical wall, assuming no obstructions, is 40%. This VSC at any given point can be tested in RadianceIES, a module of IES VE.

For typical residential schemes the BRE Guide states the following in Section 2.2.7:

> 2.2.7 If this VSC is greater than 27% then enough skylight should still be reaching the window of the existing building. Any reduction below this level should be kept to a minimum. If the VSC, with the new development in place, is both less than 27% and less than 0.8 times its former value, occupants of the existing building will notice the reduction in the amount of skylight. The area lit by the window is likely to appear more gloomy, and electric lighting will be needed more of the time.

As such this study will compare the Existing Scheme and Proposed Schemes and consider if the values on the existing buildings are above 27% or not less than 0.8 times their former value (that of the Existing scheme).

It is also important to note that Section 2.1.6 of the BRE Guide states that if the VSC is between 15% and 27%, special measures such as larger windows can provide adequate daylight (refer to extract below).

2.1.6 The amount of daylight a room needs depends on what it is being used for. But roughly speaking, if θ is:

- greater than 65° (obstruction angle less than 25° or VSC at least 27%) conventional window design will usually give reasonable results
- between 45° and 65° (obstruction angle between 25° and 45°, VSC between 15% and 27%) special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight
- between 25° and 45° (obstruction angle between 45° and 65°, VSC between 5% and 15%) it is very difficult to provide adequate daylight unless very large windows are used
- less than 25° (obstruction angle greater than 65°, VSC less than 5%) it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed.

9.2 Assessment

Based on the above criteria, the locations in the following sections have been modelled and analysed with the results also included.

Please note, the "Comment" symbol in each of the tables represents the following:

✓	For these locations, the Proposed Scheme VSC value is greater than 27% or 0.8 times their former value (that of the Existing Situation/Permitted Scheme).
✓[1]	For these locations, the Proposed Scheme VSC value is less than 0.8 times its former value (that of the Existing). However, the Proposed Scheme VSC values are between 15% and 27% and hence adequate daylight should still be expected (as per Section 2.1.6 of the BRE Guide) given the presence of larger than conventional windows.
x	For these locations, the Proposed Scheme VSC value is less than 15% and less than 0.8 times its former value (that of the Existing Situation), therefore, it does not achieve the BRE recommendations.

9.2.1 View 1: 50-58B Cappaghmore Road

	VSC	VSC	of Existing Situation	✓
1	39.18	38.36	98%	✓
2	39.17	38.35	98%	✓
3	39.15	38.43	98%	✓
4	39.15	38.61	99%	✓
5	39.16	38.44	98%	✓
6	39.06	38.22	98%	✓
7	39.08	38.36	98%	✓
8	39.10	38.39	98%	✓
9	39.07	38.40	98%	✓

[illegible]	[illegible] VSC	[illegible] VSC	[illegible] of Existing Situation	[illegible]
10	39.15	38.21	98%	✓
11	39.13	38.52	98%	✓
12	39.05	38.51	99%	✓
13	39.18	38.47	98%	✓
14	39.24	38.57	98%	✓
15	39.16	38.30	98%	✓
16	39.14	38.47	98%	✓
17	39.10	38.18	98%	✓
18	39.17	38.34	98%	✓
19	39.11	38.59	99%	✓
20	39.10	38.51	98%	✓
21	39.03	38.63	99%	✓
22	39.10	38.71	99%	✓
23	39.10	38.41	98%	✓
24	39.01	38.49	99%	✓
25	39.07	38.36	98%	✓
26	39.23	38.44	98%	✓
27	39.86	38.68	97%	✓
28	39.06	38.57	99%	✓
29	39.16	38.67	99%	✓
30	39.22	38.71	99%	✓
31	39.05	38.53	99%	✓
32	39.02	38.33	98%	✓
33	39.00	38.50	99%	✓
34	38.75	38.08	98%	✓
35	39.21	38.55	98%	✓
36	39.13	38.83	99%	✓
37	32.20	31.79	99%	✓
38	38.94	38.53	99%	✓
39	38.55	38.55	100%	✓
40	38.60	38.46	100%	✓
41	38.70	38.61	100%	✓
42	38.68	38.42	99%	✓
43	38.72	38.71	100%	✓
44	37.93	37.55	99%	✓
45	37.90	37.55	99%	✓
46	37.86	37.56	99%	✓
47	37.66	37.63	100%	✓
48	37.90	37.60	99%	✓
49	38.57	38.38	100%	✓

[illegible]	[illegible] VSC	[illegible] VSC	[illegible] of Existing Situation	[illegible]
50	38.52	38.52	100%	✓
51	38.58	38.48	100%	✓
52	37.81	37.76	100%	✓
53	37.96	37.77	99%	✓
54	37.89	37.61	99%	✓

9.3 Discussion

This study considers the Proposed Scheme and tests if the VSC results are greater than 27% or not less than 0.8 times the value of the Existing Situation.

When compared to the Existing Situation, of the 54 no. points tested, 100% (54 points) have a Proposed VSC value greater than 27% or not less than 0.8 times their former value compared to the Existing Situation.

10 Daylight to Proposed Development

This section addresses daylight provision to the proposed apartments. The purpose of the calculations is to quantify an overall percentage of units which exceeds the daylight provision recommendations. Our proposed methodology is to complete the calculations for all of the apartments and duplexes within the development. The objective of the design team is to maximise the number of units which exceed the minimum recommendations.

10.1 Reference Standards

The daylight provision to the proposed development was assessed against the following standards:

- BRE Guide / BS 8206-2:2008
- IS EN 17037:2018
- BS EN 17037:2018

The following sections summarise the various requirements of each standard.

10.1.1 BRE Guide / BS 8206-2:2008

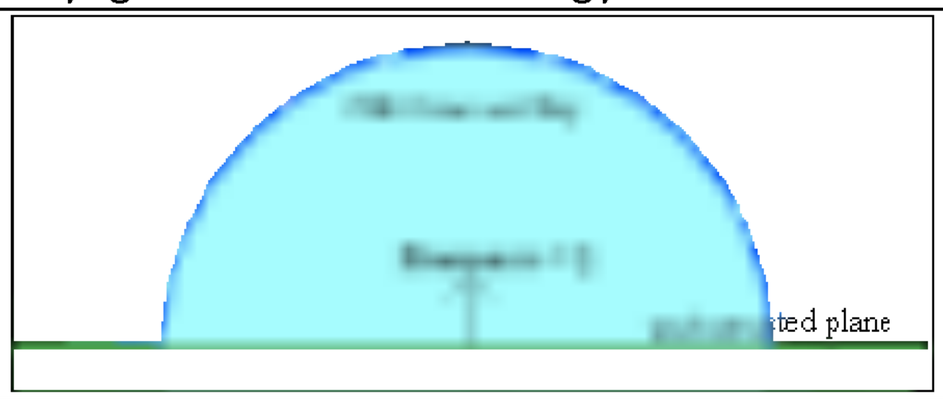
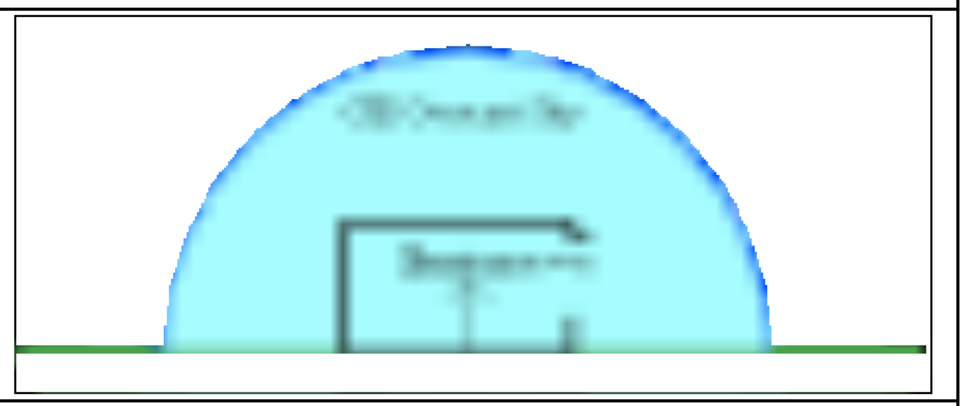
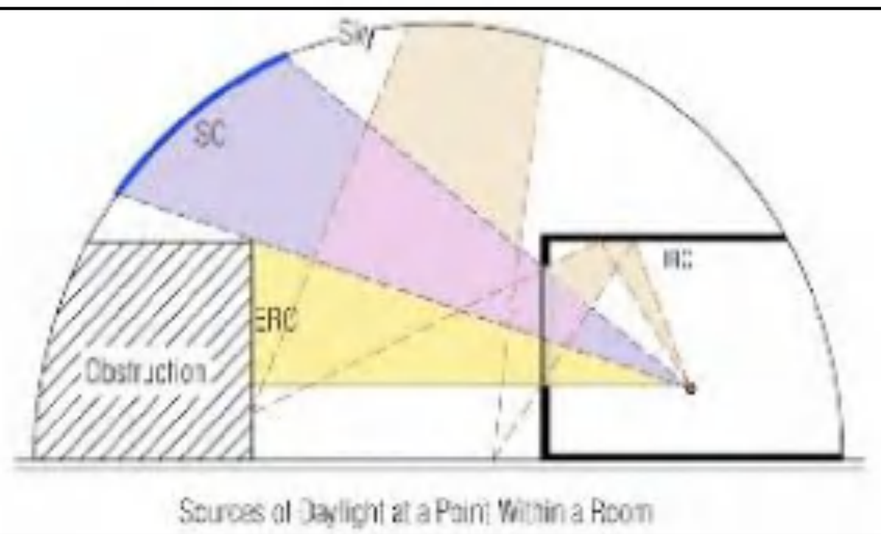
The BRE Guide states that the "*advice is not mandatory and that the guide should not be seen as an instrument of planning policy*". It should be noted when trying to achieve height and density within a development where deep plan, single aspect, combined living, kitchen and dining spaces exist (in some situations with a balcony in place as well), it is very difficult to achieve good levels of daylight across the whole space. Therefore, when considering the modelling approach noted above, results should be interpreted with flexibility as noted in the BRE guide:

"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."

10.1.1.1 Introduction to ADF

Daylight is constantly changing, so its level at a point in a building is usually defined as an average daylight factor (ADF).

This is the ratio of the indoor illuminance at the point in question to the outdoor unobstructed horizontal illuminance.

<table>
<tr><td colspan="2">Daylight Factor Methodology</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>E = illuminance on unobstructed plane</td><td>e = illuminance at point in interior</td></tr>
<tr><td colspan="2">Daylight Factor = e/E (often expressed as a percentage)</td></tr>
<tr><td colspan="2">SC – Sky Component
ERC – Externally Reflected Component
IRC – Internally Reflected Component
 

Sources of Daylight at a Point Within a Room</td></tr>
</table>

Both illuminances are measured under the same standard sky, a CIE overcast sky. Since the sun is in a particular position for only a short period each day, direct sunlight is excluded. Instead diffuse sunlight is used for average daylight calculations. Diffuse sunlight describes the sunlight that has been scattered by molecules and particles in the atmosphere but has still made it down to surface of the earth.

For average daylight factor there are three possible paths along which diffuse light can get into a room through glazed windows.

1. Light from the patch of sky visible at the point considered, is expressed as the sky component.
2. Light reflected from opposing exterior surfaces and then reaches the point, is expressed as the externally reflected component.
3. Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

Average Daylight Factor is an average of all measured points within the space.

10.1.1.2 ADF Requirements

The BRE Guide states the following in Appendix C with respect to Average Daylight Factors (ADF):

C4 If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable.

Therefore, the recommended Average Daylight Factors (ADF) are summarised as follows:

- Bedrooms – 1.0%
- Living Rooms – 1.5%
- Kitchens – 2.0%

The BRE Guide does not provide explicit guidance for an open space that is a combination of Living/Kitchen/Dining (LKD) functions. However, the BS 8206-2:2008 standard states:

"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%."

Although the above target is referenced within BS 8206-2:2008, it also states, "*The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement should be exercised when using the criteria given in the standard for other purposes, particularly town planning*."

For the purposes of clarity, we have assessed all LKDs against the 2% ADF target. However, we have also assessed the LKDs against an alternative 1.5% ADF design value which is justified in the following section.

10.1.1.3 Alternative ADF Design Value for Combined Living, Kitchen and Dining Spaces

For combined Living/Kitchen/Dining areas, the living area is typically treated as the main area of activity, with the kitchen being placed at the back of the space. This design decision is understandable as the kitchen area is typically a transient space as its primary functional

purpose is to serve as a food preparation area. Additionally, not every space within a commercially viable apartment development can be in direct connection with an exterior elevation, making the kitchen the obvious choice for this position given that it is a transient space that will require supplementary electric lighting.

As stated in Section 2.1.14 of the BRE Guide: *"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".*

Modern architectural design maximises the space function by creating open Living/Dining/Kitchen areas. Where previously solid partition walls may have existed to separate these functions, they are now removed to help maximise an open space that creates a more flexible and larger feeling habitable environment.

Therefore, where a kitchen may have been closed off into a cellular space with no access to daylight, the kitchen can now take advantage of daylight distribution from the adjoining living/dining area. Kitchen environments will still typically rely on artificial light, primarily for detail and safety precautions whilst preparing meals, but with this open layout form they will capture daylight that previously would not be available and which will help reduce artificial lighting needs at suitable times. This in turn helps to reduce electrical energy consumption. With the kitchen positioned at the back of the space where artificial lighting will typically be required, then aspiring to achieve daylight contribution should be seen as the goal and not measuring it to fixed requirements. As the kitchen is typically a transient space, the daylight benefit is primarily to the Living and Dining areas which are more frequently occupied.

Having regard for the need to comply with additional requirements of the Design Standards for New Apartments (Dec 2020) such as the provision of balconies (which reduce daylight within apartments as noted within the BRE Guide) as well as the layout of the apartments with respect to Kitchens as discussed above, achieving a 1.5% ADF design value can be considered reasonable for Living/Kitchen/Dining areas. Although the design value is lower, this is compensated by the provision of a valued outdoor private amenity for occupants.

Based on the above justification, the Living/Kitchen/Dining spaces have also been assessed against an alternative 1.5% ADF design value.

10.1.2 IS EN 17037:2018

As outlined in Section 5.1.2 of the IS EN 17037:2018 standard:

"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. In addition, for spaces with vertical or inclined daylight openings, a minimum target illuminance level is also to be achieved across the reference plane".

Annex A of IS EN 17037:2018 gives three levels of recommendation for the assessment of daylight provision in interior spaces which are summarised as follows:

"The three levels are: minimum, medium and high, and the minimum recommendation should be provided."

It is important to note that IS EN 17037:2018 does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

Table A.1 of IS EN 17037:2018 (included below) provides recommendations for daylight provision by daylight openings in vertical and inclined surfaces. Note, Table A.2 provides similar recommendations for daylight openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.2 are not followed.

To achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.1, the following must be achieved:

- A target illuminance (E_T) of 300 lux must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target illuminance (E_{TM}) of 100 lux must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

Table A.1 — Recommendations of daylight provision by daylight openings in vertical and inclined surface

Level of recommendation for vertical and inclined daylight opening	Target illuminance E_T lx	Fraction of space for target level $F_{plane,\%}$	Minimum target illuminance E_{TM} lx	Fraction of space for minimum target level $F_{plane,\%}$	Fraction of daylight hours $F_{time,\%}$
Minimum	300	50 %	100	95 %	50 %
Medium	500	50 %	300	95 %	50 %
High	750	50 %	500	95 %	50 %
NOTE Table A.3 gives target daylight factor (D_T) and minimum target daylight factor (D_{TM}) corresponding to target illuminance level and minimum target illuminance, respectively, for the CEN capital cities.					

The recommendations in Table A.1 can also be expressed in terms of a daylight factor "D". Table A.3 provides the corresponding daylight factor (D) relative to a recommended target illuminance E_T (lx) and target minimum illuminance E_{TM} (lx) depending on the location for daylight openings in vertical and inclined surfaces. Note, Table A.4 provides similar target values for openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.4 are not followed.

The extract from Table A.3 below is for Dublin with the daylight factor targets highlighted, i.e. to achieve the target illuminance (E_T) of 300 lux outlined in Table A.1, an equivalent target daylight factor is 2.0%. Furthermore, to achieve the minimum target illuminance (E_{TM}) of 100 lux outlined in Table A.1, an equivalent target daylight factor is 0.7%.

Table A.3 — Values of *D* for daylight openings to exceed an illuminance level of 100, 300, 500 or 750 lx for a fraction of daylight hours $F_{time,\%}$ = 50 % for 33 capitals of CEN national members

Nation	Capital [a]	Geographical latitude φ [°]	Median External Diffuse Illuminance $E_{v,d,med}$	*D* to exceed 100 lx	*D* to exceed 300 lx	*D* to exceed 500 lx	*D* to exceed 750 lx
Ireland	Dublin	53,43	14 900	0,7 %	2,0 %	3,4 %	5,0 %

Therefore, to achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.3, the following must be achieved:

- A target daylight factor (D_T) of 2.0% must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target daylight factor (D_{TM}) of 0.7% must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3. The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1. The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

10.1.3 BS EN 17037:2018 National Annex

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". However, a "National Annex NA" was included which states:

"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."

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 below. It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

Table NA.1 — Values of target illuminance for room types in UK dwellings

Room type	Target illuminance E_T (lx)
Bedroom	100
Living room	150
Kitchen	200

The BS National Annex also states:

"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx."

Therefore, combined LKDs are to be assessed using a 200 lux target illuminance (E_T).

Finally, the BS National Annex also states that:

"It is the opinion of the UK committee that the recommendation in Clause A.2 – that a target illuminance level should be achieved across the entire (i.e. 95 %) fraction of the reference plane within a space – need not be applied to rooms in dwellings."

Therefore, when assessing the daylight provisions in residential dwellings in accordance with BS EN 17037:2018, only the target illuminance (E_T) or target daylight factor (D_T) will be assessed for Bedrooms, Living Rooms, Kitchens (or combined LKDs) on over 50% of the floor area over 50% of the available daylight hours. The minimum target illuminance (E_{TM}) or minimum target daylight factor (D_{TM}) will not be assessed.

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table NA.1 of BS EN 17037:2018.

10.2 Daylight Model Inputs

The following inputs were used in the study:

BRE Guide / BS 8206-2:2008

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September

IS EN / BS EN 17037:2018

- Weather File: Dublin.epw (15 year average)

Common Inputs to all Standards

- Working Plane Height: 0.85m
- Glazing Light Transmittance: 70%
- Window Frame thickness: 50 mm

The following surface reflectance values are used in the study:

[illegible]	[illegible]
External Wall – Red Brick	0.20
External Wall – Buff Brick	0.30
External Wall – White Render	0.60
Internal Partition	0.85
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.40
Floor/Ceiling (Ceiling)	0.85

10.3 Daylight Results

The following tables summarise the daylight provision results for each block assessed against the various standards. Individual room results can be viewed in Appendix A.

The purpose of the calculations is to quantify an overall percentage of rooms which exceed the recommendations of the various standards that were assessed. The objective of the design team is to maximise the number of units which exceed the recommendations.

The following changes were incorporated throughout the design phase to maximise the daylight and sunlight provision to the proposed development:

- Increased window sizes to improve daylight provision to the apartments.
- Addition of windows in some cases to improve daylight to the apartments in question.
- Moved balcony positions to lessen the overshadowing impact to the apartments below and the subsequent impact to daylight performance.
- Incorporated white render to internal courtyards to increase surface reflectance and subsequent daylight provision to the apartments.

As outlined previously in Section 10.2.1.2, where there are combined Living/Kitchen/Dining areas (LKDs) within the development, these have been assessed as whole spaces against a 2% ADF target as well as an alternative 1.5% ADF design value.

The results are summarised in the following tables:

Block 1

The daylight provision results for Block 1 under the various standards are summarised below. An 84% compliance rate is achieved in accordance with the BRE Guide / BS 8206:2008 when LKDs are assessed against a 2% ADF target. This increases to 95% when LKDs are assessed against an alternative 1.5% ADF design value. Under IS EN 17037:2018 Method 2, a compliance rate of 98% is achieved which increases to 99% under BS EN 17037:2018 Method 2 National Annex. Overall, the quality of daylight provision to Block 1 is high with the majority of rooms that are failing located on the lower floors.

[illegible]	Total No. Rooms
Total No. Bedrooms Tested	273
Total No. LKDs Tested	172
Total No. Spaces Tested	445

[illegible] LKDs Assessed Against 2% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	273	100%	0	0%
No. LKDs	102	59%	70	41%
Total No.	**375**	**84%**	**70**	**16%**

[illegible] LKDs Assessed Against Alternative 1.5% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	273	100%	0	0%
No. LKDs	149	87%	23	13%
Total No.	**422**	**95%**	**23**	**5%**

[illegible] Method 2 Assessment				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	272	100%	1	0%
No. LKDs	165	96%	7	3%
Total No.	**437**	**98%**	**8**	**3%**

[illegible] Method 2 Assessment National Annex				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	273	100%	0	0%
No. LKDs	171	99%	1	1%
Total No.	**444**	**99%**	**1**	**0%**

Block 2

The daylight provision results for Block 2 under the various standards are summarised below. An 83% compliance rate is achieved in accordance with the BRE Guide / BS 8206:2008 when LKDs are assessed against a 2% ADF target. This increases to 95% when LKDs are assessed against an alternative 1.5% ADF design value. Under IS EN 17037:2018 Method 2, a compliance rate of 100% is achieved. Under BS EN 17037:2018 Method 2 National Annex, a compliance rate of 100% is achieved. Overall, the quality of daylight provision to Block 2 is high with the majority of rooms that are failing located on the lower floors.

[illegible]	[illegible]
Total No. Bedrooms Tested	60
Total No. LKDs Tested	38
Total No. Spaces Tested	98

[illegible] LKDs Assessed Against 2% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	21	55%	17	45%
Total No.	**81**	**83%**	**17**	**17%**

[illegible] LKDs Assessed Against Alternative 1.5% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	33	87%	5	13%
Total No.	**93**	**95%**	**5**	**5%**

[illegible] Method 2 Assessment				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	38	100%	0	0%
Total No.	**98**	**100%**	**0**	**0%**

[illegible] Method 2 Assessment National Annex				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	38	100%	0	0%
Total No.	**98**	**100%**	**0**	**0%**

Block 3

The daylight provision results for Block 3 under the various standards are summarised below. An 83% compliance rate is achieved in accordance with the BRE Guide / BS 8206:2008 when LKDs are assessed against a 2% ADF target. This increases to 94% when LKDs are assessed against an alternative 1.5% ADF design value. Under IS EN 17037:2018 Method 2, a compliance rate of 100% is achieved. Under BS EN 17037:2018 Method 2 National Annex, a compliance rate of 100% is achieved. Overall, the quality of daylight provision to Block 3 is high with the majority of rooms that are failing located on the lower floors.

[illegible]	[illegible]
Total No. Bedrooms Tested	60
Total No. LKDs Tested	38
Total No. Spaces Tested	98

[illegible] LKDs Assessed Against 2% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	21	55%	17	45%
Total No.	**81**	**83%**	**17**	**17%**

[illegible] LKDs Assessed Against Alternative 1.5% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	32	84%	6	16%
Total No.	**92**	**94%**	**6**	**6%**

[illegible] Method 2 Assessment				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	38	100%	0	0%
Total No.	**98**	**100%**	**0**	**0%**

[illegible] Method 2 Assessment National Annex				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	60	100%	0	0%
No. LKDs	38	100%	0	0%
Total No.	**98**	**100%**	**0**	**0%**

Duplexes

The daylight provision results for the duplexes under the various standards are summarised below. A 100% compliance rate is achieved in accordance with the BRE Guide / BS 8206:2008 when LKDs are assessed against a 2% ADF target. This remains 100% when LKDs are assessed against an alternative 1.5% ADF design value. Under IS EN 17037:2018 Method 2, a compliance rate of 100% is achieved. Under BS EN 17037:2018 Method 2 National Annex, a compliance rate of 100% is achieved. Overall, the quality of daylight provision to the duplexes is high. It should be noted that a sampling of Duplexes has been chosen to assess their performance. Specific duplexes had been chosen based on worst case locations, in the middle of a terraced row and/or opposite another terrace of duplexes or one of the apartment buildings.

[illegible]	[illegible]
Total No. Bedrooms Tested	35
Total No. LKDs Tested	14
Total No. Spaces Tested	49

[illegible] LKDs Assessed Against 2% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	35	100%	0	0%
No. LKDs	14	100%	0	0%
Total No.	**49**	**100%**	**0**	**0%**

[illegible] LKDs Assessed Against Alternative 1.5% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	35	100%	0	0%
No. LKDs	14	100%	0	0%
Total No.	**49**	**100%**	**0**	**0%**

[illegible] Method 2 Assessment				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	35	100%	0	0%
No. LKDs	14	100%	0	0%
Total No.	**49**	**100%**	**0**	**0%**

[illegible] Method 2 Assessment National Annex				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	35	100%	0	0%
No. LKDs	14	100%	0	0%
Total No.	**49**	**100%**	**0**	**0%**

Total for the Development

The overall daylight provision results for the total development under the various standards are summarised below. An 85% compliance rate is achieved in accordance with the BRE Guide / BS 8206:2008 when LKDs are assessed against a 2% ADF target. This increases to 95% when LKDs are assessed against an alternative 1.5% ADF design value. Under IS EN 17037:2018 Method 2, a compliance rate of 99% is achieved which increases to 99.9% under BS EN 17037:2018 Method 2 National Annex. Overall the quality of daylight provision across the development is high, with the majority of rooms that are failing located on the lower floors.

[illegible]	[illegible]
Total No. Bedrooms Tested	428
Total No. LKDs Tested	262
Total No. Spaces Tested	**690**

[illegible] LKDs Assessed Against 2% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	428	100%	0	0%
No. LKDs	158	60%	104	40%
Total No.	**586**	**85%**	**104**	**15%**

[illegible] LKDs Assessed Against Alternative 1.5% ADF Target				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	428	100%	0	0%
No. LKDs	228	87%	34	13%
Total No.	**656**	**95%**	**34**	**5%**

[illegible] Method 2 Assessment				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	427	100%	1	0%
No. LKDs	255	97%	7	2%
Total No.	**682**	**99%**	**8**	**2%**

[illegible] Method 2 Assessment National Annex				
[illegible]	[illegible] (No.)	[illegible] (%)	[illegible] (No.)	[illegible] (%)
No. Bedrooms	428	100%	0	0%
No. LKDs	261	100%	1	0%
Total No.	**689**	**99.9%**	**1**	**0.1%**

10.4 Compensatory Measures

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2020, states the following:

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

Furthermore, Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities December 2018, states the following:

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.

Based on the above statements, compensatory measures have been incorporated into the design of the proposed development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. The compensatory measures are summarised as follows:

- 60% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (Dec 2020). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 61.36% of the apartment units (including duplex units) are dual aspect which is above the 50% minimum required by the Design Standards (Dec 2020). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- 2.5 times in excess of the minimum required open space of the SDZ Plan for this development sector 3 is provided in additional residential amenity.

- Furthermore, an additional 80% overall of communal open space above the minimum requirements required by the Design Standards (Dec 2020) is proposed across the development. Block 1 is providing 60% more than the minimum requirements.
- All apartment blocks are immediately adjacent to a significant local park or urban space as described either in this application or in future phases as set out in the SDZ planning scheme.

There is also a need to create a high-quality urban streetscape along the main street, requiring increased height along this road to create an appropriate presence. The daylight results achieved are to a high standard having regard to the fact that the above referenced factors (increased height and larger apartment sizes) render it more difficult to achieve target values for daylight performance.

11 View Out

11.1 Guidance – IS EN 17037:2018

In accordance with Section 5.2.1 of IS EN 17037:2018, windows in buildings provide occupants a connection to the outdoors. It is recommended the view out should be made up of "*sky, city or landscape, and ground.*" Table A.5 summarises the recommendations for outward views from a given position within a new development.

Table A.5 — Assessment of the view outwards from a given position

	Parameter [a]		
Level of recommendation for view out	**Horizontal sight angle**	**Outside distance of the view**	**Number of layers to be seen from at least 75 % of utilized area:** **- sky** **- landscape (urban and/or nature)** **- ground**
Minimum	≥ 14°	≥ 6,0 m	At least landscape layer is included
Medium	≥ 28°	≥ 20,0 m	Landscape layer and one additional layer is included in the same view opening
High	≥ 54°	≥ 50,0 m	all layers are included in the same view opening

[a] For a space with room depth more than 4 m, it is recommended that the respective sum of the view opening(s) dimensions is at least 1,0 m × 1,25 m (width × height).

11.2 Assessment

The View Out assessment is related to buildings such as offices or schools where seating layouts are more fixed compared to domestic settings where an occupant can move around the space a lot more freely. Therefore, on this basis a View Out assessment for the proposed development has not been carried out.

12 Glare

12.1 Guidance – IS EN 17037:2018

In accordance with Section 5.4.1 of IS EN 17037:2018, glare is a *"negative sensation and the cause is bright areas with sufficiently greater luminance than the luminance to which the eyes are adapted to, producing annoyance, discomfort or loss in visual performance and visibility."* Daylight Glare Probability (DGP) is the metric used to assess protection from glare. Table A.7 summarises the recommendations for glare protection within a new development.

Table A.7 — Proposed different levels of threshold $DGP_{e<5\,\%}$ for glare protection

Level of recommendation for glare protection	$DGP_{e<5\,\%}$
Minimum	0,45
Medium	0,40
High	0,35

12.2 Assessment

A Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

13 Conclusion

The following can be concluded based on the studies undertaken:

13.1 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Existing Situation and the Proposed Scheme. The images indicate that the existing buildings located at 50-58B Cappaghmore Road will receive no additional shading as a result of the proposed development. Taking this into account, the overall impact of overshadowing can be classed as a negligible impact.

13.2 Sunlight to Existing and Proposed Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide, for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on March 21st.

Proposed Public Amenity Areas

On the 21st of March, all of the proposed public amenity areas would receive over 2 hours of sunlight on at least 57% of their area. Overall when combined, 99% of the proposed public amenity area will received at least 2 hours of sunlight on March 21st, thus exceeding BRE recommendations.

Proposed Private Gardens

On the 21st of March, 52 of the 78 (66%) tested proposed private gardens within the development would receive over 2 hours of sunlight on at least 50% of their area. These are typical results for a housing scheme development such as this where not all properties can be provided with a south/east/west facing amenity space.

Existing Gardens Adjacent to the Proposed Development.

The existing communal and private amenity spaces in the adjacent properties have been analysed and the results demonstrate that they will continue to receive the same level of sunlight even with the proposed development in place on March 21st, thus exceeding the recommendations in the BRE Guide.

13.3 Sunlight to Existing Buildings - APSH

Based on the criteria outlined in the BRE guide, none of the existing buildings need to be analysed for Annual Probable Sunlight Hours (APSH). The buildings do not have living room windows that face within 90 degrees of south, and they are also too far away from the proposed development by the 25-degree rule. (see section 7.2 APSH Exclusions for further information)

13.4 Sunlight to Proposed Development - APSH

For the sunlight to proposed development assessment, two standards have been analysed: BRE Guide / BS 8206-2:2008 and IS EN 17037:2018. The results under each standard are summarised below.

BRE Guide / BS 8206-2:2008

Within the BS 8206-2:2008 standard, when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

"The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

This is also reflected in the BRE Guide which states:

"The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 418 no. points tested, 295 no. points (71%) meet the BRE recommended values over the annual period. The compliance rate increases to 80% (335 no. points) during the winter period when sunlight is most valuable. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *"significantly north of due east or west"* e.g. Block 1 View 5, Block 4 View 1 etc., or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with BRE Guide/BS 8206-2:2008 are considered satisfactory in the context of an urban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

IS EN 17037:2018

As the sunlight exposure assessment in accordance with IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide / BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 418 no. points tested, 332 no. points (79%) meet the IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21st. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows

facing *"significantly north of due east or west"* e.g. Block 1 View 5, Block 4 View 1 etc., or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered satisfactory in the context of an urban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

13.5 Daylight to Existing Buildings

This study considers the Proposed Scheme and tests if the VSC results are greater than 27% or not less than 0.8 times the value of the Existing Situation.

When compared to the Existing Situation, of the 54 no. points tested, 100% (54 points) have a Proposed VSC value greater than 27% or not less than 0.8 times their former value compared to the Existing Situation.

13.6 Daylight to Proposed Development

For the daylight to proposed development assessment, three standards have been analysed: BRE Guide / BS 8206-2:2008, IS EN 17037:2018 and BS EN 17037:2018 National Annex. The results under each standard are summarised below.

BRE Guide / BS 8206-2:2008

Across the proposed development, 85% of the tested rooms are achieving Average Daylight Factors (ADF) in accordance with the BRE Guide / BS 8206-2:2008 when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target and Bedrooms against a 1% ADF target. The majority of rooms that are failing are located on the lower floors. However, overall the quality of daylight provision across the development can be considered high.

For combined Living/Kitchen/Dining areas, the living area is typically treated as the main area of activity, with the kitchen being placed at the back of the space. This design decision is understandable as the kitchen area is typically a transient space as its primary functional purpose is to serve as a food preparation area. Additionally, not every space within a commercially viable apartment development can be in direct connection with an exterior elevation, making the kitchen the obvious choice for this position given that it is a transient space that will require supplementary electric lighting.

Having regard for the need to comply with additional requirements of the Design Standards for New Apartments (Dec 2020) such as the provision of balconies (which reduce daylight within apartments as noted within the BRE Guide) as well as the layout of the apartments

with respect to Kitchens as discussed above, achieving a 1.5% ADF design value can be considered reasonable for Living/Kitchen/Dining areas. Although the design value is lower, this is compensated by the provision of a valued outdoor private amenity for occupants along with oversized apartments provided within this development.

Therefore, when Living/Kitchen/Dining spaces are assessed as whole rooms against an alternative 1.5% ADF design value, a 95% compliance rate is achieved across all tested rooms within the proposed development.

IS EN 17037:2018

It is important to note that IS EN 17037:2018 does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 of IS EN 17037:2018 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1 (refer to Section 10.1.2 of this report). The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4 of the standard, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential

the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

Across the proposed development, 99% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037:2018 using Method 2. The majority of rooms that are failing are located on the lower floors, however, overall the quality of daylight provision across the development can be considered high.

BS EN 17037:2018 National Annex

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". However, a National Annex was included which states:

"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."

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 10.1.3 of this report). It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

The BS National Annex also states:

"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx."

Therefore, combined LKDs were assessed using a 200 lux target illuminance (E_T).

Across the proposed development, 99.9% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037:2018 using Method 2. The majority of rooms that are failing are located on the lower floors, however, overall the quality of daylight provision across the development can be considered extremely high under this standard.

Compensatory Measures

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2020, states the following:

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

Furthermore, Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities December 2018, states the following:

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.

Based on the above statements, compensatory measures have been incorporated into the design of the proposed development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. The compensatory measures are summarised as follows:

- 60% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (Dec 2020). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.

- 61.36% of the apartment units (including duplex units) are dual aspect which is above the 50% minimum required by the Design Standards (Dec 2020). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- 2.5 times in excess of the minimum required open space of the SDZ Plan for this development sector 3 is provided in additional residential amenity.
- Furthermore, an additional 80% overall of communal open space above the minimum requirements required by the Design Standards (Dec 2020) is proposed across the development. Block 1 is providing 60% more than the minimum requirements.
- All apartment blocks are immediately adjacent to a significant local park or urban space as described either in this application or in future phases as set out in the SDZ planning scheme.

There is also a need to create a high-quality urban streetscape along the main street, requiring increased height along this road to create an appropriate presence. The daylight results achieved are to a high standard having regard to the fact that the above referenced factors (increased height and larger apartment sizes) render it more difficult to achieve target values for daylight performance.

13.7 View Out

The View Out assessment is related to buildings such as offices or schools where seating layouts are more fixed compared to domestic settings where an occupant can move around the space a lot more freely. Therefore, on this basis a View Out assessment for the proposed development has not been carried out.

13.8 Glare

A Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

13.9 Observations

It is important to note that the recommendations within the BRE Guide are not mandatory and the guide itself states *"although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design".*

Whilst the results shown relate to the criteria as laid out in the BRE Guide, it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and

caution when dealing with different types of sites. Taking this onboard, the site performs well in relation to the metrics considered in this report.

In addition, the foreword of BS 8206-2:2008 also states "*The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement needs to be exercised when using the criteria given in the standard for other purposes, particularly town planning control.*"

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide / BS 8206-2:2008, IS EN 17037:2018 and BS EN 17037:2018 National Annex.

14 Appendix A – Daylight Provision Results

The tables in the following sections summarise the daylight provision results for the rooms that were assessed in the proposed development. Note, within the tables the code "LKD" equates to combined Living, Kitchen, Dining area.

The results for the following daylight standards are included in each table:

- BRE Guide / BS 8206-2:2008
- IS EN 17037:2018
- BS EN 17037:2018 National Annex

Please note, the "Comment" symbol in each of the tables represents the following:

<u>BRE Guide / BS 8206-2:2008</u>

✓ These rooms have an ADF greater than the recommended minimum values (2.0% for combined L/K/Ds and 1.0% for bedrooms) as stated within the BRE Guide.

x/✓ The ADF in these rooms falls below the BRE recommendation for a L/K/D when the whole space is assessed against the 2% ADF target. However, the whole space complies with an alternative 1.5% ADF design value.

x The ADF in these rooms falls below the BRE recommendation for a L/K/D when the whole space is assessed against the alternative 1.5% ADF design value or in the case of Bedrooms, is less than the 1% ADF target.

<u>IS EN 17037:2018</u>

✓ These rooms achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements, i.e. 300 lux for over 50% of their floor area (E_T) and 100 lux for over 95% of their floor area (E_{TM}).

x These rooms do not achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements.

<u>BS EN 17037:2018 National Annex</u>

✓ These rooms achieve the target illuminance (E_T) over the minimum floor area requirements, i.e. 100 lux for over 50% of bedroom floor areas, and 200 lux for over 50% of LKD floor areas.

x These rooms do not achieve the target illuminance (E_T) over the minimum floor area requirements.

14.1 Daylight Provision Results

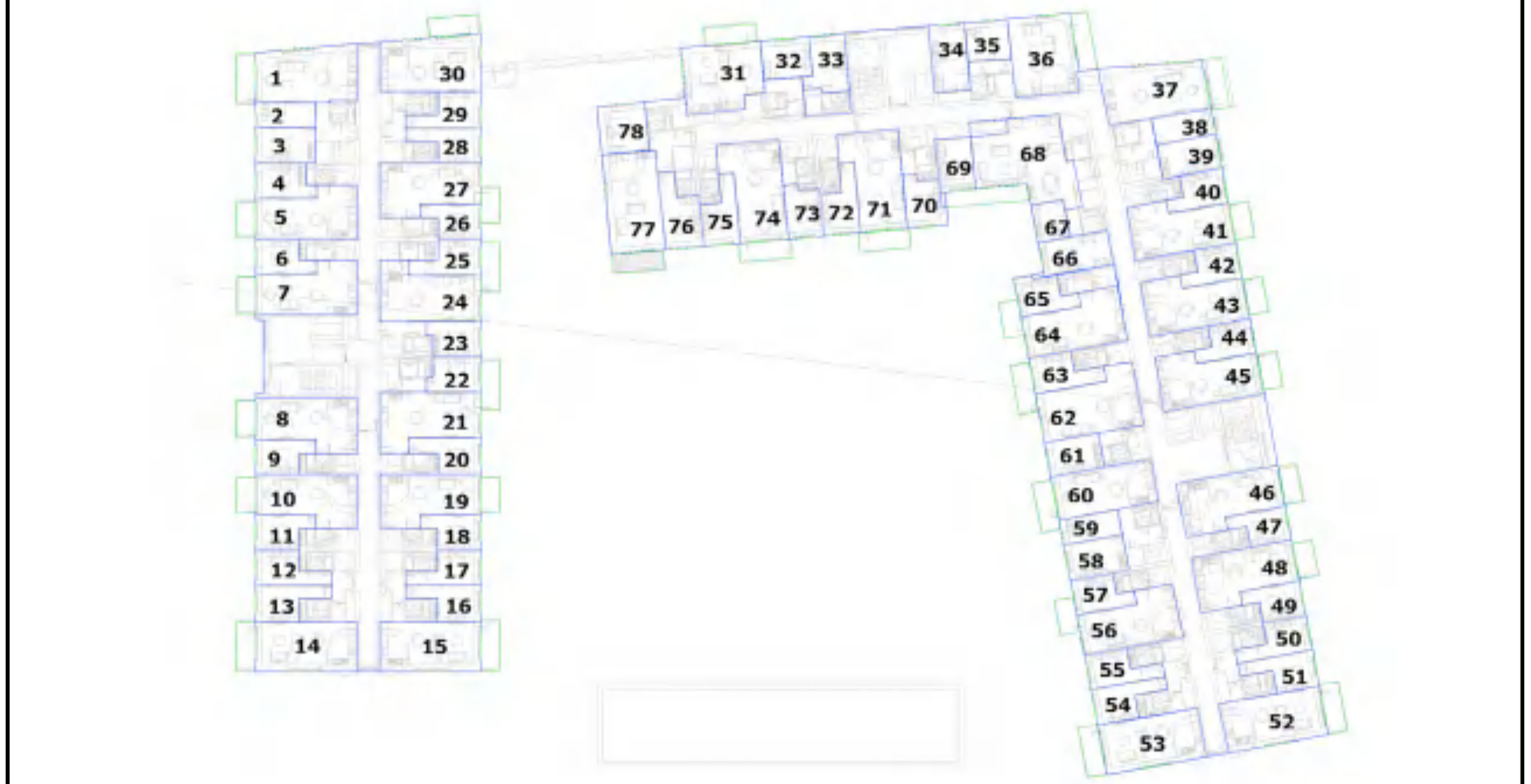
14.1.1 Block 1 – Level 0

No.	Room Activity	BRE Guide	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.38	✓	100	100	✓	100	✓
2	Bedroom	1.58	✓	100	100	✓	100	✓
3	Bedroom	1.94	✓	100	100	✓	100	✓
4	Bedroom	2.30	✓	100	100	✓	100	✓
5	LKD	1.74	x / ✓	59.74	100	✓	96.1	✓
6	LKD	1.81	x / ✓	56.58	100	✓	97.3	✓
7	Bedroom	2.74	✓	100	100	✓	100	✓
8	LKD	1.84	x / ✓	98.68	100	✓	100	✓
9	Bedroom	2.84	✓	100	100	✓	100	✓
10	Bedroom	2.88	✓	100	100	✓	100	✓
11	Bedroom	2.77	✓	100	100	✓	100	✓
12	LKD	3.17	✓	100	100	✓	100	✓
13	LKD	2.97	✓	100	100	✓	100	✓
14	Bedroom	2.32	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
15	Bedroom	2.33	✓	100	100	✓	100	✓
16	Bedroom	2.46	✓	100	100	✓	100	✓
17	LKD	1.44	x	100	100	✓	100	✓
18	Bedroom	2.05	✓	100	100	✓	100	✓
19	LKD	1.50	x / ✓	73.86	100	✓	100	✓
20	Bedroom	1.87	✓	100	100	✓	100	✓
21	Bedroom	1.25	✓	62.5	100	✓	100	✓
22	LKD	0.81	x	15.38	57.41	x	29.49	x
23	Bedroom	1.00	✓	56.25	100	✓	100	✓
24	Bedroom	1.11	✓	31.25	100	x	100	✓
25	LKD	1.78	x / ✓	100	100	✓	100	✓
26	LKD	1.50	x / ✓	100	100	✓	100	✓
27	Bedroom	2.33	✓	100	100	✓	100	✓
28	Bedroom	1.99	✓	100	100	✓	100	✓
29	LKD	2.92	✓	100	100	✓	100	✓
30	Bedroom	1.55	✓	100	100	✓	100	✓
31	Bedroom	2.25	✓	100	100	✓	100	✓
32	Bedroom	2.95	✓	100	100	✓	100	✓
33	LKD	1.92	x / ✓	100	100	✓	100	✓
34	Bedroom	2.92	✓	100	100	✓	100	✓
35	LKD	1.91	x / ✓	100	100	✓	100	✓
36	Bedroom	2.93	✓	100	100	✓	100	✓
37	LKD	1.90	x / ✓	100	100	✓	100	✓
38	LKD	1.89	x / ✓	100	100	✓	100	✓
39	Bedroom	2.98	✓	100	100	✓	100	✓
40	Bedroom	2.94	✓	100	100	✓	100	✓
41	Bedroom	2.94	✓	100	100	✓	100	✓
42	LKD	3.25	✓	100	100	✓	100	✓
43	LKD	3.13	✓	100	100	✓	100	✓
44	Bedroom	2.72	✓	100	100	✓	100	✓
45	Bedroom	2.59	✓	100	100	✓	100	✓
46	LKD	1.80	x / ✓	100	100	✓	100	✓
47	Bedroom	2.65	✓	100	100	✓	100	✓
48	Bedroom	1.92	✓	100	100	✓	100	✓
49	LKD	1.55	x / ✓	97	100	✓	100	✓
50	Bedroom	2.13	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
51	Bedroom	2.24	✓	100	100	✓	100	✓
52	LKD	1.15	x	40.96	100	x	54.22	✓
53	Bedroom	1.94	✓	100	100	✓	100	✓
54	LKD	1.29	x	96.63	100	✓	100	✓
55	Bedroom	2.43	✓	96	100	✓	100	✓

14.1.2 Block 1 – Level 1



Activity	BS 8206:2008		Method 2			Method 2 National Annex	
	(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	LKD	2.86	✓	100	100	✓	100	✓
2	Bedroom	1.63	✓	100	100	✓	100	✓
3	Bedroom	2.41	✓	100	100	✓	100	✓
4	Bedroom	2.85	✓	100	100	✓	100	✓
5	LKD	1.81	x / ✓	100	100	✓	100	✓
6	Bedroom	2.75	✓	100	100	✓	100	✓
7	LKD	1.84	x / ✓	100	100	✓	100	✓
8	LKD	1.84	x / ✓	100	100	✓	100	✓
9	Bedroom	2.86	✓	100	100	✓	100	✓
10	LKD	1.86	x / ✓	100	100	✓	100	✓
11	Bedroom	2.86	✓	100	100	✓	100	✓
12	Bedroom	2.91	✓	100	100	✓	100	✓
13	Bedroom	2.82	✓	100	100	✓	100	✓
14	LKD	3.61	✓	100	100	✓	100	✓
15	LKD	3.47	✓	100	100	✓	100	✓
16	Bedroom	2.47	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
17	Bedroom	2.47	✓	100	100	✓	100	✓
18	Bedroom	2.58	✓	100	100	✓	100	✓
19	LKD	1.55	x / ✓	100	100	✓	100	✓
20	Bedroom	2.23	✓	100	100	✓	100	✓
21	LKD	1.50	x / ✓	100	100	✓	100	✓
22	Bedroom	1.35	✓	100	100	✓	100	✓
23	Bedroom	1.94	✓	100	100	✓	100	✓
24	LKD	1.22	x	73.33	100	✓	100	✓
25	Bedroom	1.11	✓	100	100	✓	100	✓
26	Bedroom	1.11	✓	100	100	✓	100	✓
27	LKD	0.85	x	40	100	x	56	✓
28	Bedroom	1.09	✓	100	100	✓	100	✓
29	Bedroom	1.11	✓	100	100	✓	100	✓
30	LKD	2.00	✓	100	100	✓	100	✓
31	LKD	2.12	✓	100	100	✓	100	✓
32	Bedroom	2.49	✓	100	100	✓	100	✓
33	Bedroom	1.96	✓	100	100	✓	100	✓
34	Bedroom	1.81	✓	100	100	✓	100	✓
35	Bedroom	1.79	✓	100	100	✓	100	✓
36	LKD	2.94	✓	100	100	✓	100	✓
37	LKD	3.42	✓	100	100	✓	100	✓
38	Bedroom	1.60	✓	100	100	✓	100	✓
39	Bedroom	2.34	✓	100	100	✓	100	✓
40	Bedroom	3.00	✓	100	100	✓	100	✓
41	LKD	2.00	✓	100	100	✓	100	✓
42	Bedroom	2.98	✓	100	100	✓	100	✓
43	LKD	2.02	✓	100	100	✓	100	✓
44	Bedroom	2.95	✓	100	100	✓	100	✓
45	LKD	2.00	✓	100	100	✓	100	✓
46	LKD	2.00	✓	100	100	✓	100	✓
47	Bedroom	2.94	✓	100	100	✓	100	✓
48	LKD	2.00	✓	100	100	✓	100	✓
49	Bedroom	3.08	✓	100	100	✓	100	✓
50	Bedroom	3.01	✓	100	100	✓	100	✓
51	Bedroom	2.88	✓	100	100	✓	100	✓
52	LKD	3.64	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
53	LKD	3.53	✓	100	100	✓	100	✓
54	Bedroom	2.70	✓	100	100	✓	100	✓
55	Bedroom	2.81	✓	100	100	✓	100	✓
56	LKD	1.76	x / ✓	100	100	✓	100	✓
57	Bedroom	2.25	✓	100	100	✓	100	✓
58	Bedroom	2.29	✓	100	100	✓	100	✓
59	Bedroom	1.47	✓	100	100	✓	100	✓
60	LKD	1.50	x / ✓	100	100	✓	100	✓
61	Bedroom	2.37	✓	100	100	✓	100	✓
62	LKD	1.50	x / ✓	100	100	✓	100	✓
63	Bedroom	1.48	✓	100	100	✓	100	✓
64	Bedroom	1.78	✓	100	100	✓	100	✓
65	LKD	1.17	x	61.54	100	✓	79.49	✓
66	Bedroom	1.11	✓	64.71	100	✓	100	✓
67	Bedroom	1.47	✓	90.91	100	✓	100	✓
68	LKD	0.93	x	44.96	100	x	82.95	✓
69	Bedroom	1.02	✓	78.95	100	✓	100	✓
70	Bedroom	2.05	✓	100	100	✓	100	✓
71	LKD	1.27	x	100	100	✓	100	✓
72	Bedroom	2.34	✓	100	100	✓	100	✓
73	Bedroom	2.45	✓	100	100	✓	100	✓
74	LKD	1.38	x	100	100	✓	100	✓
75	Bedroom	2.46	✓	100	100	✓	100	✓
76	Bedroom	2.22	✓	100	100	✓	100	✓
77	LKD	1.45	x	100	100	✓	100	✓
78	Bedroom	1.99	✓	100	100	✓	100	✓

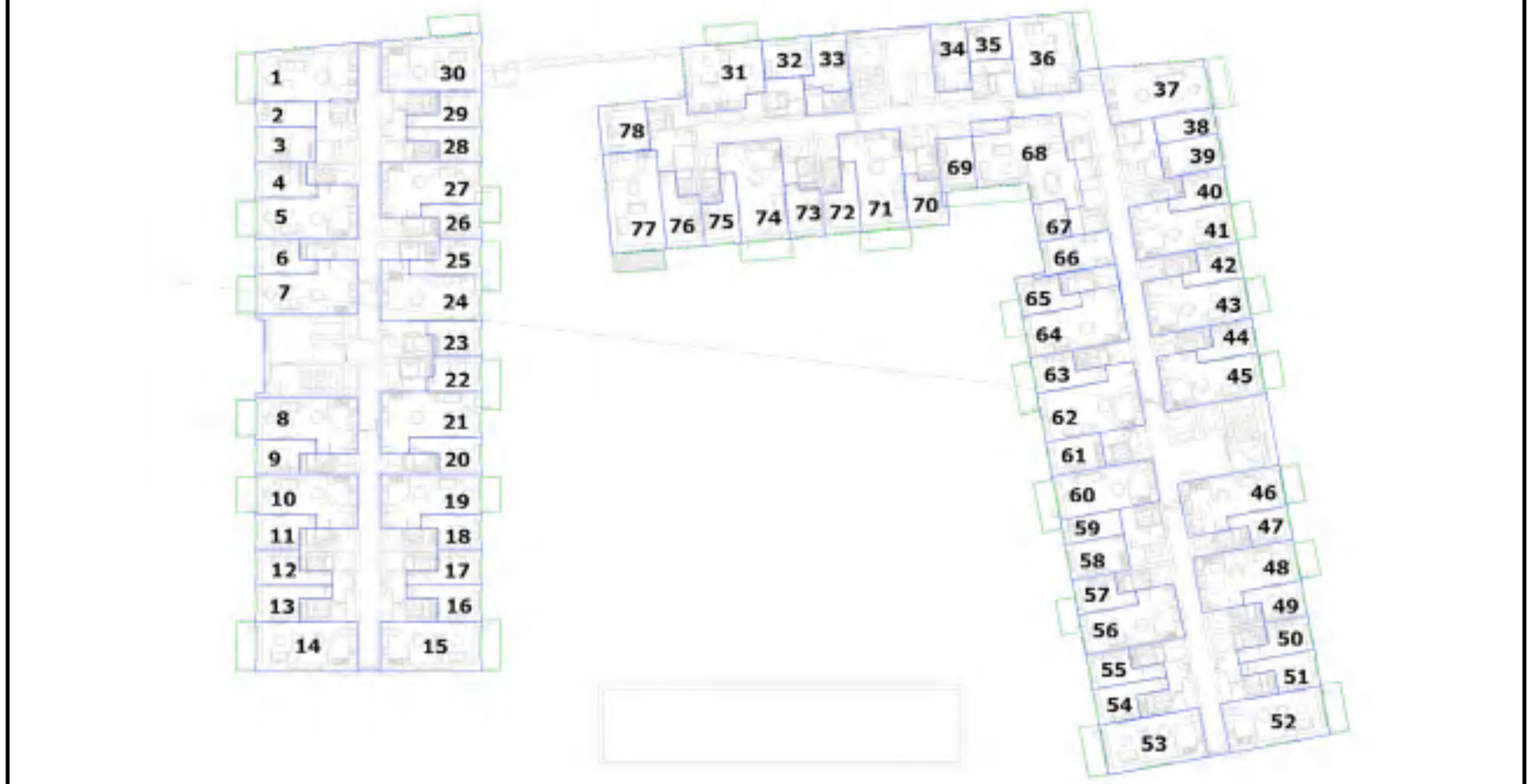
14.1.3 Block 1 – Level 2

[illegible]	[illegible] Activity	[illegible] BS 8206:2008		[illegible] Method 2			[illegible] Method 2 National Annex	
		[illegible] (%)	[illegible] Comment	[illegible] Floor Area > E_T (%)	[illegible] Floor Area > E_{TM} (%)	[illegible] Comment	[illegible] Floor Area > E_T (%)	[illegible] Comment
1	LKD	3.02	✓	100	100	✓	100	✓
2	Bedroom	1.70	✓	100	100	✓	100	✓
3	Bedroom	2.50	✓	100	100	✓	100	✓
4	Bedroom	2.95	✓	100	100	✓	100	✓
5	LKD	1.82	x / ✓	100	100	✓	100	✓
6	Bedroom	2.82	✓	100	100	✓	100	✓
7	LKD	1.82	x / ✓	100	100	✓	100	✓
8	LKD	1.84	x / ✓	100	100	✓	100	✓
9	Bedroom	2.92	✓	100	100	✓	100	✓
10	LKD	1.86	x / ✓	100	100	✓	100	✓
11	Bedroom	2.92	✓	100	100	✓	100	✓
12	Bedroom	2.96	✓	100	100	✓	100	✓
13	Bedroom	2.87	✓	100	100	✓	100	✓
14	LKD	3.65	✓	100	100	✓	100	✓
15	LKD	3.57	✓	100	100	✓	100	✓
16	Bedroom	2.60	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
17	Bedroom	2.60	✓	100	100	✓	100	✓
18	Bedroom	2.72	✓	100	100	✓	100	✓
19	LKD	1.64	x / ✓	80	100	✓	100	✓
20	Bedroom	2.40	✓	100	100	✓	100	✓
21	LKD	1.60	x / ✓	100	100	✓	100	✓
22	Bedroom	1.50	✓	100	100	✓	100	✓
23	Bedroom	2.11	✓	100	100	✓	100	✓
24	LKD	1.33	x	73.33	100	✓	100	✓
25	Bedroom	1.01	✓	100	100	✓	100	✓
26	Bedroom	1.09	✓	100	100	✓	100	✓
27	LKD	0.94	x	44	100	x	60	✓
28	Bedroom	1.23	✓	100	100	✓	100	✓
29	Bedroom	1.04	✓	100	100	✓	100	✓
30	LKD	2.10	✓	100	100	✓	100	✓
31	LKD	2.84	✓	100	100	✓	100	✓
32	Bedroom	2.64	✓	100	100	✓	100	✓
33	Bedroom	2.09	✓	100	100	✓	100	✓
34	Bedroom	1.92	✓	100	100	✓	100	✓
35	Bedroom	1.88	✓	100	100	✓	100	✓
36	LKD	3.68	✓	100	100	✓	100	✓
37	LKD	4.18	✓	100	100	✓	100	✓
38	Bedroom	1.63	✓	100	100	✓	100	✓
39	Bedroom	2.38	✓	100	100	✓	100	✓
40	Bedroom	3.05	✓	100	100	✓	100	✓
41	LKD	2.01	✓	100	100	✓	100	✓
42	Bedroom	3.03	✓	100	100	✓	100	✓
43	LKD	2.01	✓	100	100	✓	100	✓
44	Bedroom	3.00	✓	100	100	✓	100	✓
45	LKD	2.01	✓	100	100	✓	100	✓
46	LKD	2.00	✓	100	100	✓	100	✓
47	Bedroom	2.99	✓	100	100	✓	100	✓
48	LKD	2.05	✓	100	100	✓	100	✓
49	Bedroom	3.12	✓	100	100	✓	100	✓
50	Bedroom	3.06	✓	100	100	✓	100	✓
51	Bedroom	2.92	✓	100	100	✓	100	✓
52	LKD	3.69	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
53	LKD	3.59	✓	100	100	✓	100	✓
54	Bedroom	2.77	✓	100	100	✓	100	✓
55	Bedroom	2.89	✓	100	100	✓	100	✓
56	LKD	1.82	x / ✓	100	100	✓	100	✓
57	Bedroom	2.33	✓	100	100	✓	100	✓
58	Bedroom	2.37	✓	100	100	✓	100	✓
59	Bedroom	1.51	✓	100	100	✓	100	✓
60	LKD	1.52	x / ✓	83.95	100	✓	100	✓
61	Bedroom	2.49	✓	100	100	✓	100	✓
62	LKD	1.50	x / ✓	100	100	✓	100	✓
63	Bedroom	1.61	✓	100	100	✓	100	✓
64	Bedroom	1.92	✓	100	100	✓	100	✓
65	LKD	1.31	x	76.62	100	✓	100	✓
66	Bedroom	1.06	✓	74.19	100	✓	100	✓
67	Bedroom	1.62	✓	81.82	100	✓	100	✓
68	LKD	0.99	x	46.51	100	x	86.82	✓
69	Bedroom	1.09	✓	100	100	✓	100	✓
70	Bedroom	2.14	✓	100	100	✓	100	✓
71	LKD	1.30	x	100	100	✓	100	✓
72	Bedroom	2.42	✓	100	100	✓	100	✓
73	Bedroom	2.53	✓	100	100	✓	100	✓
74	LKD	1.42	x	96.67	100	✓	100	✓
75	Bedroom	2.53	✓	100	100	✓	100	✓
76	Bedroom	2.30	✓	100	100	✓	100	✓
77	LKD	1.59	x / ✓	100	100	✓	100	✓
78	Bedroom	2.24	✓	100	100	✓	100	✓

14.1.4 Block 1 – Level 3

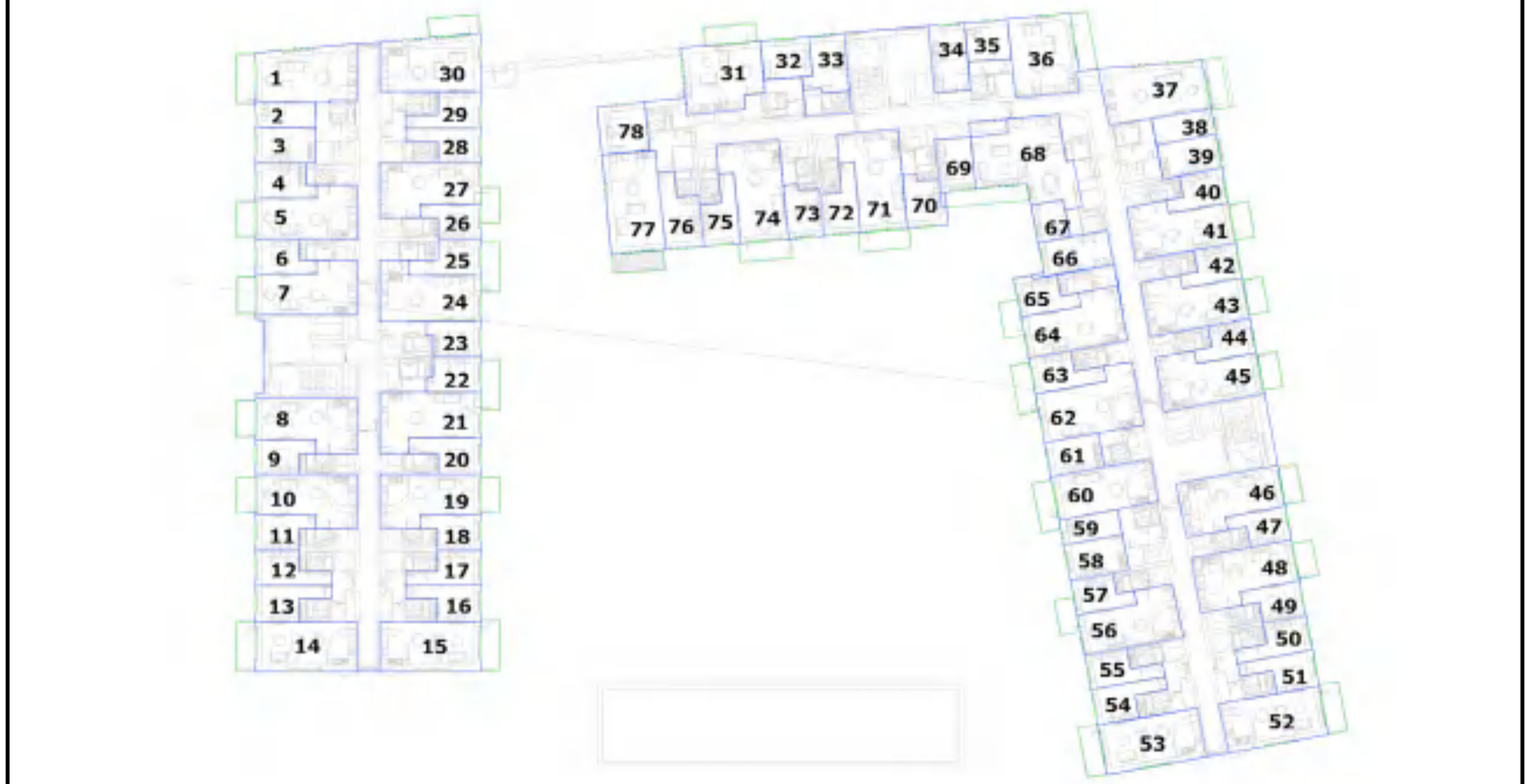


[illegible]	[illegible] Activity	[illegible] BS 8206:2008		[illegible] Method 2			[illegible] Method 2 National Annex	
		[illegible] (%)	[illegible]	[illegible] > E_T (%)	[illegible] > E_{TM} (%)	[illegible]	[illegible] > E_T (%)	[illegible]
1	LKD	3.01	✓	100	100	✓	100	✓
2	Bedroom	2.08	✓	100	100	✓	100	✓
3	Bedroom	2.60	✓	100	100	✓	100	✓
4	Bedroom	3.96	✓	100	100	✓	100	✓
5	LKD	2.00	✓	98.7	100	✓	100	✓
6	Bedroom	3.31	✓	100	100	✓	100	✓
7	LKD	2.00	✓	100	100	✓	100	✓
8	LKD	2.00	✓	100	100	✓	100	✓
9	Bedroom	3.35	✓	100	100	✓	100	✓
10	LKD	2.02	✓	100	100	✓	100	✓
11	Bedroom	3.46	✓	100	100	✓	100	✓
12	Bedroom	3.50	✓	100	100	✓	100	✓
13	Bedroom	3.34	✓	100	100	✓	100	✓
14	LKD	3.55	✓	100	100	✓	100	✓
15	LKD	3.53	✓	100	100	✓	100	✓
16	Bedroom	3.13	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
17	Bedroom	3.17	✓	100	100	✓	100	✓
18	Bedroom	3.33	✓	100	100	✓	100	✓
19	LKD	1.81	x / ✓	100	100	✓	100	✓
20	Bedroom	2.87	✓	100	100	✓	100	✓
21	LKD	1.46	x	73.86	100	✓	100	✓
22	Bedroom	2.75	✓	100	100	✓	100	✓
23	Bedroom	2.75	✓	100	100	✓	100	✓
24	LKD	1.24	x	61.36	100	✓	86.36	✓
25	Bedroom	1.94	✓	100	100	✓	100	✓
26	Bedroom	2.14	✓	100	100	✓	100	✓
27	LKD	1.05	x	39.74	100	x	57.69	✓
28	Bedroom	1.78	✓	100	100	✓	100	✓
29	Bedroom	1.51	✓	100	100	✓	100	✓
30	LKD	2.23	✓	100	100	✓	100	✓
31	LKD	2.62	✓	100	100	✓	100	✓
32	Bedroom	3.17	✓	100	100	✓	100	✓
33	Bedroom	2.57	✓	100	100	✓	100	✓
34	Bedroom	2.13	✓	100	100	✓	100	✓
35	Bedroom	2.43	✓	100	100	✓	100	✓
36	LKD	2.82	✓	100	100	✓	100	✓
37	LKD	3.35	✓	100	100	✓	100	✓
38	Bedroom	1.85	✓	100	100	✓	100	✓
39	Bedroom	2.76	✓	100	100	✓	100	✓
40	Bedroom	3.51	✓	100	100	✓	100	✓
41	LKD	2.06	✓	91.46	100	✓	100	✓
42	Bedroom	3.48	✓	100	100	✓	100	✓
43	LKD	2.04	✓	89.02	100	✓	100	✓
44	Bedroom	3.49	✓	100	100	✓	100	✓
45	LKD	2.05	✓	92.68	100	✓	100	✓
46	LKD	1.78	x / ✓	100	100	✓	100	✓
47	Bedroom	3.69	✓	100	100	✓	100	✓
48	LKD	2.05	✓	100	100	✓	100	✓
49	Bedroom	3.56	✓	100	100	✓	100	✓
50	Bedroom	3.53	✓	100	100	✓	100	✓
51	Bedroom	3.50	✓	100	100	✓	100	✓
52	LKD	3.61	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 1 BS 8206:2008		EN 17037:2018+A1 Method 2			BS EN 17037:2018 Method 2 National Annex	
		Area (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
53	LKD	3.56	✓	100	100	✓	100	✓
54	Bedroom	3.41	✓	100	100	✓	100	✓
55	Bedroom	3.31	✓	100	100	✓	100	✓
56	LKD	2.00	✓	100	100	✓	100	✓
57	Bedroom	3.41	✓	100	100	✓	100	✓
58	Bedroom	2.52	✓	100	100	✓	100	✓
59	Bedroom	1.95	✓	100	100	✓	100	✓
60	LKD	1.71	x / ✓	100	100	✓	100	✓
61	Bedroom	2.63	✓	100	100	✓	100	✓
62	LKD	1.69	x / ✓	98	100	✓	100	✓
63	Bedroom	2.99	✓	100	100	✓	100	✓
64	Bedroom	3.19	✓	100	100	✓	100	✓
65	LKD	1.53	x / ✓	59.04	100	✓	91.57	✓
66	Bedroom	1.69	✓	100	100	✓	100	✓
67	Bedroom	2.39	✓	100	100	✓	100	✓
68	LKD	1.10	x	94.83	100	✓	100	✓
69	Bedroom	2.08	✓	100	100	✓	100	✓
70	Bedroom	2.68	✓	100	100	✓	100	✓
71	LKD	1.50	x / ✓	100	100	✓	100	✓
72	Bedroom	3.08	✓	100	100	✓	100	✓
73	Bedroom	2.95	✓	100	100	✓	100	✓
74	LKD	1.67	x / ✓	95.56	100	✓	100	✓
75	Bedroom	3.01	✓	100	100	✓	100	✓
76	Bedroom	2.35	✓	100	100	✓	100	✓
77	LKD	1.75	x / ✓	100	100	✓	100	✓
78	Bedroom	2.66	✓	100	100	✓	100	✓

14.1.5 Block 1 – Level 4



Activity	BS 8206:2008		Method 2			Method 2 National Annex	
	(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	LKD	3.21	✓	100	100	✓	100	✓
2	Bedroom	2.01	✓	100	100	✓	100	✓
3	Bedroom	2.97	✓	100	100	✓	100	✓
4	Bedroom	3.51	✓	100	100	✓	100	✓
5	LKD	2.00	✓	97.14	100	✓	100	✓
6	Bedroom	3.36	✓	100	100	✓	100	✓
7	LKD	2.00	✓	100	100	✓	100	✓
8	LKD	2.00	✓	100	100	✓	100	✓
9	Bedroom	3.49	✓	100	100	✓	100	✓
10	LKD	2.04	✓	100	100	✓	100	✓
11	Bedroom	3.48	✓	100	100	✓	100	✓
12	Bedroom	3.54	✓	100	100	✓	100	✓
13	Bedroom	3.42	✓	100	100	✓	100	✓
14	LKD	3.72	✓	100	100	✓	100	✓
15	LKD	3.71	✓	100	100	✓	100	✓
16	Bedroom	3.22	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
17	Bedroom	3.25	✓	100	100	✓	100	✓
18	Bedroom	3.42	✓	100	100	✓	100	✓
19	LKD	1.97	x / ✓	100	100	✓	100	✓
20	Bedroom	3.08	✓	100	100	✓	100	✓
21	LKD	1.80	x / ✓	100	100	✓	100	✓
22	Bedroom	2.01	✓	100	100	✓	100	✓
23	Bedroom	2.85	✓	100	100	✓	100	✓
24	LKD	1.62	x / ✓	71.11	100	✓	96.67	✓
25	Bedroom	1.60	✓	100	100	✓	100	✓
26	Bedroom	1.90	✓	100	100	✓	100	✓
27	LKD	1.39	x	53.33	100	✓	68	✓
28	Bedroom	2.48	✓	100	100	✓	100	✓
29	Bedroom	1.96	✓	100	100	✓	100	✓
30	LKD	2.35	✓	100	100	✓	100	✓
31	LKD	2.91	✓	100	100	✓	100	✓
32	Bedroom	3.21	✓	100	100	✓	100	✓
33	Bedroom	2.62	✓	100	100	✓	100	✓
34	Bedroom	2.38	✓	100	100	✓	100	✓
35	Bedroom	2.24	✓	100	100	✓	100	✓
36	LKD	3.22	✓	100	100	✓	100	✓
37	LKD	3.63	✓	100	100	✓	100	✓
38	Bedroom	1.89	✓	100	100	✓	100	✓
39	Bedroom	2.78	✓	100	100	✓	100	✓
40	Bedroom	3.59	✓	100	100	✓	100	✓
41	LKD	2.00	✓	75.34	100	✓	100	✓
42	Bedroom	3.58	✓	100	100	✓	100	✓
43	LKD	2.00	✓	94.59	100	✓	100	✓
44	Bedroom	3.55	✓	100	100	✓	100	✓
45	LKD	2.00	✓	74.29	100	✓	100	✓
46	LKD	2.02	✓	100	100	✓	100	✓
47	Bedroom	3.54	✓	100	100	✓	100	✓
48	LKD	2.05	✓	100	100	✓	100	✓
49	Bedroom	3.70	✓	100	100	✓	100	✓
50	Bedroom	3.63	✓	100	100	✓	100	✓
51	Bedroom	3.44	✓	100	100	✓	100	✓
52	LKD	3.73	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide		BS EN 15193:2007			BS EN 15193:2007 National Annex	
		BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
53	LKD	3.66	✓	100	100	✓	100	✓
54	Bedroom	3.32	✓	100	100	✓	100	✓
55	Bedroom	3.47	✓	100	100	✓	100	✓
56	LKD	2.00	✓	100	100	✓	100	✓
57	Bedroom	2.74	✓	100	100	✓	100	✓
58	Bedroom	2.87	✓	100	100	✓	100	✓
59	Bedroom	1.81	✓	100	100	✓	100	✓
60	LKD	1.71	x / ✓	100	100	✓	100	✓
61	Bedroom	3.09	✓	100	100	✓	100	✓
62	LKD	1.70	x / ✓	94.62	100	✓	100	✓
63	Bedroom	1.99	✓	100	100	✓	100	✓
64	Bedroom	2.50	✓	100	100	✓	100	✓
65	LKD	1.69	x / ✓	97.22	100	✓	100	✓
66	Bedroom	1.65	✓	100	100	✓	100	✓
67	Bedroom	2.29	✓	100	100	✓	100	✓
68	LKD	1.18	x	100	100	✓	100	✓
69	Bedroom	1.49	✓	100	100	✓	100	✓
70	Bedroom	2.94	✓	100	100	✓	100	✓
71	LKD	1.51	x / ✓	100	100	✓	100	✓
72	Bedroom	3.00	✓	100	100	✓	100	✓
73	Bedroom	3.12	✓	100	100	✓	100	✓
74	LKD	1.67	x / ✓	100	100	✓	100	✓
75	Bedroom	3.10	✓	100	100	✓	100	✓
76	Bedroom	2.81	✓	100	100	✓	100	✓
77	LKD	2.03	✓	100	100	✓	100	✓
78	Bedroom	2.98	✓	100	100	✓	100	✓

14.1.6 Block 1 – Level 5

Activity	BS 8206:2008		Method 2			Method 2 National Annex	
	(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	LKD	4.10	✓	100	100	✓	100	✓
2	Bedroom	2.06	✓	100	100	✓	100	✓
3	Bedroom	3.00	✓	100	100	✓	100	✓
4	Bedroom	3.60	✓	100	100	✓	100	✓
5	LKD	2.01	✓	87.01	100	✓	98.7	✓
6	Bedroom	3.50	✓	100	100	✓	100	✓
7	LKD	2.01	✓	89.61	100	✓	98.7	✓
8	LKD	2.01	✓	100	100	✓	100	✓
9	Bedroom	3.64	✓	100	100	✓	100	✓
10	LKD	2.03	✓	100	100	✓	100	✓
11	Bedroom	3.58	✓	100	100	✓	100	✓
12	Bedroom	3.56	✓	100	100	✓	100	✓
13	Bedroom	3.50	✓	100	100	✓	100	✓
14	LKD	4.71	✓	100	100	✓	100	✓
15	LKD	5.34	✓	100	100	✓	100	✓
16	Bedroom	3.35	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
17	Bedroom	3.30	✓	100	100	✓	100	✓
18	Bedroom	3.57	✓	100	100	✓	100	✓
19	LKD	2.01	✓	100	100	✓	100	✓
20	Bedroom	3.20	✓	100	100	✓	100	✓
21	LKD	2.16	✓	100	100	✓	100	✓
22	Bedroom	3.15	✓	100	100	✓	100	✓
23	Bedroom	3.11	✓	100	100	✓	100	✓
24	LKD	2.06	✓	66.67	100	✓	92.22	✓
25	Bedroom	3.05	✓	100	100	✓	100	✓
26	Bedroom	3.35	✓	100	100	✓	100	✓
27	LKD	2.06	✓	66.67	100	✓	90.67	✓
28	Bedroom	3.12	✓	100	100	✓	100	✓
29	Bedroom	2.41	✓	100	100	✓	100	✓
30	LKD	3.22	✓	100	100	✓	100	✓
31	LKD	4.26	✓	100	100	✓	100	✓
32	Bedroom	3.30	✓	100	100	✓	100	✓
33	Bedroom	2.67	✓	100	100	✓	100	✓
34	Bedroom	2.43	✓	100	100	✓	100	✓
35	Bedroom	2.27	✓	100	100	✓	100	✓
36	LKD	4.16	✓	100	100	✓	100	✓
37	LKD	4.68	✓	100	100	✓	100	✓
38	Bedroom	1.95	✓	100	100	✓	100	✓
39	Bedroom	2.81	✓	100	100	✓	100	✓
40	Bedroom	3.71	✓	100	100	✓	100	✓
41	LKD	2.09	✓	59.76	100	✓	95.12	✓
42	Bedroom	3.74	✓	100	100	✓	100	✓
43	LKD	2.09	✓	81.71	100	✓	98.78	✓
44	Bedroom	3.70	✓	100	100	✓	100	✓
45	LKD	2.09	✓	67.07	100	✓	100	✓
46	LKD	2.10	✓	100	100	✓	100	✓
47	Bedroom	3.70	✓	100	100	✓	100	✓
48	LKD	2.10	✓	100	100	✓	100	✓
49	Bedroom	3.79	✓	100	100	✓	100	✓
50	Bedroom	3.65	✓	100	100	✓	100	✓
51	Bedroom	3.54	✓	100	100	✓	100	✓
52	LKD	4.76	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide		IES Method 2			IES Method 2 National Annex	
		BS 8206:2008						
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
53	LKD	4.69	✓	100	100	✓	100	✓
54	Bedroom	3.44	✓	100	100	✓	100	✓
55	Bedroom	3.52	✓	100	100	✓	100	✓
56	LKD	2.38	✓	100	100	✓	100	✓
57	Bedroom	3.56	✓	100	100	✓	100	✓
58	Bedroom	2.93	✓	100	100	✓	100	✓
59	Bedroom	1.91	✓	100	100	✓	100	✓
60	LKD	2.17	✓	100	100	✓	100	✓
61	Bedroom	3.24	✓	100	100	✓	100	✓
62	LKD	2.03	✓	85.71	100	✓	100	✓
63	Bedroom	3.20	✓	100	100	✓	100	✓
64	Bedroom	3.46	✓	100	100	✓	100	✓
65	LKD	2.22	✓	80.26	100	✓	100	✓
66	Bedroom	1.98	✓	100	100	✓	100	✓
67	Bedroom	2.66	✓	100	100	✓	100	✓
68	LKD	2.22	✓	100	100	✓	100	✓
69	Bedroom	2.75	✓	100	100	✓	100	✓
70	Bedroom	3.24	✓	100	100	✓	100	✓
71	LKD	2.24	✓	89.25	100	✓	100	✓
72	Bedroom	3.24	✓	100	100	✓	100	✓
73	Bedroom	3.31	✓	100	100	✓	100	✓
74	LKD	2.34	✓	93.62	100	✓	100	✓
75	Bedroom	3.30	✓	100	100	✓	100	✓
76	Bedroom	3.00	✓	100	100	✓	100	✓
77	LKD	2.71	✓	100	100	✓	100	✓
78	Bedroom	3.08	✓	100	100	✓	100	✓

14.1.7 Block 2 – Level 0

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.81	✓	100	100	✓	100	✓
2	Bedroom	2.87	✓	100	100	✓	100	✓
3	Bedroom	2.97	✓	100	100	✓	100	✓
4	Bedroom	1.68	✓	100	100	✓	100	✓
5	LKD	1.66	x / ✓	100	100	✓	100	✓
6	Bedroom	1.99	✓	100	100	✓	100	✓
7	LKD	1.06	x	95.65	100	✓	100	✓
8	Bedroom	2.43	✓	100	100	✓	100	✓
9	LKD	2.73	✓	100	100	✓	100	✓
10	Bedroom	2.91	✓	100	100	✓	100	✓
11	Bedroom	3.00	✓	100	100	✓	100	✓
12	Bedroom	2.01	✓	100	100	✓	100	✓
13	LKD	1.50	x / ✓	100	100	✓	100	✓
14	LKD	1.50	✓	100	100	✓	100	✓
15	Bedroom	2.93	✓	100	100	✓	100	✓
16	LKD	1.54	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
17	Bedroom	2.99	✓	100	100	✓	100	✓
18	Bedroom	3.04	✓	100	100	✓	100	✓
19	Bedroom	2.84	✓	100	100	✓	100	✓
20	LKD	2.09	✓	100	100	✓	100	✓

14.1.8 Block 2 – Level 1

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	3.23	✓	100	100	✓	100	✓
2	Bedroom	3.26	✓	100	100	✓	100	✓
3	Bedroom	3.37	✓	100	100	✓	100	✓
4	LKD	1.52	x / ✓	100	100	✓	100	✓
5	Bedroom	3.35	✓	100	100	✓	100	✓
6	Bedroom	3.01	✓	100	100	✓	100	✓
7	LKD	1.22	x	100	100	✓	100	✓
8	Bedroom	2.66	✓	100	100	✓	100	✓
9	Bedroom	1.98	✓	100	100	✓	100	✓
10	LKD	2.10	✓	100	100	✓	100	✓
11	Bedroom	2.58	✓	100	100	✓	100	✓
12	LKD	1.50	x / ✓	100	100	✓	100	✓
13	Bedroom	3.05	✓	100	100	✓	100	✓
14	LKD	3.14	✓	100	100	✓	100	✓
15	Bedroom	3.31	✓	100	100	✓	100	✓
16	Bedroom	3.42	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
17	Bedroom	3.08	✓	100	100	✓	100	✓
18	LKD	1.20	x	100	100	✓	100	✓
19	Bedroom	3.02	✓	100	100	✓	100	✓
20	LKD	1.50	x / ✓	100	100	✓	100	✓
21	Bedroom	3.35	✓	100	100	✓	100	✓
22	LKD	1.51	x / ✓	100	100	✓	100	✓
23	Bedroom	3.38	✓	100	100	✓	100	✓
24	Bedroom	3.43	✓	100	100	✓	100	✓
25	Bedroom	3.23	✓	100	100	✓	100	✓
26	LKD	2.47	✓	100	100	✓	100	✓

14.1.9 Block 2 – Level 2

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	3.38	✓	100	100	✓	100	✓
2	Bedroom	3.34	✓	100	100	✓	100	✓
3	Bedroom	3.47	✓	100	100	✓	100	✓
4	LKD	1.57	x / ✓	100	100	✓	100	✓
5	Bedroom	3.46	✓	100	100	✓	100	✓
6	Bedroom	3.12	✓	100	100	✓	100	✓
7	LKD	1.28	x	97.73	100	✓	100	✓
8	Bedroom	2.80	✓	100	100	✓	100	✓
9	Bedroom	2.24	✓	100	100	✓	100	✓
10	LKD	2.47	✓	100	100	✓	100	✓
11	Bedroom	2.81	✓	100	100	✓	100	✓
12	LKD	1.63	x / ✓	100	100	✓	100	✓
13	Bedroom	3.28	✓	100	100	✓	100	✓
14	LKD	3.33	✓	100	100	✓	100	✓
15	Bedroom	3.41	✓	100	100	✓	100	✓
16	Bedroom	3.51	✓	100	100	✓	100	✓

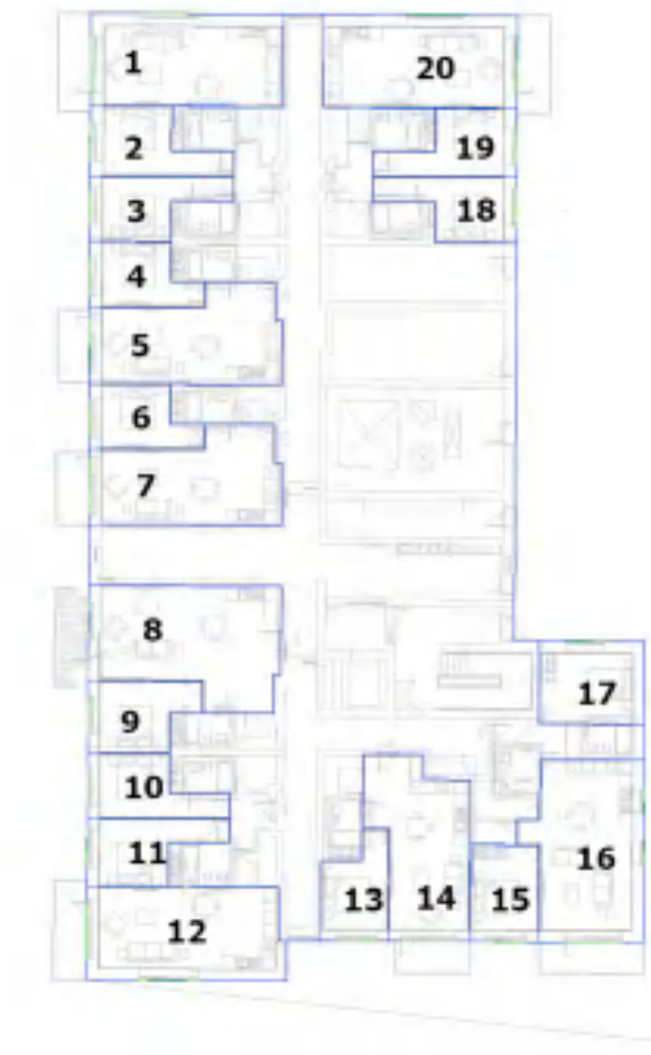
Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		[illegible] (%)	[illegible]	[illegible] > E_T (%)	[illegible] > E_{TM} (%)	[illegible]	[illegible] > E_T (%)	[illegible]
17	Bedroom	3.18	✓	100	100	✓	100	✓
18	LKD	1.25	x	100	100	✓	100	✓
19	Bedroom	3.13	✓	100	100	✓	100	✓
20	LKD	1.55	x / ✓	100	100	✓	100	✓
21	Bedroom	3.45	✓	100	100	✓	100	✓
22	LKD	1.55	x / ✓	100	100	✓	100	✓
23	Bedroom	3.47	✓	100	100	✓	100	✓
24	Bedroom	3.52	✓	100	100	✓	100	✓
25	Bedroom	3.31	✓	100	100	✓	100	✓
26	LKD	3.01	✓	100	100	✓	100	✓

14.1.10 Block 2 – Level 3

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	4.10	✓	100	100	✓	100	✓
2	Bedroom	3.49	✓	100	100	✓	100	✓
3	Bedroom	3.59	✓	100	100	✓	100	✓
4	LKD	2.08	✓	100	100	✓	100	✓
5	Bedroom	3.62	✓	100	100	✓	100	✓
6	Bedroom	3.37	✓	100	100	✓	100	✓
7	LKD	2.28	✓	92.08	100	✓	100	✓
8	Bedroom	3.20	✓	100	100	✓	100	✓
9	Bedroom	2.69	✓	100	100	✓	100	✓
10	LKD	2.49	✓	100	100	✓	100	✓
11	Bedroom	3.07	✓	100	100	✓	100	✓
12	LKD	2.12	✓	100	100	✓	100	✓
13	Bedroom	3.47	✓	100	100	✓	100	✓
14	LKD	4.12	✓	100	100	✓	100	✓
15	Bedroom	3.56	✓	100	100	✓	100	✓
16	Bedroom	3.56	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
17	Bedroom	3.35	✓	100	100	✓	100	✓
18	LKD	2.17	✓	100	100	✓	100	✓
19	Bedroom	3.19	✓	100	100	✓	100	✓
20	LKD	2.26	✓	100	100	✓	100	✓
21	Bedroom	3.66	✓	100	100	✓	100	✓
22	LKD	2.20	✓	79.75	100	✓	100	✓
23	Bedroom	3.62	✓	100	100	✓	100	✓
24	Bedroom	3.57	✓	100	100	✓	100	✓
25	Bedroom	3.46	✓	100	100	✓	100	✓
26	LKD	3.98	✓	100	100	✓	100	✓

14.1.11 Block 3 – Level 0



Activity	BS 8206:2008		Method 2			Method 2 National Annex	
	(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	LKD	2.00	✓	100	100	✓	100	✓
2	Bedroom	2.88	✓	100	100	✓	100	✓
3	Bedroom	3.05	✓	100	100	✓	100	✓
4	Bedroom	3.03	✓	100	100	✓	100	✓
5	LKD	1.53	x / ✓	100	100	✓	100	✓
6	Bedroom	2.98	✓	100	100	✓	100	✓
7	LKD	1.52	x / ✓	98.7	100	✓	100	✓
8	LKD	1.33	✓	100	100	✓	100	✓
9	Bedroom	2.65	✓	100	100	✓	100	✓
10	Bedroom	3.01	✓	100	100	✓	100	✓
11	Bedroom	2.88	✓	100	100	✓	100	✓
12	LKD	2.76	✓	100	100	✓	100	✓
13	Bedroom	2.31	✓	100	100	✓	100	✓
14	LKD	1.01	✓	85.71	100	✓	100	✓
15	Bedroom	1.87	✓	100	100	✓	100	✓
16	LKD	1.60	x / ✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
17	Bedroom	1.68	✓	100	100	✓	100	✓
18	Bedroom	2.86	✓	100	100	✓	100	✓
19	Bedroom	2.74	✓	100	100	✓	100	✓
20	LKD	2.75	✓	100	100	✓	100	✓

14.1.12 Block 3 – Level 1

Ref.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.15	✓	100	100	✓	100	✓
2	Bedroom	3.36	✓	100	100	✓	100	✓
3	Bedroom	3.57	✓	100	100	✓	100	✓
4	Bedroom	3.54	✓	100	100	✓	100	✓
5	LKD	1.63	x / ✓	100	100	✓	100	✓
6	Bedroom	3.49	✓	100	100	✓	100	✓
7	LKD	1.62	x / ✓	100	100	✓	100	✓
8	Bedroom	3.05	✓	100	100	✓	100	✓
9	LKD	1.30	x	100	100	✓	100	✓
10	Bedroom	3.23	✓	100	100	✓	100	✓
11	Bedroom	3.54	✓	100	100	✓	100	✓
12	Bedroom	3.38	✓	100	100	✓	100	✓
13	LKD	3.34	✓	100	100	✓	100	✓
14	Bedroom	3.04	✓	100	100	✓	100	✓
15	LKD	1.50	x / ✓	100	100	✓	100	✓
16	Bedroom	2.55	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 1 BS 8206:2008		EN 17037:2018+A1 Method 2			EN 17037:2018+A1 Method 2 National Annex	
		DF (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
17	LKD	2.21	✓	100	100	✓	100	✓
18	Bedroom	2.04	✓	100	100	✓	100	✓
19	Bedroom	2.68	✓	100	100	✓	100	✓
20	LKD	1.24	x	96.67	100	✓	100	✓
21	Bedroom	3.02	✓	100	100	✓	100	✓
22	Bedroom	3.41	✓	100	100	✓	100	✓
23	LKD	1.57	x / ✓	100	100	✓	100	✓
24	Bedroom	3.39	✓	100	100	✓	100	✓
25	Bedroom	3.24	✓	100	100	✓	100	✓
26	LKD	3.32	✓	100	100	✓	100	✓

14.1.13 Block 3 – Level 2

Ref.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	2.88	✓	100	100	✓	100	✓
2	Bedroom	3.42	✓	100	100	✓	100	✓
3	Bedroom	3.62	✓	100	100	✓	100	✓
4	Bedroom	3.61	✓	100	100	✓	100	✓
5	LKD	1.66	x / ✓	100	100	✓	100	✓
6	Bedroom	3.56	✓	100	100	✓	100	✓
7	LKD	1.65	x / ✓	100	100	✓	100	✓
8	Bedroom	3.12	✓	100	100	✓	100	✓
9	LKD	1.32	x	100	100	✓	100	✓
10	Bedroom	3.29	✓	100	100	✓	100	✓
11	Bedroom	3.61	✓	100	100	✓	100	✓
12	Bedroom	3.46	✓	100	100	✓	100	✓
13	LKD	3.49	✓	100	100	✓	100	✓
14	Bedroom	3.29	✓	100	100	✓	100	✓
15	LKD	1.65	x / ✓	100	100	✓	100	✓
16	Bedroom	2.79	✓	100	100	✓	100	✓

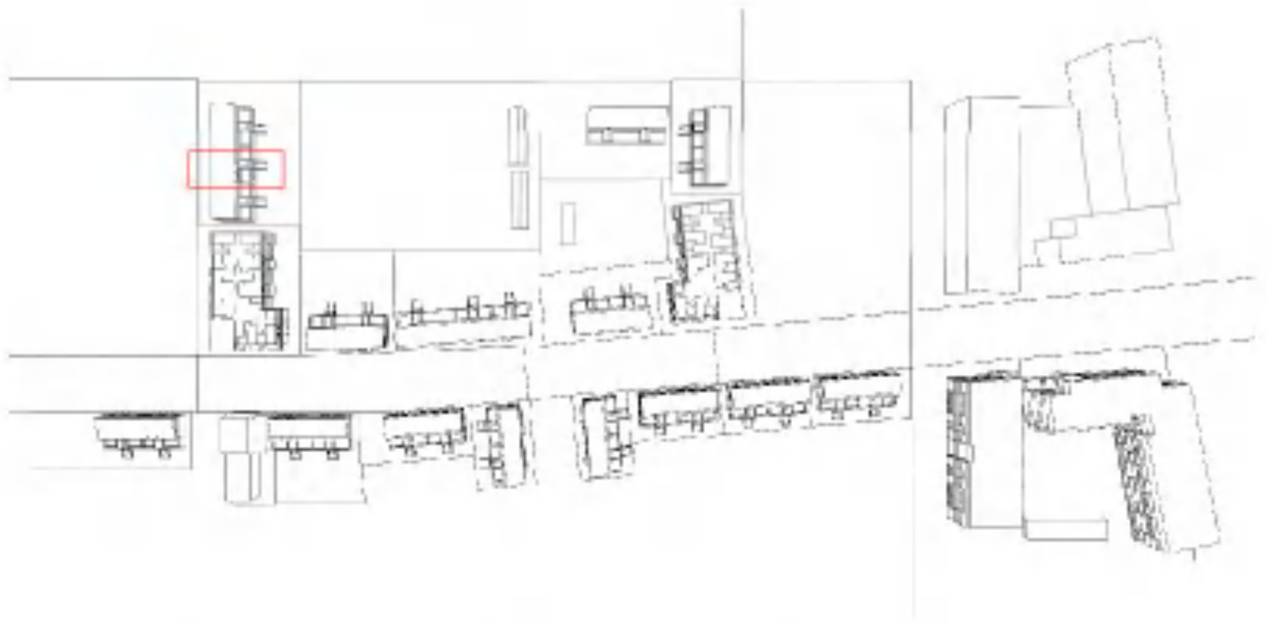
Ref.	Room Activity	BRE Guide 1 BS 8206:2008		EN 17037:2018+A1 Method 2			BS EN 17037:2018 Method 2 National Annex	
		Area (%)	Compliant	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Compliant	Floor Area > E_T (%)	Compliant
17	LKD	2.54	✓	100	100	✓	100	✓
18	Bedroom	2.28	✓	100	100	✓	100	✓
19	Bedroom	2.81	✓	100	100	✓	100	✓
20	LKD	1.28	x	92.22	100	✓	100	✓
21	Bedroom	3.12	✓	100	100	✓	100	✓
22	Bedroom	3.50	✓	100	100	✓	100	✓
23	LKD	1.61	x / ✓	56	100	✓	76	✓
24	Bedroom	3.48	✓	100	100	✓	100	✓
25	Bedroom	3.33	✓	100	100	✓	100	✓
26	LKD	3.45	✓	100	100	✓	100	✓

14.1.14 Block 3 – Level 3

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	4.00	✓	100	100	✓	100	✓
2	Bedroom	3.55	✓	100	100	✓	100	✓
3	Bedroom	3.66	✓	100	100	✓	100	✓
4	Bedroom	3.73	✓	100	100	✓	100	✓
5	LKD	2.00	✓	100	100	✓	100	✓
6	Bedroom	3.75	✓	100	100	✓	100	✓
7	LKD	2.00	✓	100	100	✓	100	✓
8	Bedroom	3.29	✓	100	100	✓	100	✓
9	LKD	2.07	✓	100	100	✓	100	✓
10	Bedroom	3.44	✓	100	100	✓	100	✓
11	Bedroom	3.65	✓	100	100	✓	100	✓
12	Bedroom	3.58	✓	100	100	✓	100	✓
13	LKD	4.23	✓	100	100	✓	100	✓
14	Bedroom	3.50	✓	100	100	✓	100	✓
15	LKD	2.13	✓	100	100	✓	100	✓
16	Bedroom	3.05	✓	100	100	✓	100	✓

Ref.	Room Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
17	LKD	2.50	✓	100	100	✓	100	✓
18	Bedroom	2.72	✓	100	100	✓	100	✓
19	Bedroom	3.21	✓	100	100	✓	100	✓
20	LKD	2.25	✓	86.67	100	✓	98.89	✓
21	Bedroom	3.34	✓	100	100	✓	100	✓
22	Bedroom	3.64	✓	100	100	✓	100	✓
23	LKD	2.04	✓	100	100	✓	100	✓
24	Bedroom	3.59	✓	100	100	✓	100	✓
25	Bedroom	3.46	✓	100	100	✓	100	✓
26	LKD	4.18	✓	100	100	✓	100	✓

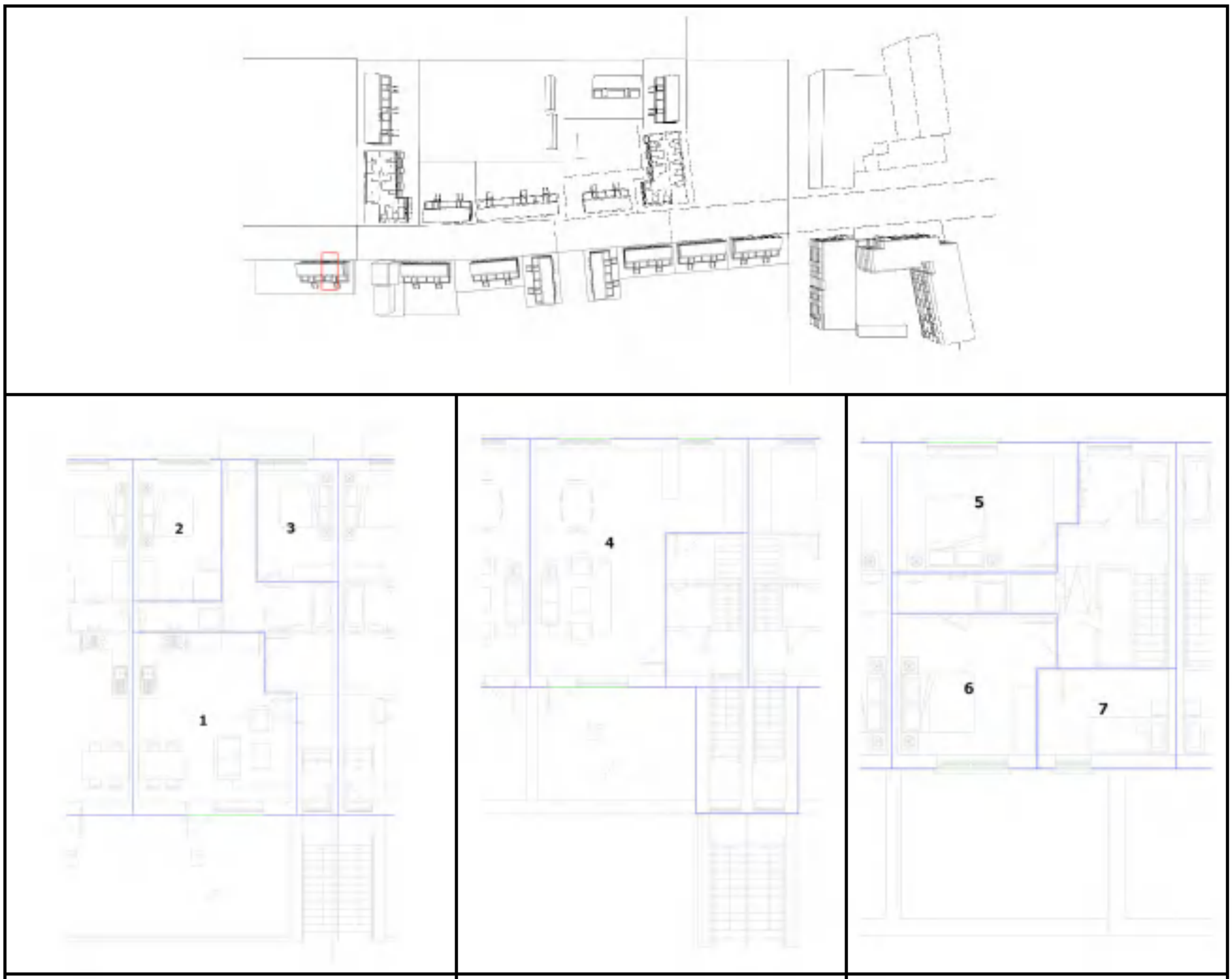
14.1.15 Duplex 1



L00	L01	L02

No.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	Living	2.06	✓	100	100	✓	100	✓
2	Bedroom	1.48	✓	100	100	✓	100	✓
3	Bedroom	2.20	✓	100	100	✓	100	✓
4	Living	3.16	✓	100	100	✓	100	✓
5	Bedroom	2.12	✓	100	100	✓	100	✓
6	Bedroom	3.21	✓	100	100	✓	100	✓
7	Bedroom	2.86	✓	100	100	✓	100	✓

14.1.16 Duplex 2



L00	L01	L02

No.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	Living	2.01	✓	100	100	✓	100	✓
2	Bedroom	2.15	✓	100	100	✓	100	✓
3	Bedroom	1.41	✓	100	100	✓	100	✓
4	Living	3.17	✓	100	100	✓	100	✓
5	Bedroom	3.19	✓	100	100	✓	100	✓
6	Bedroom	2.92	✓	100	100	✓	100	✓
7	Bedroom	2.11	✓	100	100	✓	100	✓

14.1.17 Duplex 3

L00	L01	L02

No.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	Living	2.04	✓	100	100	✓	100	✓
2	Bedroom	1.81	✓	100	100	✓	100	✓
3	Bedroom	1.07	✓	100	100	✓	100	✓
4	Living	3.01	✓	100	100	✓	100	✓
5	Bedroom	2.12	✓	90	100	✓	100	✓
6	Bedroom	2.87	✓	100	100	✓	100	✓
7	Bedroom	3.04	✓	100	100	✓	100	✓

14.1.18 Duplex 4

L00	L01	L02

No.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	Living	2.04	✓	100	100	✓	100	✓
2	Bedroom	1.94	✓	100	100	✓	100	✓
3	Bedroom	1.09	✓	100	100	✓	100	✓
4	Living	3.06	✓	100	100	✓	100	✓
5	Bedroom	2.09	✓	100	100	✓	100	✓
6	Bedroom	2.88	✓	100	100	✓	100	✓
7	Bedroom	3.10	✓	100	100	✓	100	✓

14.1.19 Duplex 5

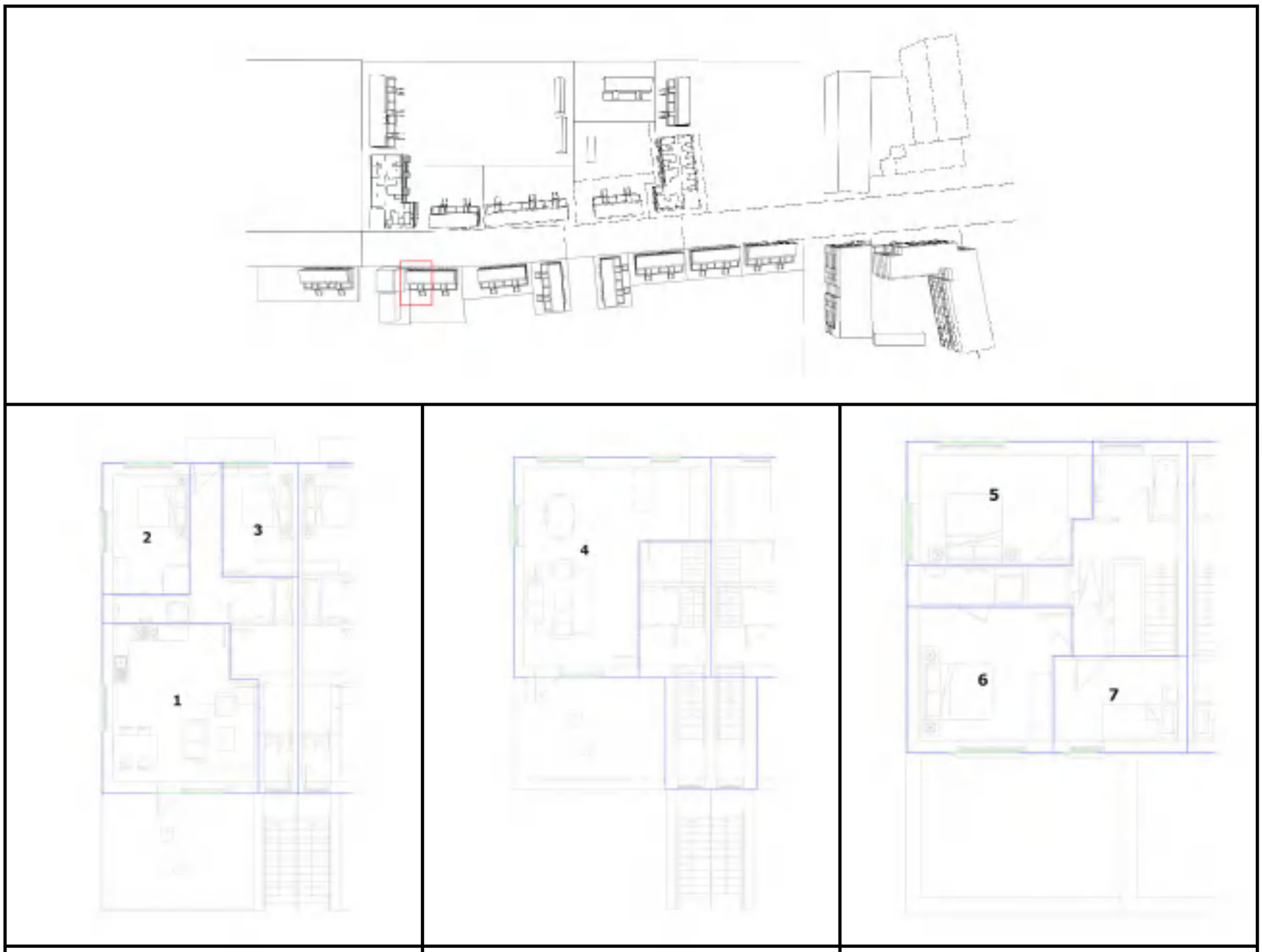
L00

L01

L02

Ref.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	Living	2.04	✓	100	100	✓	100	✓
2	Bedroom	1.71	✓	100	100	✓	100	✓
3	Bedroom	1.08	✓	100	100	✓	100	✓
4	Living	2.93	✓	100	100	✓	100	✓
5	Bedroom	2.78	✓	100	100	✓	100	✓
6	Bedroom	2.99	✓	100	100	✓	100	✓
7	Bedroom	2.03	✓	100	100	✓	100	✓

14.1.20 Duplex 6



L00	L01	L02

No.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> ET (%)	> ETM (%)		> ET (%)	
1	Living	2.13	✓	100	100	✓	100	✓
2	Bedroom	1.86	✓	100	100	✓	100	✓
3	Bedroom	1.01	✓	100	100	✓	100	✓
4	Living	2.70	✓	100	100	✓	100	✓
5	Bedroom	2.90	✓	100	100	✓	100	✓
6	Bedroom	2.85	✓	100	100	✓	100	✓
7	Bedroom	1.84	✓	100	100	✓	100	✓

14.1.21 Duplex 7

L00	L01	L02

No.	Activity	BS 8206:2008		Method 2			Method 2 National Annex	
		(%)		> E_T (%)	> E_{TM} (%)		> E_T (%)	
1	Living	2.05	✓	100	100	✓	100	✓
2	Bedroom	1.77	✓	100	100	✓	100	✓
3	Bedroom	1.02	✓	100	100	✓	100	✓
4	Living	3.00	✓	100	100	✓	100	✓
5	Bedroom	2.98	✓	100	100	✓	100	✓
6	Bedroom	2.91	✓	100	100	✓	100	✓
7	Bedroom	2.13	✓	100	100	✓	100	✓

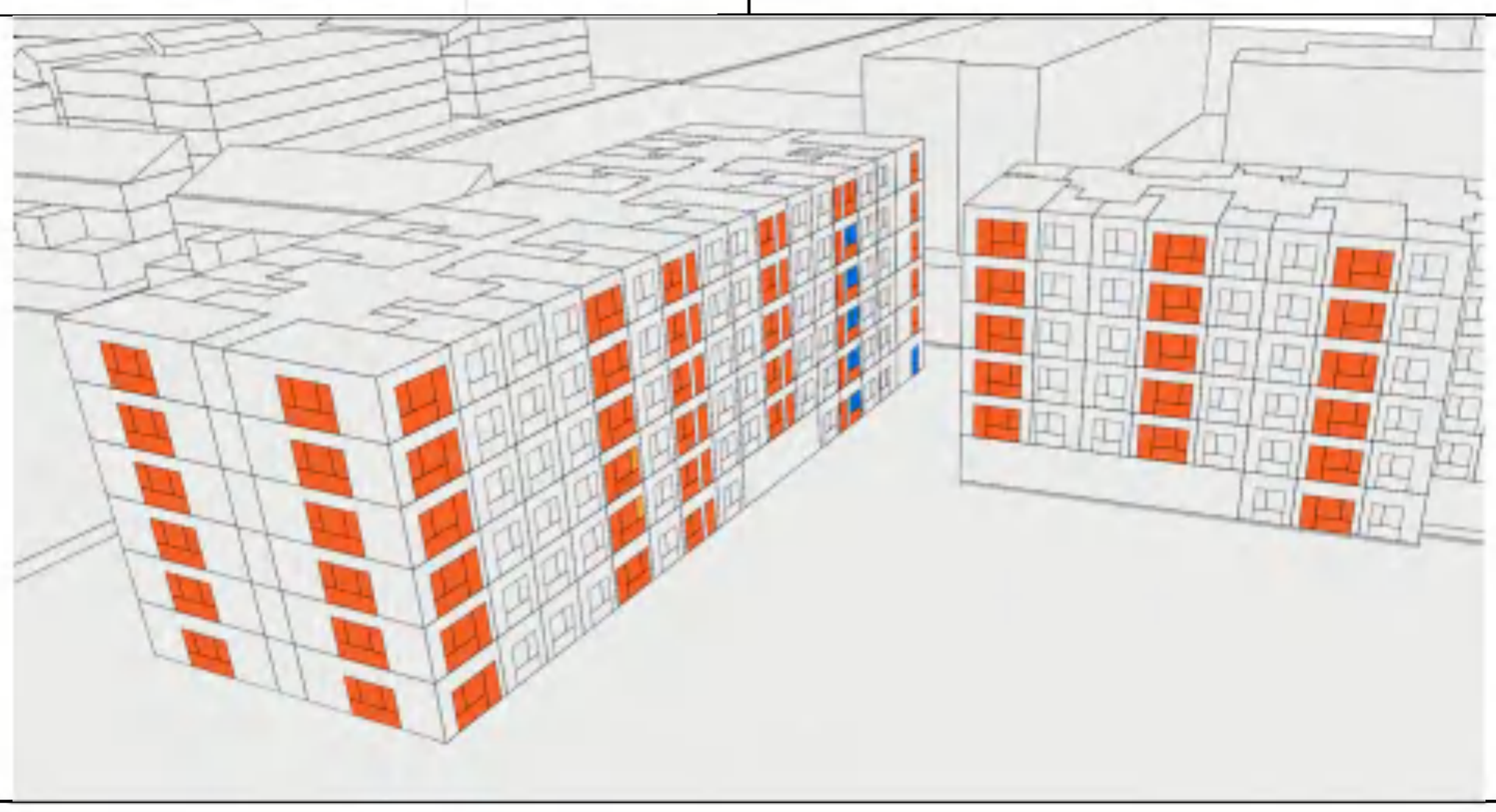
15 Appendix B – Sunlight Exposure Results

The IS EN 17037:2018 sunlight exposure results tabulated in Section 8.3 for the proposed development are visually represented in the following images. The windows highlighted in "red" achieve the minimum 1.5 hours of recommended sunlight on March 21st, while the windows highlighted in "blue" do not achieve the recommended value.

15.1.1 Block 1 – View 1

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

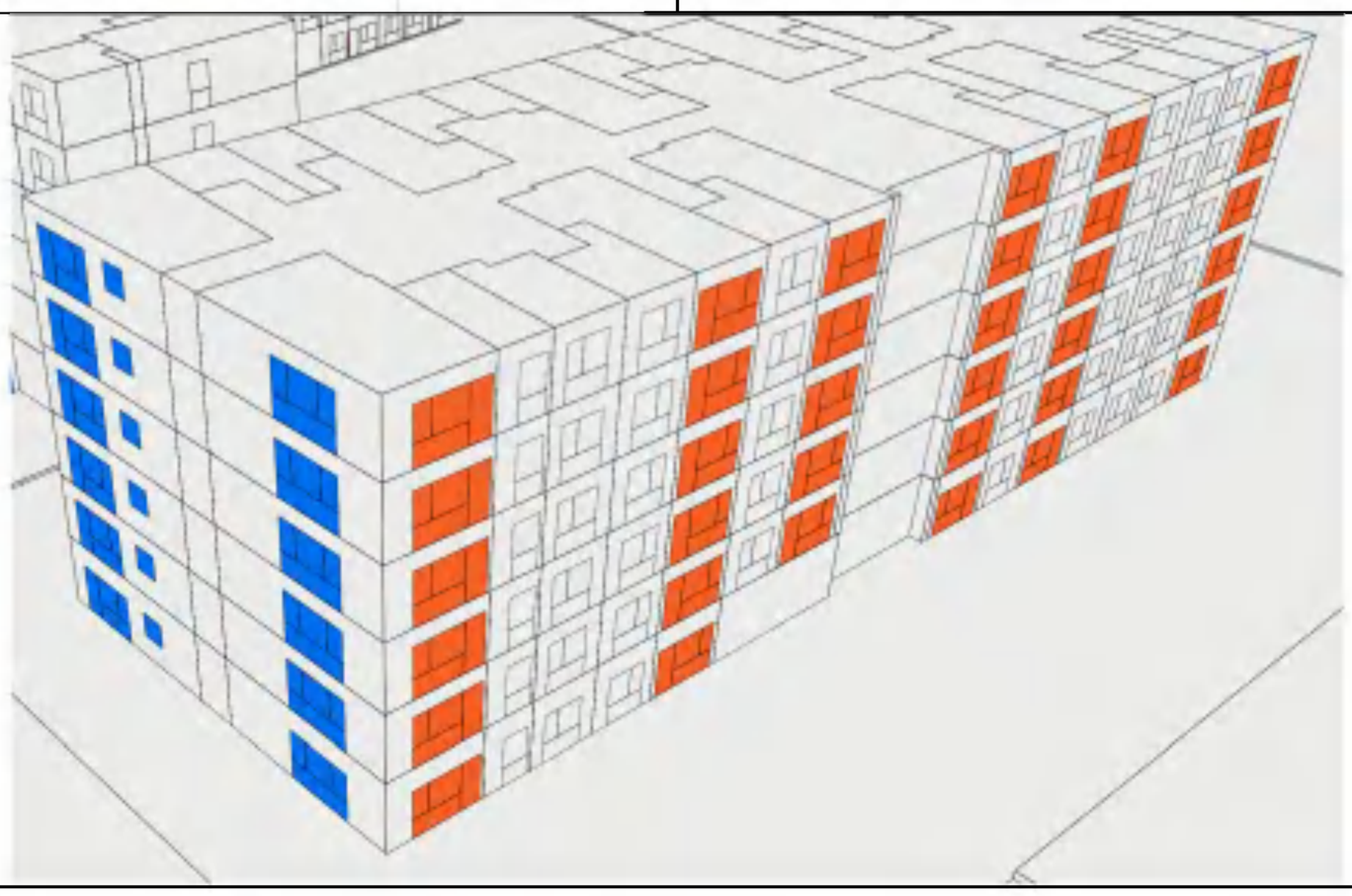


74 out of 80 windows passing

15.1.2 Block 1 – View 2

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight



35 out of 53 windows passing

15.1.3 Block 1 – View 3

Receives more than 1.5 hours of sunlight

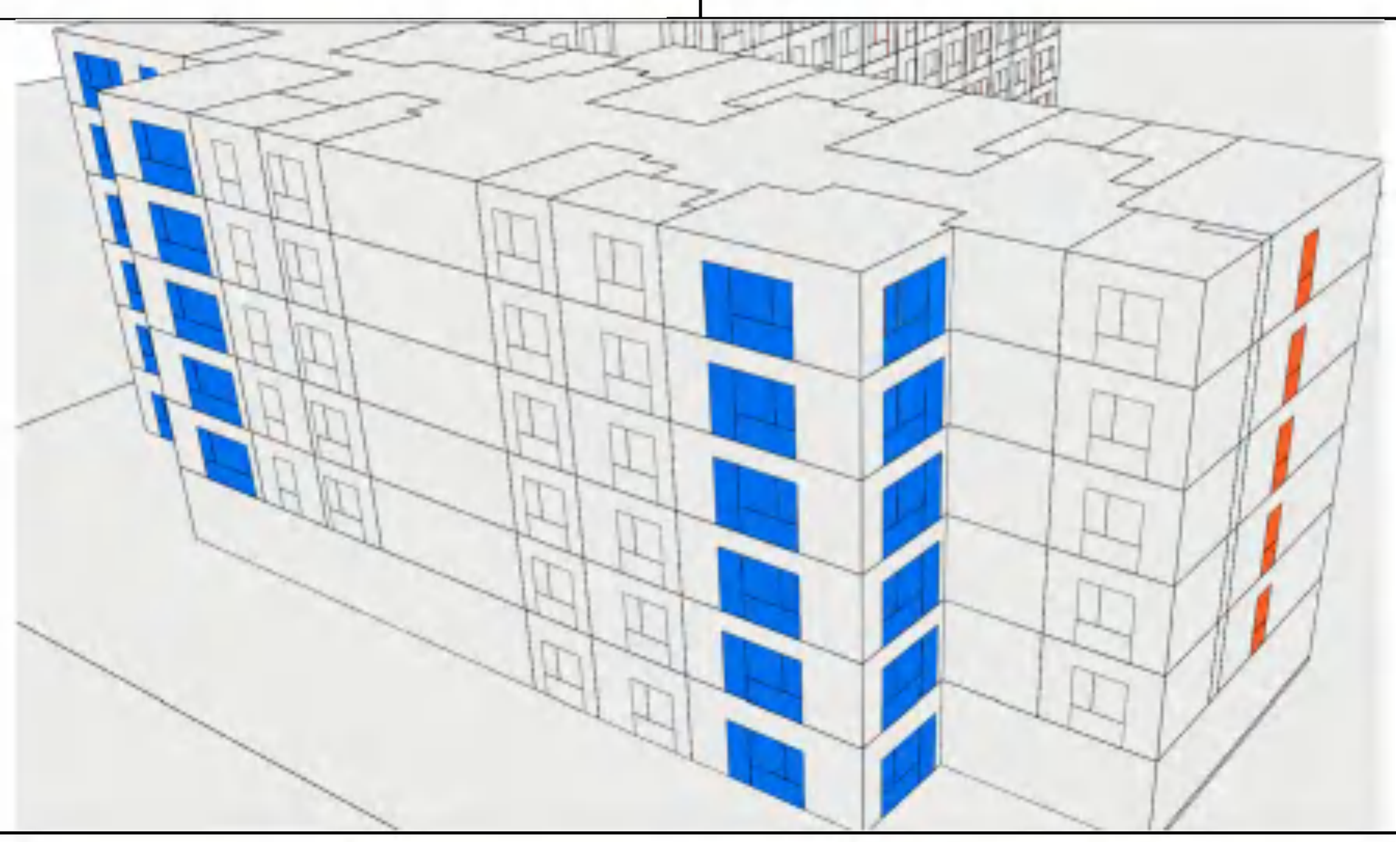
Receives less than 1.5 hours of sunlight

41 out of 58 windows passing

15.1.4 Block 1 – View 4

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

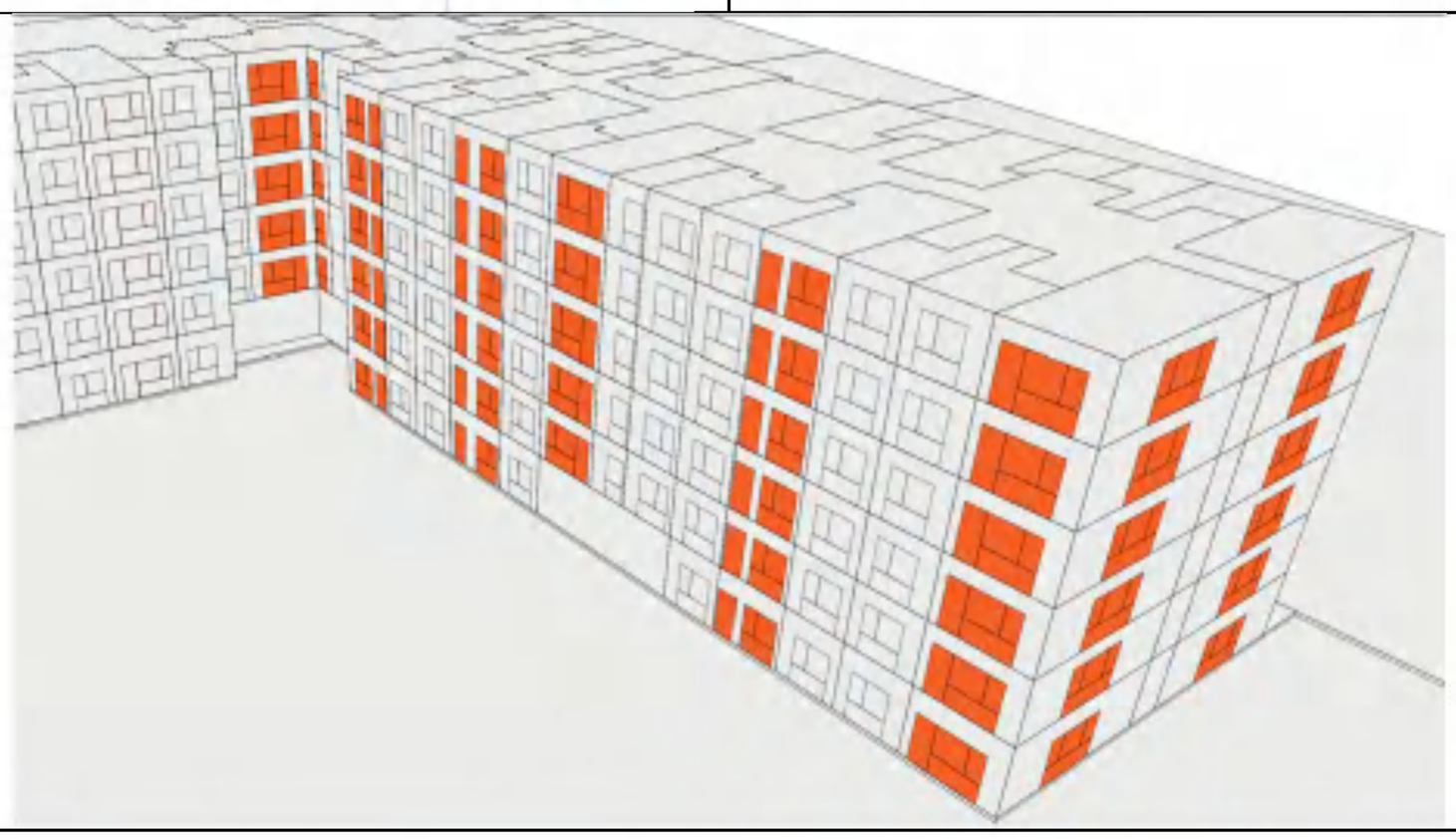


5 out of 22 windows passing

15.1.5 Block 1 – View 5

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

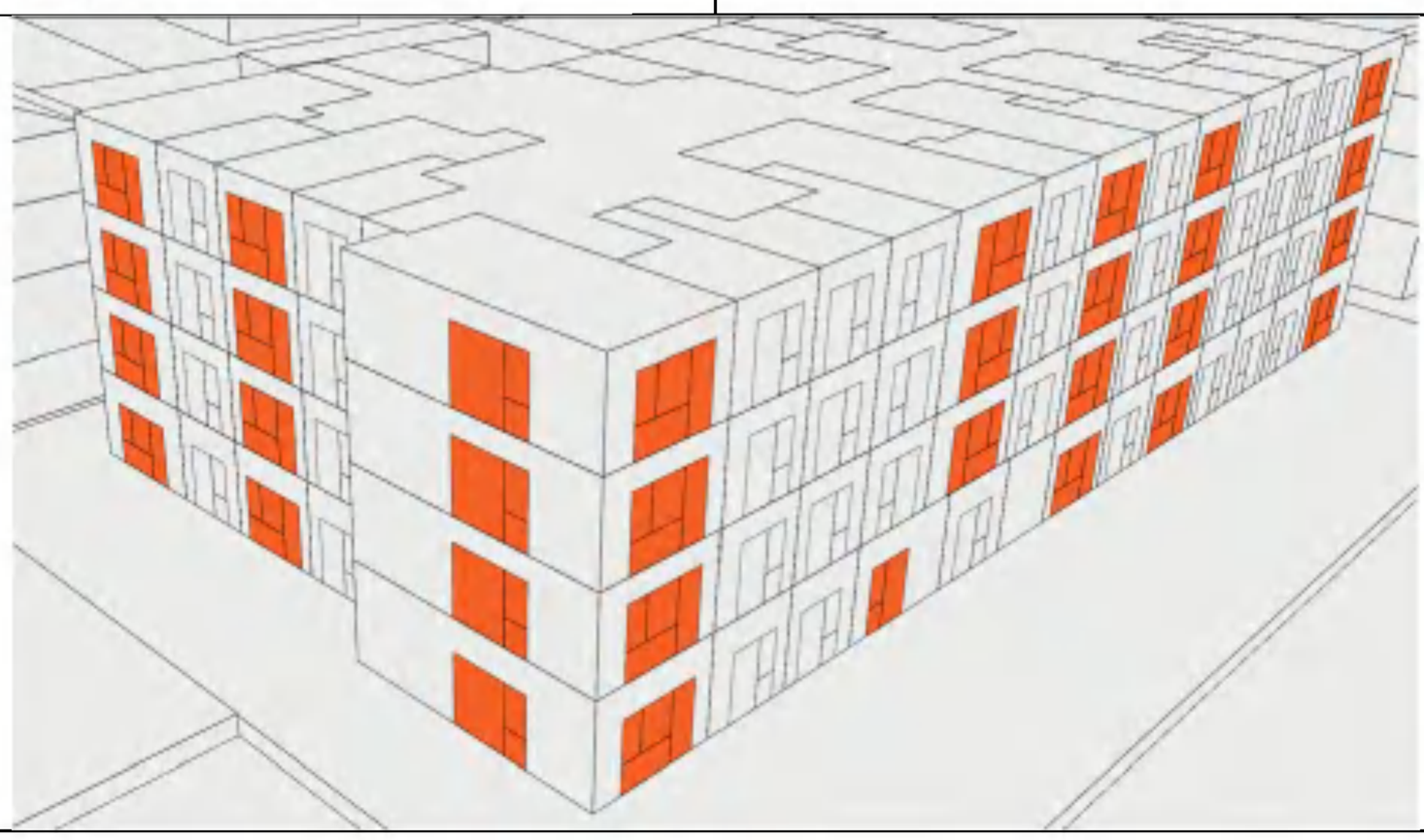


58 out of 58 windows passing

15.1.6 Block 2 – View 1

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

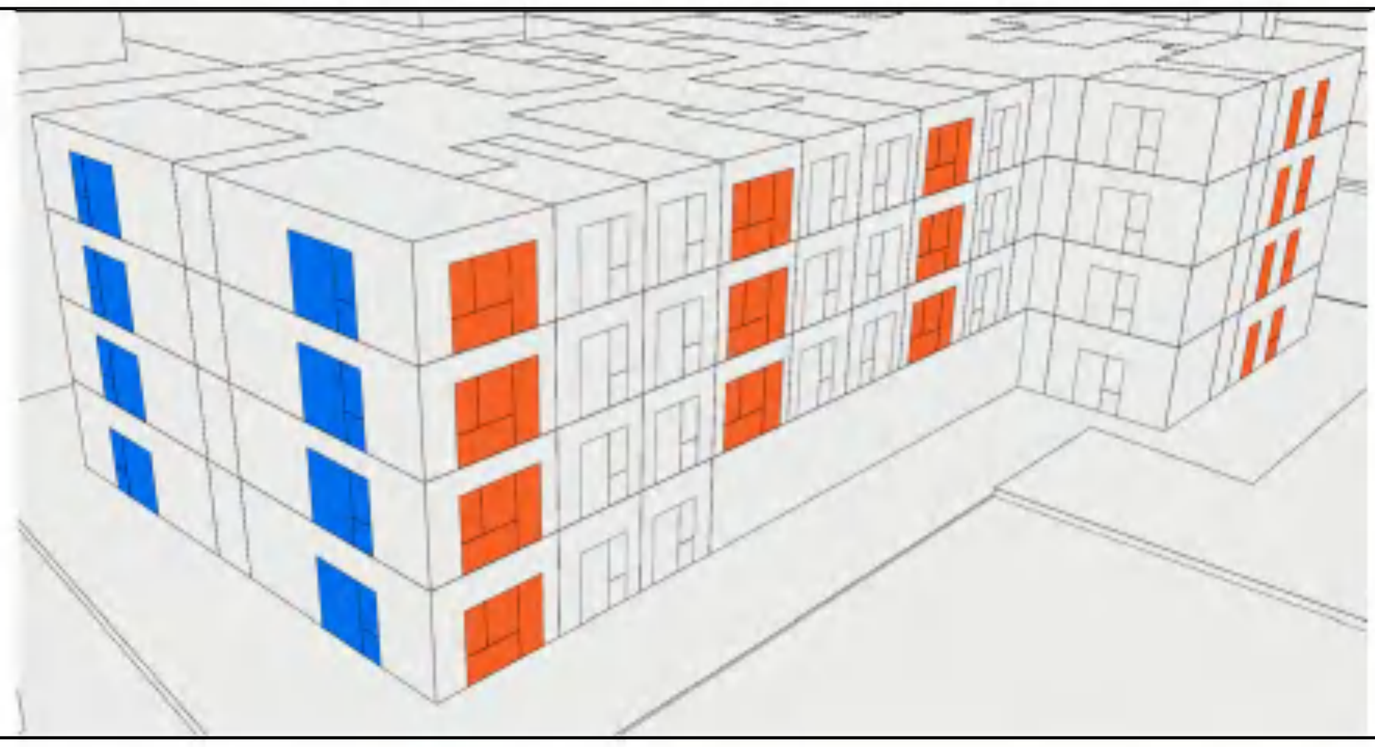


32 out of 32 windows passing

15.1.7 Block 2 – View 2

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

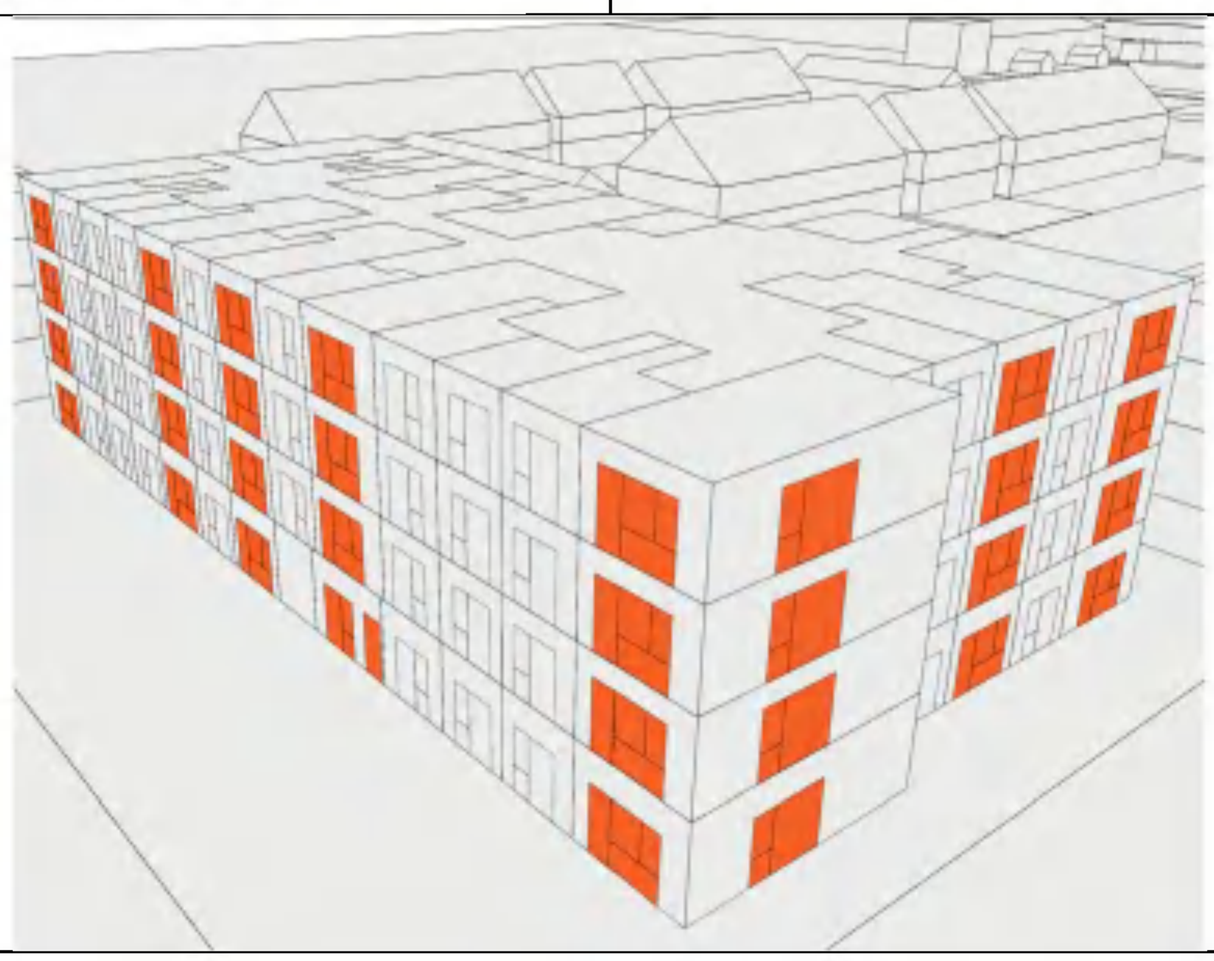


18 out of 26 windows passing

15.1.8 Block 3 – View 1

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

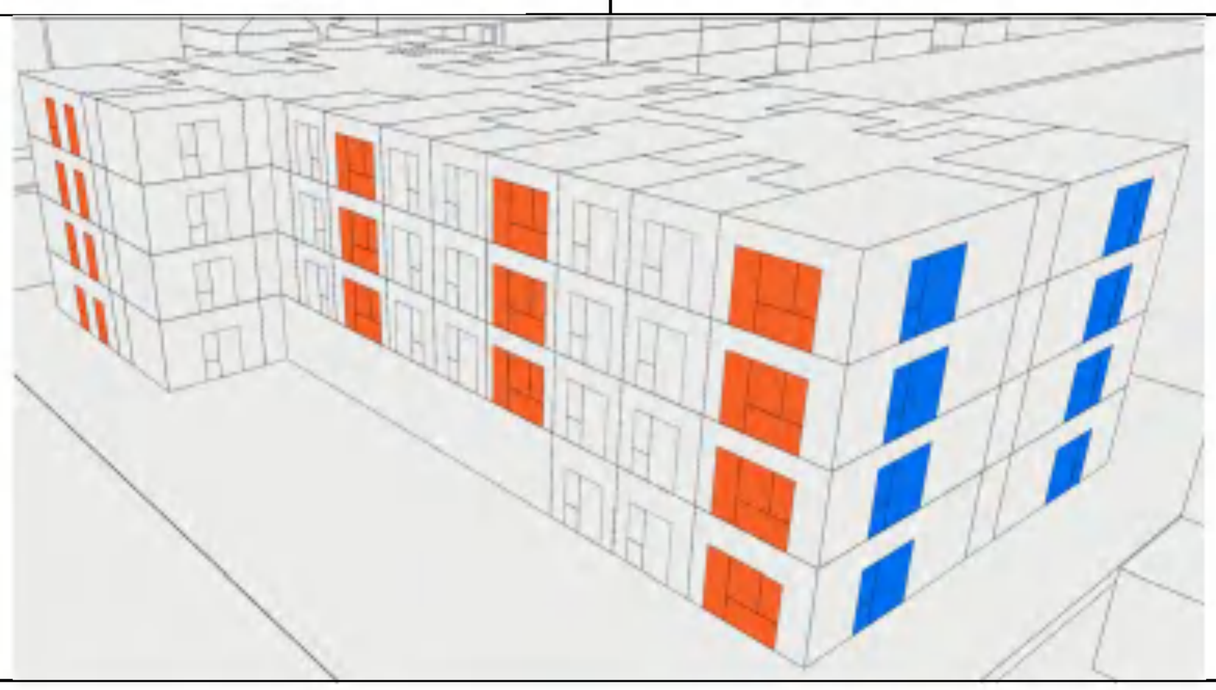


33 out of 33 windows passing

15.1.9 Block 3 – View 2

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

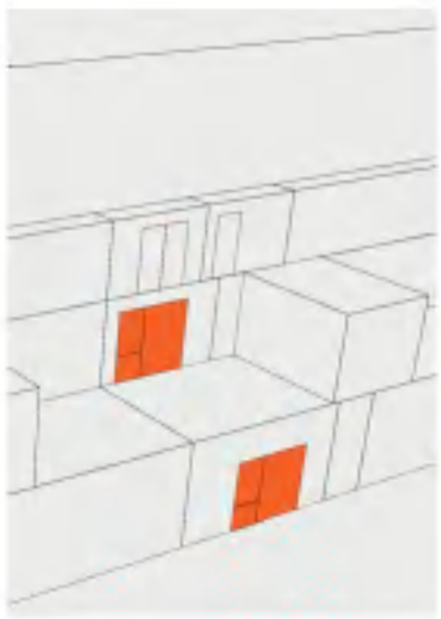
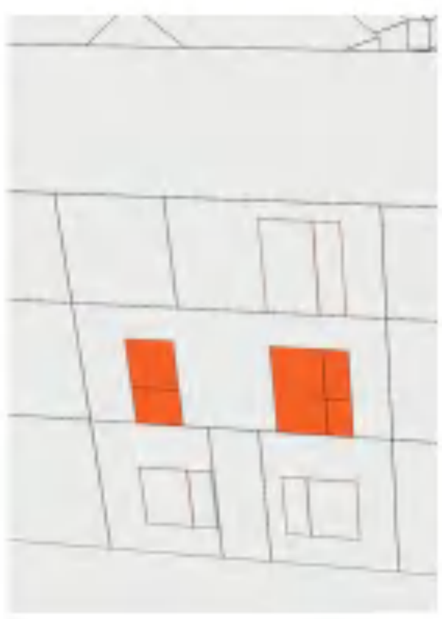
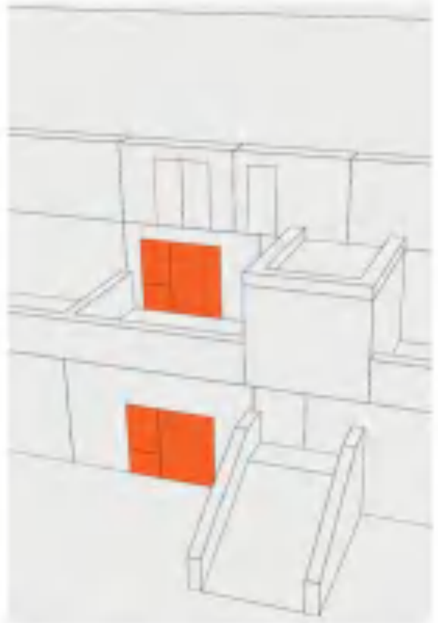


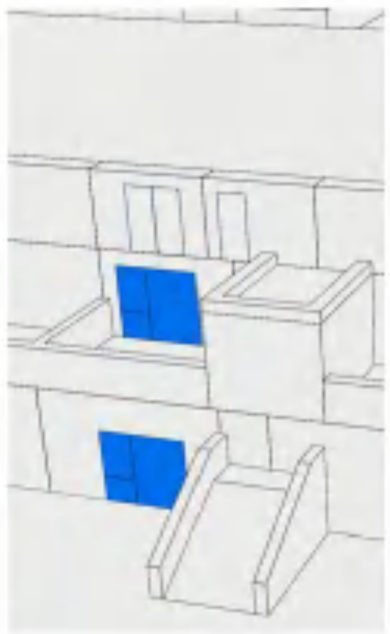
18 out of 26 windows passing

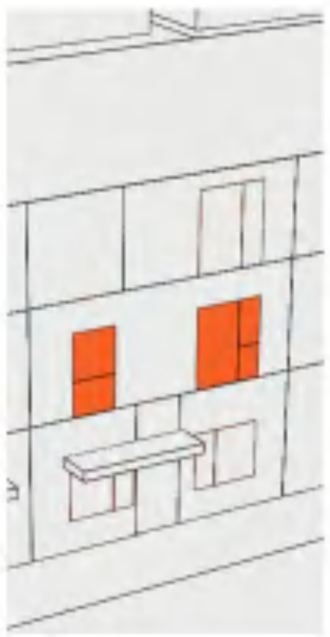
15.1.10 Duplexes 1 - 4

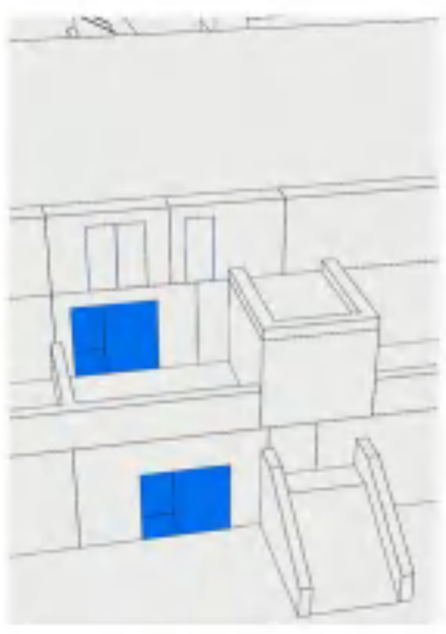
Receives more than 1.5 hours of sunlight

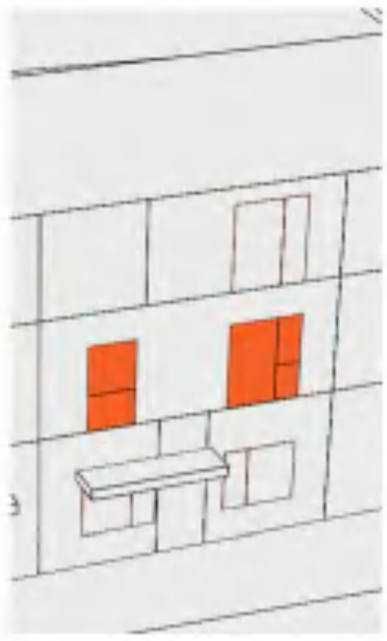
Receives less than 1.5 hours of sunlight

Duplex 1		Duplex 2	
			
Duplex 3		Duplex 4	







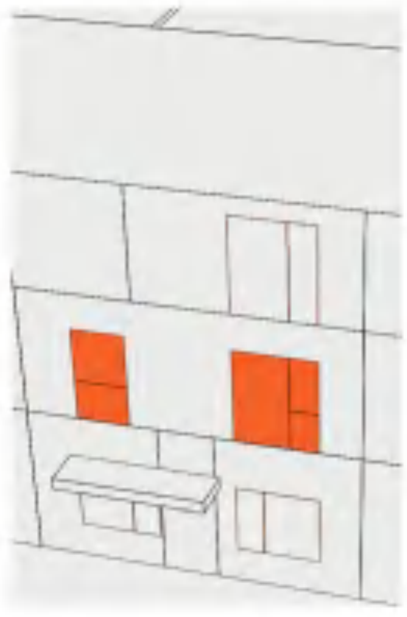
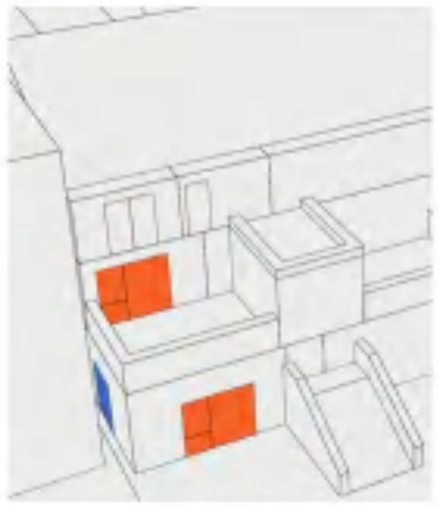
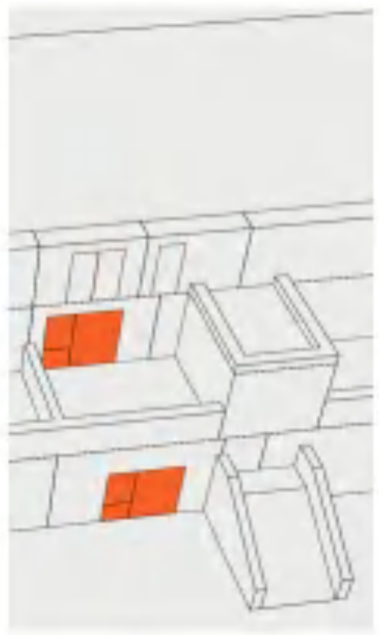
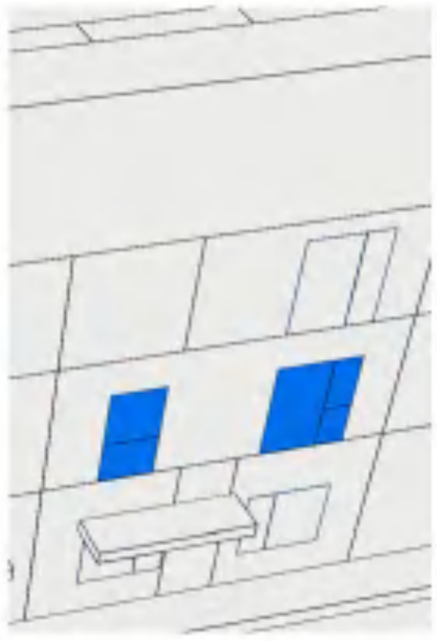


10 out of 16 windows passing

15.1.11 Duplexes 5 - 7

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

Duplex 5		Duplex 6	
			
Duplex 7			
			

8 out of 14 windows passing