Daylight & Sunlight Report

Firhouse Development

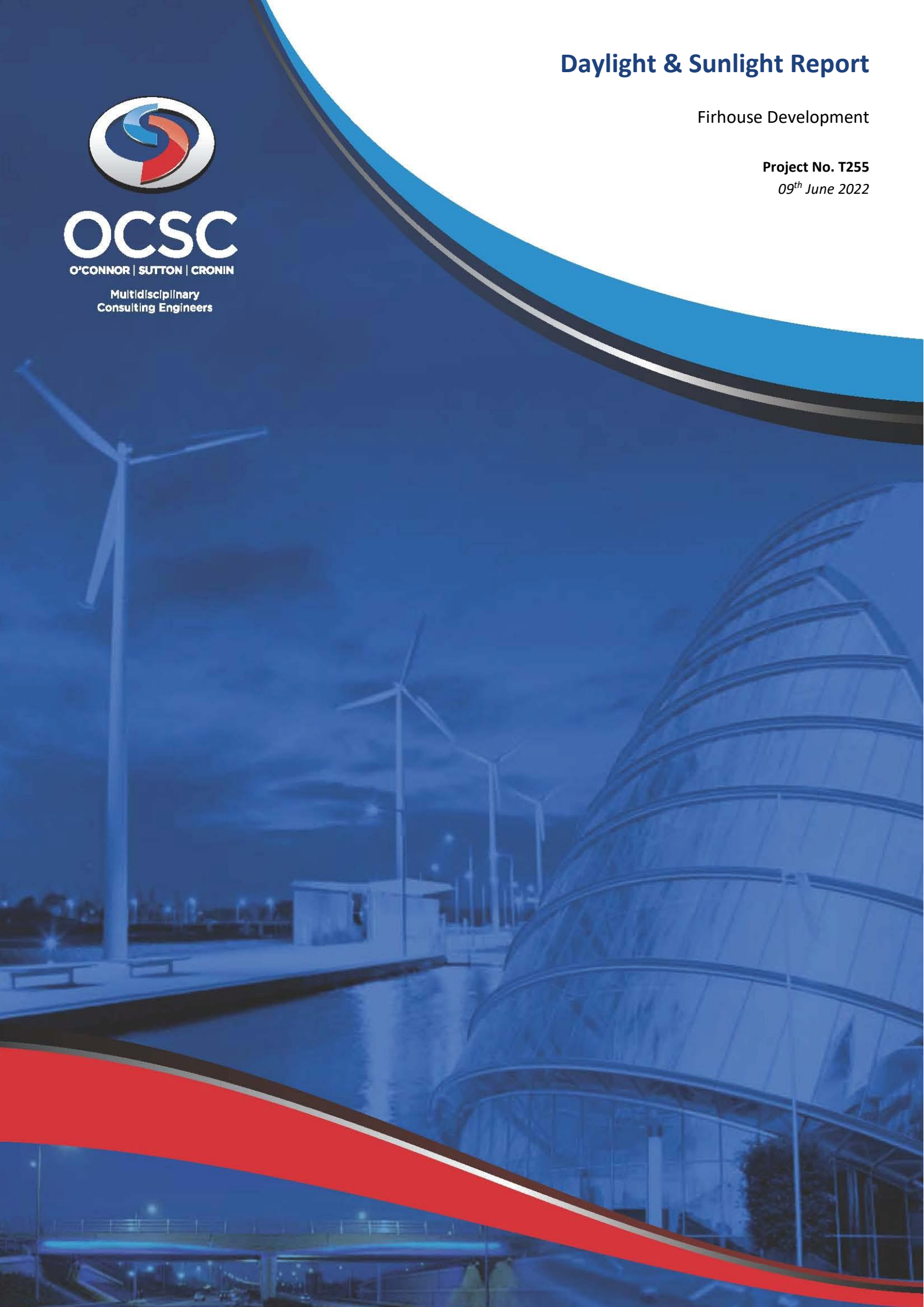
Project No. T255

09th June 2022

OCSC

O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers



Daylight & Sunlight Report

NOTICE

DOCUMENT CONTROL & HISTORY

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EXECUTIVE SUMMARY

OCSC have been appointed to carry out a Daylight & Sunlight study for the Firhouse development located in Dublin 24.

The aim of the study is to record and analyse the results for the following:

- The daylight levels within the living, kitchen and bedroom areas of selected apartments, to give an indication of the expected daylight levels throughout the proposed development;
- The expected sunlight levels received by the living areas and bedrooms within the proposed development;
- The quality of amenity space being provided as part of the development, in relation to sunlight;
- Any potential daylight or sunlight impact the proposed development may have on properties adjacent to the site.

It is important to note that the performance targets which are included should be used with a degree of flexibility as per the extract below from the BRE Guide:

"The advice given here is not mandatory and this document should not be seen as an instrument of planning policy. Its aim is to help rather than constrain the designer. Although it gives numeral guidelines these should be interpreted flexibly because natural lighting is only one of the many factors in site layout design."

The calculation methodology for daylight and sunlight is based on the British Research Establishments "Site Layout Planning for Daylight and Sunlight: A Good Practice Guide" by PJ Littlefair, 2011 Second Edition (which is based on BS 8206-2 – "Lighting for Buildings"), as well as recommendations outlined in EN 17037: 2018 – Daylighting in Buildings.

Internal Daylight within the proposed development

The analysis confirms that across the entire development excellent levels of internal daylight are achieved, with a compliance rate of 100% achieved for the BS 8206 standard, and a 98.5% compliance

rate for the EN 17037 standard. The majority of apartments not only meet but greatly exceed the recommendations outlined within the BRE guidelines on "Site Layout Planning for Daylight and Sunlight", BS 8206 as well as recommendations outlined in EN 17037: 2018 – Daylighting in Buildings.

Sunlight to proposed development amenity spaces

In terms of sunlight access, excellent levels of sunlight are experienced across the proposed amenity spaces. The communal amenity spaces provided exceed the BRE guidelines for sunlight on the test day of 21st of March.

An additional test has demonstrated that the majority of balconies within the development will achieve the recommended values within BRE Guidelines for amenity open spaces, with the majority of balconies receiving excellent levels of sunlight. It must be noted that BRE does not provide any guidance for balconies and this test has been carried out for information purpose only.

Sunlight to windows within the proposed development

The annual probable sunlight hours assessment has shown that 73% of windows across the development achieve the recommended APSH values stated in the BRE Guidelines, while 78% of windows achieve the recommended values during the winter months, when sunlight is more valuable. The vast majority of windows comply with the direct sunlight recommendations of EN 17037.

Impact to surrounding properties

The 25° line and the Vertical Sky Component analysis have shown that a negligible impact will be perceived by any of the surrounding properties.

In relation to sunlight to windows, the analysis has shown that one of the analysed windows will perceive a minimal impact only during the winter period.

Overshadowing

The overshadowing analysis illustrates that there is little overshadowing due to the proposed development, aside from on 4 p.m. in March, and 2 p.m. onwards in December

Glare

Glare has not been assessed for the development, as EN 17037 states that glare shall only be assessed where occupants are not able to choose position and viewing direction, which is not the case for this development.

DAYLIGHT & SUNLIGHT REPORT

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1. INTRODUCTION

OCSC have been appointed to carry out a Daylight & Sunlight study for the Firhouse development located in Dublin 24.

The aim of the study is to record and analyse the results for the following:

- The daylight levels within the living and bedroom areas throughout the development;
- The expected sunlight levels received by the living areas and bedrooms within the proposed development;
- The quality of amenity space being provided as part of the development, in relation to sunlight;
- Any potential daylight impact the proposed development may have on properties adjacent to the site.

The calculation methodology for daylight and sunlight is based on the British Research Establishments "Site Layout Planning for Daylight and Sunlight: A Good Practice Guide" by PJ Littlefair, 2011 Second Edition as well as recommendations outlined in EN 17037: 2018 – Daylighting in Buildings.

2. PROPOSED DEVELOPMENT

Bluemont Developments (Firhouse) Limited intend to apply to An Bord Pleanála (the Board) for a Strategic Housing Development with a total site area of c.0.46 ha, on lands located at No. 2 Firhouse Road and the former 'Morton's The Firhouse Inn', Firhouse Road, Dublin 24.

The development will consist of the demolition of all existing structures on site (c. 1,326 sq m), including:

- Two storey building formally used as public house, ancillary off-licence and associated structures (c. 972 sq m);
- Two storey building comprising an existing barber shop and betting office (c. 260 sq m);
- Single storey cottage building and associated structures (c. 94 sq m); and
- Eastern boundary wall and gated entrance from Mount Carmel Park.

The development with a total gross floor area of c. 11,638 sq m, will consist of 100 no. residential units arranged in 2 blocks (Blocks 01 and 02) ranging between 3 and 5 storeys in height, over lower ground floor and basement levels, comprising:

- 96 no. apartments (consisting of 2 no. studio units; 45 no. one bedroom units; 10 no. two bedroom (3 person) units; 34 no. two bedroom (4 person) units; and 5 no. three bedroom units), together with private (balconies and private terraces) and communal amenity open space provision at podium and roof levels; and
- 4 no. duplex apartments (consisting of 2 no. one bedroom units and 2 no. two bedroom units (4 person) located within Block 01, together with private balconies and terraces.

The development will also consist of non-residential uses (c. 355 sq m), including:

- 1 no. café (c. 58 sq m) and 1 no. office (c. 30 sq m) located at ground floor level of Block 01;
- 1 no. medical unit (c. 59 sq m) and 1 no. betting office (c. 66 sq m) located at ground floor level of Block 02;
- 1 no barber shop (c. 28 sq m) located at ground floor level between Blocks 01 and 02; and
- 1 no. crèche (c. 114 sq m) located at lower ground floor level of Block 01 and associated outdoor play area to the rear.

Vehicular access to the site will be from the existing access off Firhouse Road. The proposal includes minor alterations to the existing access, including the provision of new and enhanced pedestrian infrastructure.

The development will also consist of the provision of public open space and related play areas; hard and soft landscaping including internal roads, cycle and pedestrian routes, pathways and boundary treatments, street furniture, basement car parking (80 no. spaces in total, including accessible spaces); motorcycle parking; electric vehicle charging points; bicycle parking (long and short stay spaces including stands); ESB substations, piped infrastructural services and connections to existing public services, (including relocation of existing surface water sewer and water main from within the application site onto the public roads area along Firhouse Road and Mount Carmel Park); ducting; plant; waste management provision; SuDS measures; stormwater management and attenuation; sustainability measures; signage; changes in levels; public lighting; and all ancillary site development and excavation works above and below ground.

Figure 1: Proposed Site Plan

3. PROPOSED BUILDING DESIGN

In order to ensure that daylight levels were maximised for the Firhouse development, a number of key design strategies were incorporated during concept design.

3.1. BUILDING MATERIAL SELECTION

The selection of materials play an important role in ambient daylight levels. The façade of the proposed development has been carefully selected to promote a sense of brightness and light. This will ensure light is reflected throughout the development. The inclusion of greenery to the amenity spaces will help to improve the sense of light and brightness within the dwellings.

Figure 2: Façade Views of Proposed Development

3.2. GLAZING TO WALL RATIO

The primary function of the glazing to wall ratio is to maximise daylight within the space while reducing solar gains within the proposed development. The other advantage is that more ambient daylight will be reflected to the surrounding areas. Extensive analysis was undertaken on all building façades to ensure glazing widths were maximized to promote access to daylight. The image below illustrates the glazing to wall ratio of the proposed development.

Figure 3: South-East Elevation Glazing to Wall Ratio

4. GUIDELINES FOR DAYLIGHT AND SUNLIGHT

The analysis of the development's potential and the quality of amenity for the new development, as well as for the surrounding properties once the scheme has been implemented, has been based on the Building Research Establishment (BRE) guidelines on "Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice (Building Research Establishment Report, 2011).", as well as the newer EN 17037: 2018 – Daylighting in Buildings document.

These guidelines provide the criteria and methodology for calculations pertaining to daylight and sunlight and is the primary reference for this matter. The guide gives simple rules for analysing sites where the geometry of the surroundings is straightforward, supplementing them with graphical methods for complex sites.

However, it is important to note that the performance targets which are included should be used with a degree of flexibility as per the extract below from the BRE guidance:

"The advice given here is not mandatory and this document should not be seen as an instrument of planning policy. Its aim is to help rather than constrain the designer. Although it gives numeral guidelines these should be interpreted flexibly because natural lighting is only one of the many factors in site layout design."

The difficulty in achieving the result set out by the BRE guidance in a city centre location is also recognised within planning guidance which has been published by the Irish Government. On page 43 of the Urban Design Manual 2009 the following advice is provided:

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

5. DAYLIGHT LEVELS WITHIN THE PROPOSED DEVELOPMENT

5.1. ASSESSMENT CRITERIA – INTERNAL DAYLIGHT (BS 8206)

The method of calculation selected for the internal daylight analysis for this development is the Average Daylight Factor (ADF). This is the most detailed and thus most accurate method which considers not only the amount of sky visible from the vertical face of the window, but also the window size, room size and room use.

Architectural plans and elevations provided by O'Mahony Pike formed the basis for the internal daylight assessment.

In order to quantify the quality of daylight within a space as per BRE Guidelines, the British standards BS 8206 sets out minimum daylight factors to be achieved in new build residential units.

Table 2 **Minimum average daylight factor**

Room type	Minimum average daylight factor %
Bedrooms	1
Living rooms	1.5
Kitchens	2

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%.

Figure 4: BS 8206 – Table 2

BS 8206 outlines that for a room that serves more than one purpose, the minimum ADF should be that for the room type with the highest value. For example, in a combined living/kitchen space, the minimum recommended ADF value should be 2%.

5.2. ASSESSMENT CRITERIA – INTERNAL DAYLIGHT (EN 17037)

In addition to the BS 8206 standard, the development's daylight levels have also been tested to the more recently published EN 17037 standard. The EN 17037 standard goes beyond the average daylight levels within a space, and accounts for the distribution of light within a space.

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.					

Figure 5: EN 17037 – Table A.1

EN 17037 features two daylight criteria for compliance.

- Criterion one requires that in the analysed space an illuminance of ≥ 100 lux must be achieved for half of the daylight time in a year (2,190 hours), across ≥ 95% of the floor area of the given space.
- Criterion two requires that in the analysed space an illuminance of ≥ 300 lux must be achieved for half of the daylight time in a year (2,190 hours), across ≥ 50% of the floor area of the given space.

In order to analyse the daylight requirements for the development a detailed 3D model was constructed of the entire development, in the Integrated Environmental Solutions Virtual Environment (IES VE) software package. A number of computer simulations were then undertaken in the IES VE software package to ascertain the ADFs achieved within the dwellings of the proposed development.

5.3. DAYLIGHT RESULTS – INTERNAL DAYLIGHT DWELLINGS

This section outlines the assessment of internal daylight levels in the Firhouse development. All habitable rooms have been analysed. The results of the analysis are outlined in the accompanying tables.

In summary, all of the units meet the Average Daylight Factor criteria as outlined within the BRE Guidelines, and all but three units meet the criteria detailed in EN 17037. Therefore a 100% compliance rate has been achieved across the development against the BS-8206 standard, and a 98.5% compliance rate against the EN 17037 standard.

In all cases generous floor to ceiling heights have been designed into the project with glazing areas being maximised to amplify the quality of daylight received. Careful consideration has been given to room layout design, allocating storage and circulation areas to the back of rooms, and living spaces to the front where the highest level of daylight is experienced.

The surface reflectance values outlined in Table 1 have been used in the analysis.

Surface Type	Reflectance (%)
External Wall	30
Internal Partitions	70
Ceiling	70
Floor	40
Adjacent Buildings	30
Glazing Transmittance	70

Table 1: Surface Reflectance Values

Figure 6: Ground Floor Assessed Rooms

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
A	Living Room/ Kitchen	2.0%	12.80%	Y
B	Bedroom	1.0%	7.24%	Y
C	Living Room/ Kitchen	2.0%	4.50%	Y
D	Bedroom	1.0%	3.59%	Y
E	Bedroom	1.0%	4.38%	Y
F	Bedroom	1.0%	4.39%	Y
G	Bedroom	1.0%	3.61%	Y
H	Living Room/ Kitchen	2.0%	4.52%	Y
I	Living Room/ Kitchen	2.0%	7.23%	Y
J	Bedroom	1.0%	4.78%	Y
K	Bedroom	1.0%	4.12%	Y
L	Bedroom	1.0%	2.25%	Y
M	Living Room/ Kitchen	2.0%	3.10%	Y
N	Bedroom	1.0%	3.23%	Y
O	Bedroom	1.0%	4.83%	Y
P	Living Room/ Kitchen	2.0%	2.63%	Y
Q	Bedroom	1.0%	3.85%	Y
R	Living Room/ Kitchen	2.0%	3.00%	Y

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
S	Bedroom	1.0%	3.53%	Y
T	Bedroom	1.0%	7.89%	Y
U	Bedroom	1.0%	2.64%	Y
V	Living Room/ Kitchen	2.0%	2.05%	Y
W	Bedroom	1.0%	3.16%	Y
X	Bedroom	1.0%	2.64%	Y
Y	Living Room/ Kitchen	2.0%	2.37%	Y
Z	Living Room/ Kitchen	2.0%	3.45%	Y
AA	Living Room/ Kitchen	2.0%	7.52%	Y
AB	Bedroom	1.0%	6.50%	Y
AC	Living Room/ Kitchen	2.0%	7.40%	Y
AD	Bedroom	1.0%	3.97%	Y
AE	Bedroom	1.0%	5.69%	Y
AF	Living Room/ Kitchen	2.0%	3.95%	Y
AG	Bedroom	1.0%	3.33%	Y
AH	Living Room/ Kitchen	2.0%	2.10%	Y
AI	Living Room/ Kitchen	2.0%	2.05%	Y
AJ	Bedroom	1.0%	3.84%	Y
AK	Living Room/ Kitchen	2.0%	4.72%	Y
AL	Living Room/ Kitchen	2.0%	3.99%	Y
AM	Living Room/ Kitchen	2.0%	5.21%	Y
AN	Bedroom	1.0%	5.26%	Y
AO	Bedroom	1.0%	4.74%	Y

Table 2: Average Daylight Factor Results – Ground Floor Assessed Rooms

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
A	Living Room/ Kitchen	100%	Y	100%	Y
B	Bedroom	100%	Y	98%	Y
C	Living Room/ Kitchen	100%	Y	51%	Y
D	Bedroom	100%	Y	53%	Y
E	Bedroom	100%	Y	71%	Y
F	Bedroom	100%	Y	73%	Y
G	Bedroom	100%	Y	51%	Y
H	Living Room/ Kitchen	100%	Y	53%	Y
I	Living Room/ Kitchen	100%	Y	97%	Y
J	Bedroom	100%	Y	90%	Y
K	Bedroom	100%	Y	51%	Y
L	Bedroom	96%	Y	53%	Y

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
M	Living Room/ Kitchen	100%	Y	55%	Y
N	Bedroom	100%	Y	52%	Y
O	Bedroom	100%	Y	75%	Y
P	Living Room/ Kitchen	100%	Y	85%	Y
Q	Bedroom	100%	Y	97%	Y
R	Living Room/ Kitchen	100%	Y	70%	Y
S	Bedroom	100%	Y	75%	Y
T	Bedroom	100%	Y	100%	Y
U	Bedroom	100%	Y	40%	N
V	Living Room/ Kitchen	100%	Y	37%	N
W	Bedroom	100%	Y	57%	Y
X	Bedroom	100%	Y	100%	Y
Y	Living Room/ Kitchen	100%	Y	87%	Y
Z	Living Room/ Kitchen	100%	Y	100%	Y
AA	Living Room/ Kitchen	100%	Y	100%	Y
AB	Bedroom	100%	Y	99%	Y
AC	Living Room/ Kitchen	100%	Y	99%	Y
AD	Bedroom	100%	Y	82%	Y
AE	Bedroom	100%	Y	100%	Y
AF	Living Room/ Kitchen	100%	Y	77%	Y
AG	Bedroom	100%	Y	50%	Y
AH	Living Room/ Kitchen	100%	Y	30%	N
AI	Living Room/ Kitchen	100%	Y	96%	Y
AJ	Bedroom	100%	Y	85%	Y
AK	Living Room/ Kitchen	100%	Y	99%	Y
AL	Living Room/ Kitchen	100%	Y	100%	Y
AM	Living Room/ Kitchen	100%	Y	100%	Y
AN	Bedroom	100%	Y	100%	Y
AO	Bedroom	100%	Y	100%	Y

Table 3: EN 17037 Daylight Results - Ground Floor Assessed Rooms

Figure 7: First Floor Assessed Room

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
A	Bedroom	1.0%	3.74%	Y
B	Bedroom	1.0%	4.96%	Y
C	Living Room/ Kitchen	2.0%	2.68%	Y
D	Living Room/ Kitchen	2.0%	3.56%	Y
E	Bedroom	1.0%	4.55%	Y
F	Bedroom	1.0%	4.43%	Y
G	Living Room/ Kitchen	2.0%	3.38%	Y
H	Living Room/ Kitchen	2.0%	3.42%	Y
I	Bedroom	1.0%	4.88%	Y
J	Bedroom	1.0%	4.72%	Y
K	Living Room/ Kitchen	2.0%	3.42%	Y
L	Living Room/ Kitchen	2.0%	6.69%	Y
M	Bedroom	1.0%	5.71%	Y
N	Bedroom	1.0%	3.94%	Y
O	Bedroom	1.0%	2.60%	Y
P	Living Room/ Kitchen	2.0%	3.56%	Y
Q	Bedroom	1.0%	3.79%	Y
R	Bedroom	1.0%	4.33%	Y

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
S	Bedroom	1.0%	4.38%	Y
T	Bedroom	1.0%	4.10%	Y
U	Bedroom	1.0%	4.11%	Y
V	Living Room/ Kitchen	2.0%	5.19%	Y
W	Bedroom	1.0%	6.49%	Y
X	Bedroom	1.0%	4.84%	Y
Y	Living Room/ Kitchen	2.0%	3.13%	Y
Z	Living Room/ Kitchen	2.0%	3.66%	Y
AA	Bedroom	1.0%	4.94%	Y
AB	Bedroom	1.0%	5.41%	Y
AC	Bedroom	1.0%	5.07%	Y
AD	Living Room/ Kitchen	2.0%	10.88%	Y
AE	Living Room/ Kitchen	2.0%	3.72%	Y
AF	Bedroom	1.0%	6.14%	Y
AG	Bedroom	1.0%	4.86%	Y
AH	Living Room/ Kitchen	2.0%	7.68%	Y
AI	Bedroom	1.0%	7.21%	Y
AJ	Living Room/ Kitchen	2.0%	7.35%	Y
AK	Bedroom	1.0%	4.88%	Y
AL	Bedroom	1.0%	5.31%	Y
AM	Bedroom	1.0%	5.01%	Y
AN	Living Room/ Kitchen	2.0%	4.91%	Y
AO	Bedroom	1.0%	3.97%	Y
AP	Living Room/ Kitchen	2.0%	4.28%	Y
AQ	Living Room/ Kitchen	2.0%	3.32%	Y
AR	Bedroom	1.0%	2.48%	Y
AS	Bedroom	1.0%	2.05%	Y
AT	Bedroom	1.0%	5.16%	Y
AU	Bedroom	1.0%	3.90%	Y
AV	Living Room/ Kitchen	2.0%	4.14%	Y
AW	Living Room/ Kitchen	2.0%	10.15%	Y
AX	Living Room/ Kitchen	2.0%	4.78%	Y
AY	Bedroom	1.0%	6.20%	Y
AZ	Bedroom	1.0%	8.24%	Y
BA	Bedroom	1.0%	4.19%	Y
BB	Bedroom	1.0%	5.23%	Y
BC	Living Room/ Kitchen	2.0%	2.78%	Y
BD	Bedroom	1.0%	2.86%	Y
BE	Bedroom	1.0%	2.55%	Y
BF	Bedroom	1.0%	2.20%	Y
BG	Bedroom	1.0%	2.86%	Y
BH	Living Room/ Kitchen	2.0%	2.75%	Y

Table 4: Average Daylight Factor Results – First Floor Assessed Room

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
A	Bedroom	100%	Y	80%	Y
B	Bedroom	100%	Y	100%	Y
C	Living Room/ Kitchen	100%	Y	62%	Y
D	Living Room/ Kitchen	100%	Y	90%	Y
E	Bedroom	100%	Y	100%	Y
F	Bedroom	100%	Y		Y
G	Living Room/ Kitchen	100%	Y	87%	Y
H	Living Room/ Kitchen	100%	Y		Y
I	Bedroom	100%	Y	100%	Y
J	Bedroom	100%	Y		Y
K	Living Room/ Kitchen	100%	Y	91%	Y
L	Living Room/ Kitchen	100%	Y	100%	Y
M	Bedroom	100%	Y	100%	Y
N	Bedroom	100%	Y	69%	Y
O	Bedroom	100%	Y	75%	Y
P	Living Room/ Kitchen	100%	Y	58%	Y
Q	Bedroom	100%	Y	79%	Y
R	Bedroom	100%	Y	83%	Y
S	Bedroom	100%	Y	76%	Y
T	Bedroom	100%	Y	75%	Y
U	Bedroom	100%	Y	86%	Y
V	Living Room/ Kitchen	100%	Y	92%	Y
W	Bedroom	100%	Y	100%	Y
X	Bedroom	100%	Y	100%	Y
Y	Living Room/ Kitchen	100%	Y	88%	Y
Z	Living Room/ Kitchen	100%	Y	90%	Y
AA	Bedroom	100%	Y	100%	Y
AB	Bedroom	100%	Y	97%	Y
AC	Bedroom	100%	Y	100%	Y
AD	Living Room/ Kitchen	100%	Y	100%	Y
AE	Living Room/ Kitchen	100%	Y	94%	Y
AF	Bedroom	100%	Y	100%	Y
AG	Bedroom	100%	Y	100%	Y
AH	Living Room/ Kitchen	100%	Y	100%	Y

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
AI	Bedroom	100%	Y	100%	Y
AJ	Living Room/ Kitchen	100%	Y	95%	Y
AK	Bedroom	100%	Y	95%	Y
AL	Bedroom	100%	Y	95%	Y
AM	Bedroom	100%	Y	100%	Y
AN	Living Room/ Kitchen	100%	Y	73%	Y
AO	Bedroom	100%	Y	100%	Y
AP	Living Room/ Kitchen	100%	Y	78%	Y
AQ	Living Room/ Kitchen	100%	Y	75%	Y
AR	Bedroom	100%	Y	81%	Y
AS	Bedroom	100%	Y	57%	Y
AT	Bedroom	100%	Y	94%	Y
AU	Bedroom	100%	Y	99%	Y
AV	Living Room/ Kitchen	100%	Y	80%	Y
AW	Living Room/ Kitchen	100%	Y	100%	Y
AX	Living Room/ Kitchen	100%	Y	99%	Y
AY	Bedroom	100%	Y	100%	Y
AZ	Bedroom	100%	Y	100%	Y
BA	Bedroom	100%	Y	98%	Y
BB	Bedroom	100%	Y	100%	Y
BC	Living Room/ Kitchen	100%	Y	81%	Y
BD	Bedroom	100%	Y	55%	Y
BE	Bedroom	100%	Y	53%	Y
BF	Bedroom	100%	Y	52%	Y
BG	Bedroom	100%	Y	63%	Y
BH	Living Room/ Kitchen	100%	Y	51%	Y

Table 5: EN 17037 Daylight Results - First Floor Assessed Rooms

Figure 8: Second Floor Assessed Rooms

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
A	Bedroom	1.0%	3.79%	Y
B	Bedroom	1.0%	5.03%	Y
C	Living Room/ Kitchen	2.0%	2.72%	Y
D	Living Room/ Kitchen	2.0%	3.61%	Y
E	Bedroom	1.0%	4.61%	Y
F	Bedroom	1.0%	4.62%	Y
G	Living Room/ Kitchen	2.0%	3.42%	Y
H	Living Room/ Kitchen	2.0%	3.45%	Y
I	Bedroom	1.0%	4.94%	Y
J	Bedroom	1.0%	5.01%	Y
K	Living Room/ Kitchen	2.0%	3.69%	Y
L	Living Room/ Kitchen	2.0%	6.78%	Y
M	Bedroom	1.0%	5.79%	Y
N	Bedroom	1.0%	3.99%	Y
O	Bedroom	1.0%	2.63%	Y
P	Living Room/ Kitchen	2.0%	3.61%	Y
Q	Bedroom	1.0%	3.84%	Y
R	Bedroom	1.0%	4.39%	Y

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
S	Living Room/ Kitchen	2.0%	4.44%	Y
T	Bedroom	1.0%	4.15%	Y
U	Bedroom	1.0%	4.16%	Y
V	Living Room/ Kitchen	2.0%	5.26%	Y
W	Bedroom	1.0%	6.58%	Y
X	Bedroom	1.0%	4.90%	Y
Y	Living Room/ Kitchen	2.0%	3.17%	Y
Z	Living Room/ Kitchen	2.0%	3.71%	Y
AA	Bedroom	1.0%	5.01%	Y
AB	Bedroom	1.0%	5.48%	Y
AC	Bedroom	1.0%	5.14%	Y
AD	Living Room/ Kitchen	2.0%	11.02%	Y
AE	Living Room/ Kitchen	2.0%	3.77%	Y
AF	Bedroom	1.0%	6.22%	Y
AG	Bedroom	1.0%	4.92%	Y
AH	Bedroom	1.0%	7.78%	Y
AI	Living Room/ Kitchen	2.0%	5.66%	Y
AJ	Living Room/ Kitchen	2.0%	5.03%	Y
AK	Bedroom	1.0%	5.38%	Y
AL	Bedroom	1.0%	5.11%	Y
AM	Living Room/ Kitchen	2.0%	4.34%	Y
AN	Bedroom	1.0%	5.32%	Y
AO	Living Room/ Kitchen	2.0%	4.47%	Y
AP	Bedroom	1.0%	5.42%	Y
AQ	Living Room/ Kitchen	2.0%	3.95%	Y
AR	Bedroom	1.0%	4.19%	Y
AS	Living Room/ Kitchen	2.0%	10.28%	Y
AT	Living Room/ Kitchen	2.0%	4.84%	Y
AU	Bedroom	1.0%	8.35%	Y
AV	Bedroom	1.0%	4.25%	Y
AW	Bedroom	1.0%	5.30%	Y
AX	Living Room/ Kitchen	2.0%	2.82%	Y
AY	Bedroom	1.0%	2.90%	Y
AZ	Living Room/ Kitchen	2.0%	2.58%	Y
BA	Bedroom	1.0%	2.23%	Y
BB	Bedroom	1.0%	2.90%	Y
BC	Living Room/ Kitchen	2.0%	2.79%	Y

Table 6: Average Daylight Factor Results – Second Floor Assessed Room

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
A	Bedroom	100%	Y	84%	Y
B	Bedroom	100%	Y	100%	Y
C	Living Room/ Kitchen	100%	Y	65%	Y
D	Living Room/ Kitchen	100%	Y	94%	Y
E	Bedroom	100%	Y	100%	Y
F	Bedroom	100%	Y	100%	Y
G	Living Room/ Kitchen	100%	Y	91%	Y
H	Living Room/ Kitchen	100%	Y	93%	Y
I	Bedroom	100%	Y	100%	Y
J	Bedroom	100%	Y	100%	Y
K	Living Room/ Kitchen	100%	Y	95%	Y
L	Living Room/ Kitchen	100%	Y	100%	Y
M	Bedroom	100%	Y	100%	Y
N	Bedroom	100%	Y	72%	Y
O	Bedroom	100%	Y	79%	Y
P	Living Room/ Kitchen	100%	Y	61%	Y
Q	Bedroom	100%	Y	83%	Y
R	Bedroom	100%	Y	87%	Y
S	Living Room/ Kitchen	100%	Y	80%	Y
T	Bedroom	100%	Y	79%	Y
U	Bedroom	100%	Y	90%	Y
V	Living Room/ Kitchen	100%	Y	96%	Y
W	Bedroom	100%	Y	100%	Y
X	Bedroom	100%	Y	100%	Y
Y	Living Room/ Kitchen	100%	Y	92%	Y
Z	Living Room/ Kitchen	100%	Y	94%	Y
AA	Bedroom	100%	Y	100%	Y
AB	Bedroom	100%	Y	100%	Y
AC	Bedroom	100%	Y	100%	Y
AD	Living Room/ Kitchen	100%	Y	100%	Y
AE	Living Room/ Kitchen	100%	Y	98%	Y
AF	Bedroom	100%	Y	100%	Y
AG	Bedroom	100%	Y	100%	Y
AH	Bedroom	100%	Y	100%	Y

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
AI	Living Room/ Kitchen	100%	Y	88%	Y
AJ	Living Room/ Kitchen	100%	Y	78%	Y
AK	Bedroom	100%	Y	99%	Y
AL	Bedroom	100%	Y	94%	Y
AM	Living Room/ Kitchen	100%	Y	82%	Y
AN	Bedroom	100%	Y	98%	Y
AO	Living Room/ Kitchen	100%	Y	84%	Y
AP	Bedroom	100%	Y	100%	Y
AQ	Living Room/ Kitchen	100%	Y	100%	Y
AR	Bedroom	100%	Y	84%	Y
AS	Living Room/ Kitchen	100%	Y	100%	Y
AT	Living Room/ Kitchen	100%	Y	100%	Y
AU	Bedroom	100%	Y	100%	Y
AV	Bedroom	100%	Y	100%	Y
AW	Bedroom	100%	Y	100%	Y
AX	Living Room/ Kitchen	100%	Y	85%	Y
AY	Bedroom	100%	Y	58%	Y
AZ	Living Room/ Kitchen	100%	Y	55%	Y
BA	Bedroom	100%	Y	54%	Y
BB	Bedroom	100%	Y	66%	Y
BC	Living Room/ Kitchen	100%	Y	53%	Y

Table 7: EN 17037 Daylight Results - Second Floor Assessed Rooms

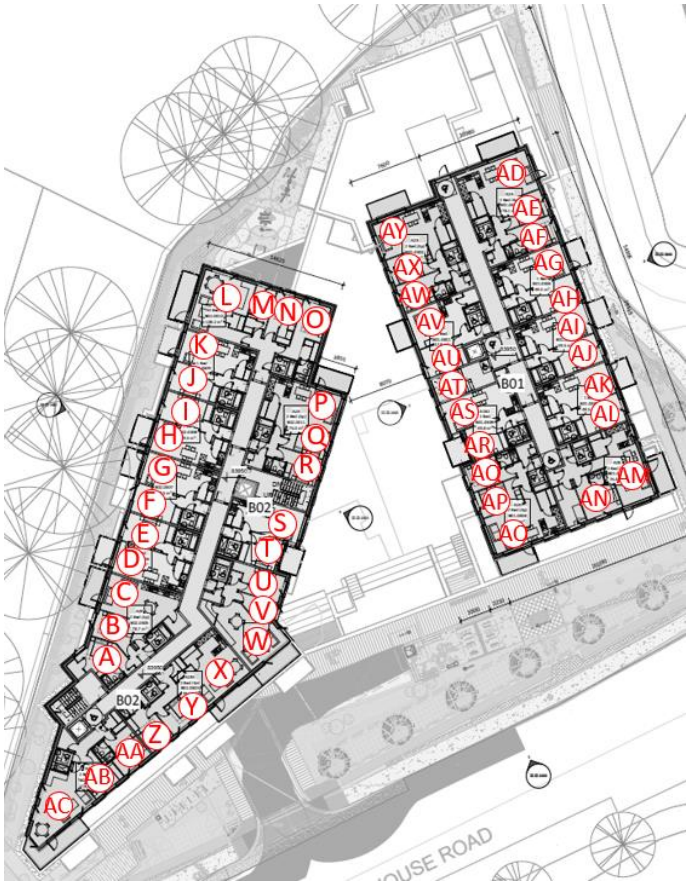

Figure 9: Third Floor Assessed Rooms

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
A	Bedroom	1.0%	3.91%	Y
B	Bedroom	1.0%	5.19%	Y
C	Living Room/ Kitchen	2.0%	2.80%	Y
D	Living Room/ Kitchen	2.0%	3.73%	Y
E	Bedroom	1.0%	4.76%	Y
F	Bedroom	1.0%	3.54%	Y
G	Living Room/ Kitchen	2.0%	3.61%	Y
H	Living Room/ Kitchen	2.0%	4.91%	Y
I	Bedroom	1.0%	2.99%	Y
J	Bedroom	1.0%	5.11%	Y
K	Living Room/ Kitchen	2.0%	5.23%	Y
L	Living Room/ Kitchen	2.0%	7.00%	Y
M	Bedroom	1.0%	5.98%	Y
N	Bedroom	1.0%	4.12%	Y
O	Bedroom	1.0%	2.72%	Y
P	Living Room/ Kitchen	2.0%	3.73%	Y
Q	Bedroom	1.0%	3.97%	Y
R	Bedroom	1.0%	4.53%	Y

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
S	Living Room/ Kitchen	2.0%	4.58%	Y
T	Bedroom	1.0%	4.29%	Y
U	Bedroom	1.0%	4.30%	Y
V	Bedroom	1.0%	8.2%	Y
W	Living Room/ Kitchen	2.0%	6.79%	Y
X	Living Room/ Kitchen	2.0%	5.07%	Y
Y	Bedroom	1.0%	3.28%	Y
Z	Bedroom	1.0%	3.83%	Y
AA	Bedroom	1.0%	5.17%	Y
AB	Bedroom	1.0%	5.66%	Y
AC	Living Room/ Kitchen	2.0%	11.39%	Y
AD	Living Room/ Kitchen	2.0%	5.20%	Y
AE	Bedroom	1.0%	5.56%	Y
AF	Bedroom	1.0%	5.28%	Y
AG	Living Room/ Kitchen	2.0%	4.48%	Y
AH	Bedroom	1.0%	5.49%	Y
AI	Living Room/ Kitchen	2.0%	4.61%	Y
AJ	Bedroom	1.0%	5.60%	Y
AK	Living Room/ Kitchen	2.0%	5.20%	Y
AL	Bedroom	1.0%	5.56%	Y
AM	Living Room/ Kitchen	2.0%	5.28%	Y
AN	Bedroom	1.0%	5.41%	Y
AO	Living Room/ Kitchen	2.0%	5.00%	Y
AP	Bedroom	1.0%	8.62%	Y
AQ	Bedroom	1.0%	4.39%	Y
AR	Bedroom	1.0%	5.47%	Y
AS	Living Room/ Kitchen	2.0%	2.91%	Y
AT	Bedroom	1.0%	2.99%	Y
AU	Bedroom	1.0%	2.67%	Y
AV	Living Room/ Kitchen	2.0%	2.30%	Y
AW	Bedroom	1.0%	2.99%	Y
AX	Bedroom	1.0%	2.88%	Y
AT	Living Room/ Kitchen	2.0%	2.88%	Y
AU	Bedroom	1.0%	5.00%	Y
AV	Living Room/ Kitchen	2.0%	8.62%	Y
AW	Bedroom	1.0%	4.39%	Y
AX	Bedroom	1.0%	5.47%	Y
AY	Living Room/ Kitchen	2.0%	2.91%	Y

Table 8: Average Daylight Factor Results – Third Floor Assessed Room

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
A	Bedroom	100%	Y	85%	Y
B	Bedroom	100%	Y	100%	Y
C	Living Room/ Kitchen	100%	Y	66%	Y
D	Living Room/ Kitchen	100%	Y	95%	Y
E	Bedroom	100%	Y	100%	Y
F	Bedroom	100%	Y	92%	Y
G	Living Room/ Kitchen	100%	Y	100%	Y
H	Living Room/ Kitchen	100%	Y	97%	Y
I	Bedroom	100%	Y	100%	Y
J	Bedroom	100%	Y	100%	Y
K	Living Room/ Kitchen	100%	Y	73%	Y
L	Living Room/ Kitchen	100%	Y	80%	Y
M	Bedroom	100%	Y	62%	Y
N	Bedroom	100%	Y	84%	Y
O	Bedroom	100%	Y	88%	Y
P	Living Room/ Kitchen	100%	Y	81%	Y
Q	Bedroom	100%	Y	80%	Y
R	Bedroom	100%	Y	91%	Y
S	Living Room/ Kitchen	100%	Y	98%	Y
T	Bedroom	100%	Y	100%	Y
U	Bedroom	100%	Y	100%	Y
V	Bedroom	100%	Y	93%	Y
W	Living Room/ Kitchen	100%	Y	95%	Y
X	Living Room/ Kitchen	100%	Y	100%	Y
Y	Bedroom	100%	Y	100%	Y
Z	Bedroom	100%	Y	100%	Y
AA	Bedroom	100%	Y	100%	Y
AB	Bedroom	100%	Y	100%	Y
AC	Living Room/ Kitchen	100%	Y	100%	Y
AD	Living Room/ Kitchen	100%	Y	100%	Y
AE	Bedroom	100%	Y	100%	Y
AF	Bedroom	100%	Y	89%	Y
AG	Living Room/ Kitchen	100%	Y	79%	Y
AH	Bedroom	100%	Y	100%	Y

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
AI	Living Room/ Kitchen	100%	Y	96%	Y
AJ	Bedroom	100%	Y	83%	Y
AK	Living Room/ Kitchen	100%	Y	100%	Y
AL	Bedroom	100%	Y	85%	Y
AM	Living Room/ Kitchen	100%	Y	100%	Y
AN	Bedroom	100%	Y	100%	Y
AO	Living Room/ Kitchen	100%	Y	85%	Y
AP	Bedroom	100%	Y	100%	Y
AQ	Bedroom	100%	Y	100%	Y
AR	Bedroom	100%	Y	100%	Y
AS	Living Room/ Kitchen	100%	Y	100%	Y
AT	Bedroom	100%	Y	85%	Y
AU	Bedroom	100%	Y	100%	Y
AV	Living Room/ Kitchen	100%	Y	66%	Y
AW	Living Room/ Kitchen	100%	Y	100%	Y
AX	Bedroom	100%	Y	100%	Y
AY	Bedroom	100%	Y	100%	Y

Table 9: EN 17037 Daylight Results - Third Floor Assessed Rooms

Figure 10: Fourth Floor Assessed Rooms

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
A	Living Room/ Kitchen	2.0%	12.53%	Y
B	Bedroom	1.0%	4.08%	Y
C	Bedroom	1.0%	5.41%	Y
D	Living Room/ Kitchen	2.0%	2.93%	Y
E	Living Room/ Kitchen	2.0%	3.89%	Y
F	Bedroom	1.0%	4.97%	Y
G	Bedroom	1.0%	3.69%	Y
H	Living Room/ Kitchen	2.0%	5.33%	Y
I	Living Room/ Kitchen	2.0%	3.97%	Y
J	Bedroom	1.0%	7.30%	Y
K	Bedroom	1.0%	6.23%	Y
L	Living Room/ Kitchen	2.0%	4.30%	Y
M	Living Room/ Kitchen	2.0%	2.84%	Y
N	Bedroom	1.0%	3.89%	Y
O	Bedroom	1.0%	4.14%	Y
P	Living Room/ Kitchen	2.0%	4.73%	Y
Q	Living Room/ Kitchen	2.0%	4.78%	Y
R	Bedroom	1.0%	4.48%	Y

Unit		BS 8206 ADF requirement (%)	ADF results (%)	Meets minimum BS 8206 ADF criteria
S	Bedroom	1.0%	4.49%	Y
T	Living Room/ Kitchen	2.0%	5.67%	Y
U	Bedroom	1.0%	7.08%	Y
V	Living Room/ Kitchen	2.0%	5.28%	Y
W	Bedroom	1.0%	3.42%	Y
X	Living Room/ Kitchen	2.0%	4.00%	Y
Y	Bedroom	1.0%	5.50%	Y
Z	Bedroom	1.0%	6.20%	Y
AA	Bedroom	1.0%	4.57%	Y
AB	Bedroom	1.0%	5.71%	Y
AC	Living Room/ Kitchen	2.0%	3.03%	Y
AD	Bedroom	1.0%	3.12%	Y
AE	Bedroom	1.0%	2.78%	Y
AF	Bedroom	1.0%	2.40%	Y
AG	Living Room/ Kitchen	2.0%	4.57%	Y
AH	Living Room/ Kitchen	2.0%	4.67%	Y
AI	Bedroom	1.0%	5.73%	Y
AJ	Bedroom	1.0%	4.81%	Y
AK	Living Room/ Kitchen	2.0%	5.84%	Y

Table 10: Average Daylight Factor Results – Fourth Floor Assessed Room

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
A	Living Room/ Kitchen	100%	Y	100%	Y
B	Bedroom	100%	Y	100%	Y
C	Bedroom	100%	Y	100%	Y
D	Living Room/ Kitchen	100%	Y	100%	Y
E	Living Room/ Kitchen	100%	Y	100%	Y
F	Bedroom	100%	Y	100%	Y
G	Bedroom	100%	Y	100%	Y
H	Living Room/ Kitchen	100%	Y	100%	Y
I	Living Room/ Kitchen	100%	Y	100%	Y
J	Bedroom	100%	Y	100%	Y
K	Bedroom	100%	Y	100%	Y
L	Living Room/ Kitchen	100%	Y	100%	Y
M	Living Room/ Kitchen	100%	Y	100%	Y

Unit		EN 17037 Criterion 1 (%) (Compliance at ≥ 95% @ 100 lux)	EN 17037 Criterion 1 Compliance	EN 17037 Criterion 2 (%) (Compliance at ≥ 50% @ 300 lux)	EN 17037 Criterion 2 Compliance
N	Bedroom	100%	Y	100%	Y
O	Bedroom	100%	Y	100%	Y
P	Living Room/ Kitchen	100%	Y	100%	Y
Q	Living Room/ Kitchen	100%	Y	100%	Y
R	Bedroom	100%	Y	100%	Y
S	Bedroom	100%	Y	100%	Y
T	Living Room/ Kitchen	100%	Y	100%	Y
U	Bedroom	100%	Y	90%	Y
V	Living Room/ Kitchen	100%	Y	100%	Y
W	Bedroom	100%	Y	89%	Y
X	Living Room/ Kitchen	100%	Y	100%	Y
Y	Bedroom	100%	Y	100%	Y
Z	Bedroom	100%	Y	100%	Y
AA	Bedroom	100%	Y	100%	Y
AB	Bedroom	100%	Y	100%	Y
AC	Living Room/ Kitchen	100%	Y	100%	Y
AD	Bedroom	100%	Y	100%	Y
AE	Bedroom	100%	Y	100%	Y
AF	Bedroom	100%	Y	95%	Y
AG	Living Room/ Kitchen	100%	Y	100%	Y
AH	Living Room/ Kitchen	100%	Y	100%	Y
AI	Bedroom	100%	Y	100%	Y
AJ	Bedroom	100%	Y	100%	Y
AK	Living Room/ Kitchen	100%	Y	100%	Y

Table 11: EN 17037 Daylight Results - Fourth Floor Assessed Rooms

6. SUNLIGHT ASSESSMENT TO AMENITY SPACES WITHIN THE DEVELOPMENT

BRE Guidelines (2011) recommend that for external amenity spaces to appear adequately sunlit throughout the year, at least half of the garden or amenity space should receive at least two hours of sunlight on March 21st. March 21st is chosen as the test date by BRE as it is the equinox and represents the average level of shading across the year.

In order to show that sunlight levels within the development achieve compliance with current BRE Guidelines a sunlight study has been carried out for the proposed development.

The red squares in Figure 11 highlight the areas that receive a minimum of 2 hours of sunlight on the 21st of March for the proposed development. It is evident at the vast majority of the overall communal amenity spaces receive 2 hours or more of sunlight on March 21st, therefore compliance with BRE Guidelines is achieved.

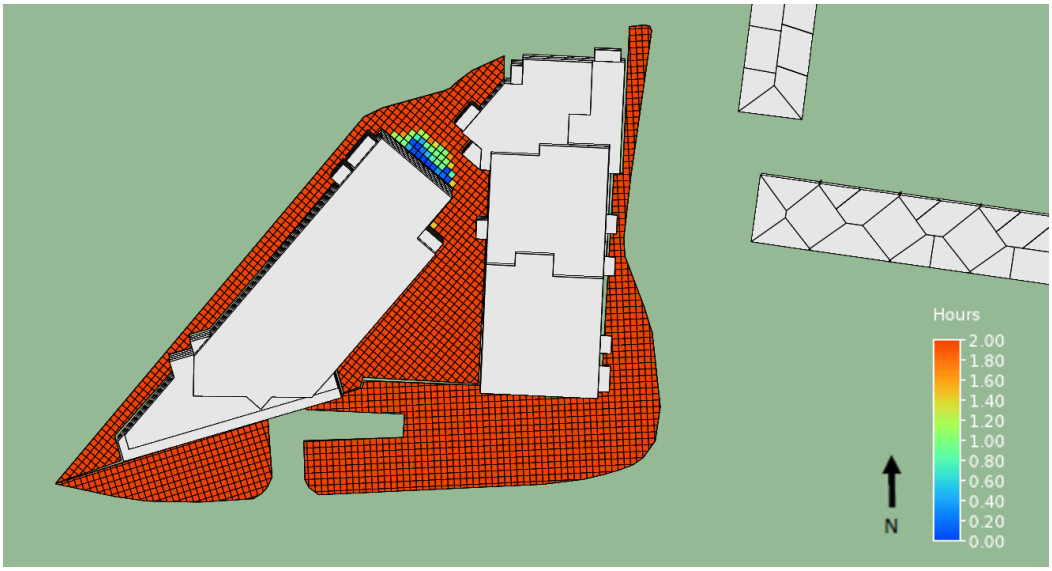

Figure 11: Amenity Spaces - Hours of Sunlight on March 21st

Even though BRE Guidelines does not give specific recommendation for balconies, these have been assessed against the benchmark for open amenity spaces. The red squares in the following figures highlight the areas that receive a minimum of 2 hours of sunlight on March 21st for the balconies within the development. It is clear that the vast majority of balconies received at least 2 hours of sunlight on March 21st, and would comply with the BRE Guidelines.

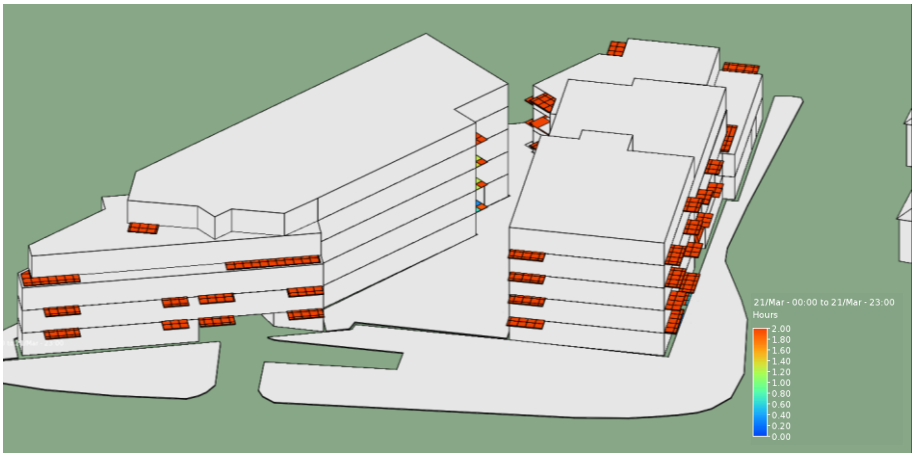

Figure 12: Private Balconies – South West Elevation – Hours of Sunlight on March 21st

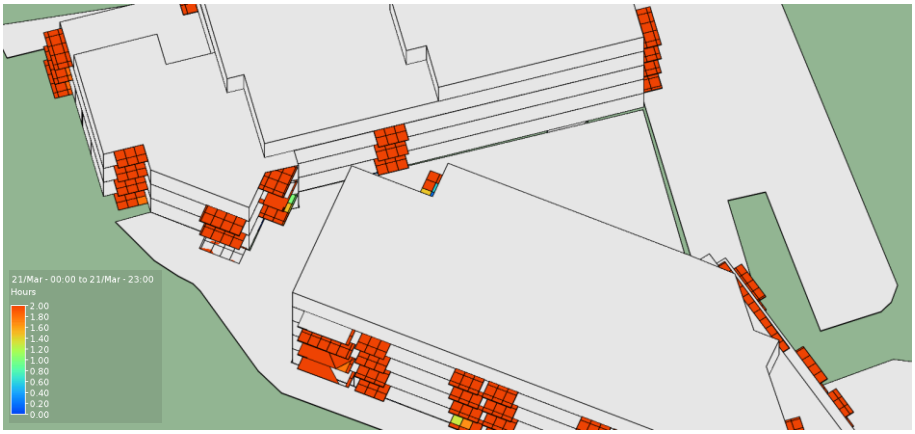

Figure 13: Private Balconies – West Elevation – Hours of Sunlight on March 21st

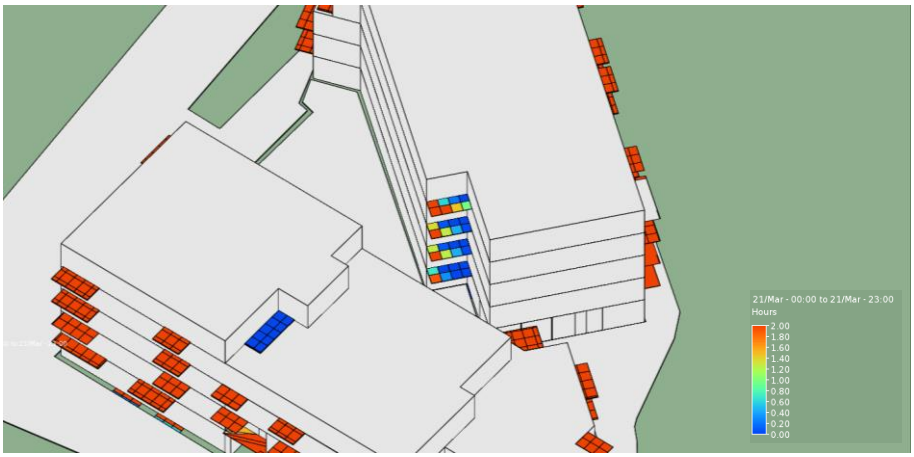

Figure 14: Private Balconies – North East Elevation – Hours of Sunlight on March 21st

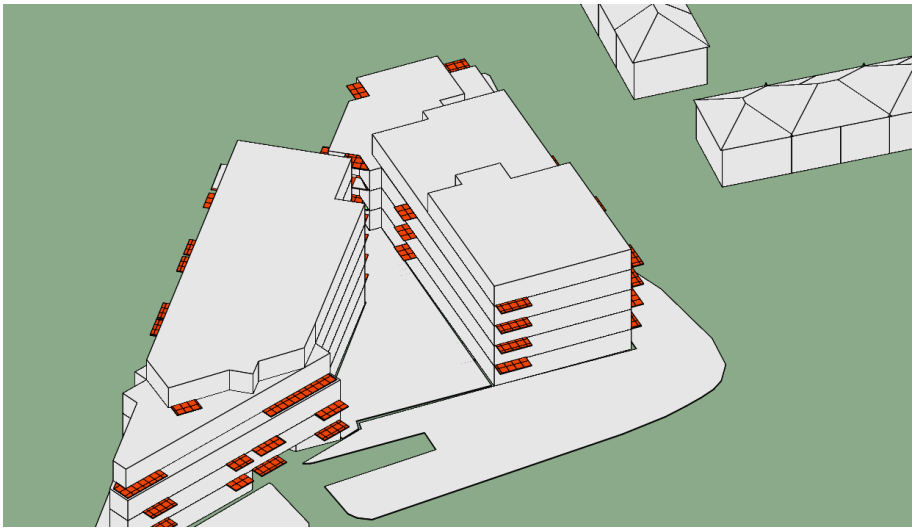

Figure 15: Private Balconies – South Elevation – Hours of Sunlight on March 21st

Figure 16: Private Balconies – East Elevation – Hours of Sunlight on March 21st

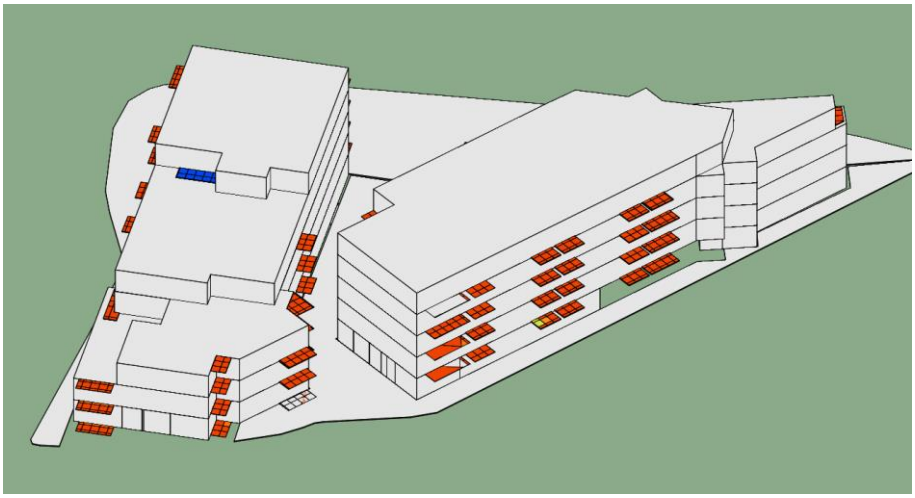

Figure 17: Private Balconies – North West Elevation – Hours of Sunlight on March 21st

7. SUNLIGHT ASSESSMENT WITHIN THE PROPOSED DEVELOPMENT

7.1. SUNLIGHT ASSESSMENT – BS 8206

In order to determine the amount of sunlight that is received by windows within the proposed development, the Annual Probable Sunlight Hours (APSH) calculation method as outlined in BRE Guidelines has been used.

BRE Guidelines outline that in housing, the main requirement for sunlight is in living rooms, where it is valued at any time of the day but especially in the afternoon. BRE Guidelines also state that sunlight is less important in bedrooms and kitchens, however, all windows to occupied rooms within the development have been included within the analysis.

The recommendation set out in BRE Guidelines state that in order to show that adequate sunlight reaches windows within occupied rooms, the centre of at least one window to a main living room must receive 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.

While the BRE criteria sets out the recommendations for living room windows receiving direct sunlight throughout the year, it contradicts the guidance set out in the Design Standards for New Apartments. This apartment design guidance document states that balconies should adjoin and have a functional relationship with the main living areas of the apartment. They also state that it is preferable that balconies would be primarily accessed from living rooms.

The below table summarises the annual probable sunlight hours for the annual period and for the winter period based on the BRE recommendations.

	BRE Guidelines Check 1 APSH > 25% Annual Period	BRE Guidelines Check 2 APSH > 5% Winter Period
Windows Passing	254	270
Total No. of Windows Analysed	364	364
Percentage of Compliance	73%	78%

Figure 18: APSH Summary Table – BS 8206

The results from the analysis have shown that for the annual period, 73% of the analysed windows achieve the recommended APSH values stated in the BRE Guidelines, while 78% of windows achieve the recommended values during the winter months, when sunlight is more valuable. The shortfall in compliance can be attributed to the projection of balconies over the lower levels rooms and to the north facing façades.

It must be noted that the results within this report should be treated with certain degree of flexibility, based on the following statement in the BRE Guidelines:

"the guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design".

In addition, BS 8206 states 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".*

The following images illustrate in red the windows that achieve the recommended values within the BRE Guidelines.

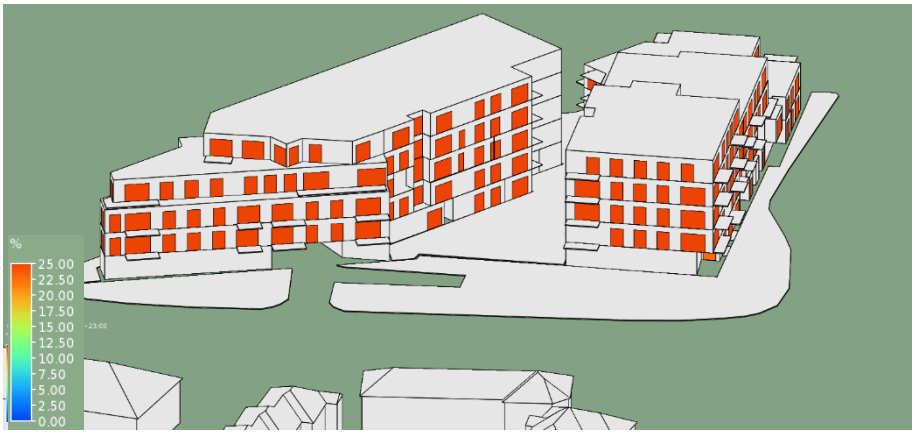

Figure 19: APSH Annual Period (BRE Recommended Benchmark) –South Elevation

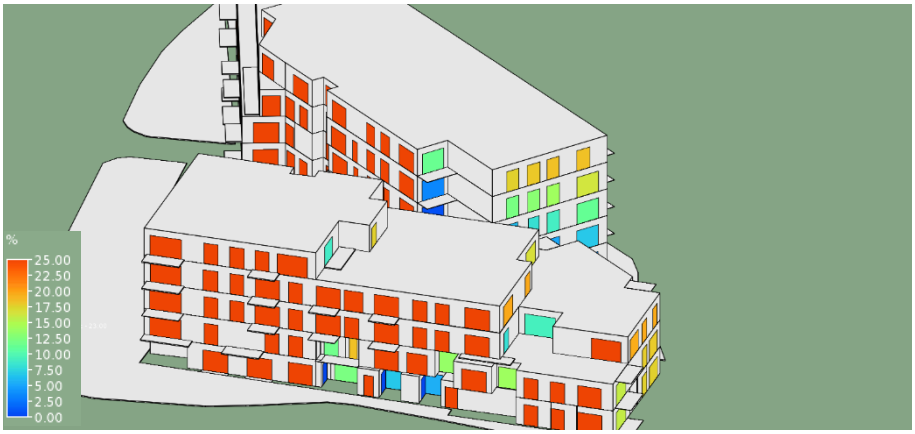

Figure 20: APSH Annual Period (BRE Recommended Benchmark) –East Elevation

Figure 21: APSH Annual Period (BRE Recommended Benchmark) –North West Elevation

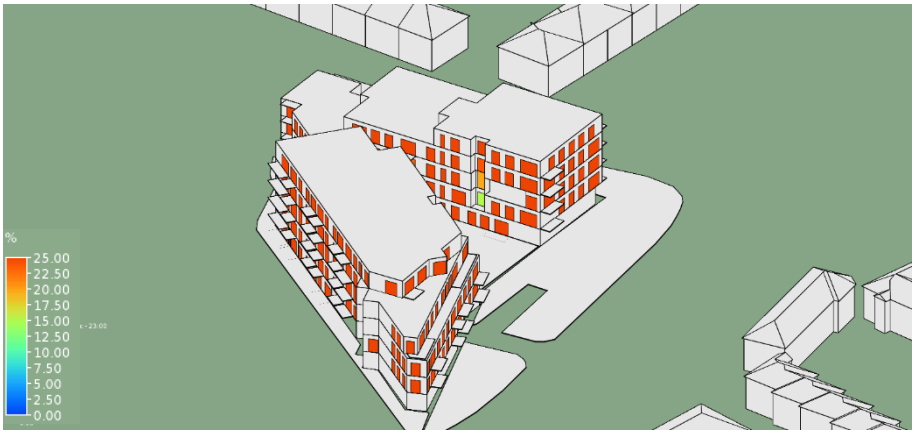

Figure 22: APSH Annual Period (BRE Recommended Benchmark) –South West Elevation

7.2. SUNLIGHT ASSESSMENT – EN 17037

In addition to the BS 8206 standard, the daylight has also been assessed against the newer EN 17037 standard. The EN 17037 standard states that windows shall receive a minimum of 1.5 hours of direct sunlight on the test day, March 21st.

The following images illustrate in red the windows that achieve the recommended minimum values for direct sunlight within the EN 17037 guidelines on March 21st. It is clear from the images that the vast majority of windows comply with the EN 17037 guidelines for direct sunlight.

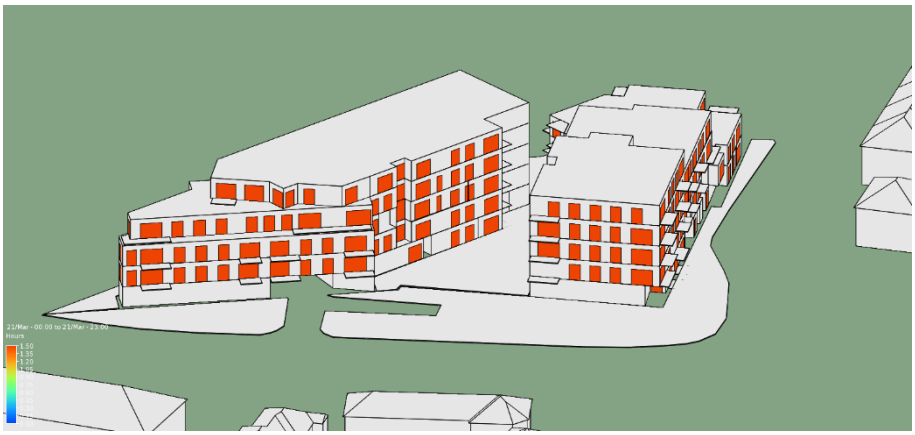

Figure 23: Sunlight Exposure March 21st (EN 17037 Min Recommendation) – South Elevation

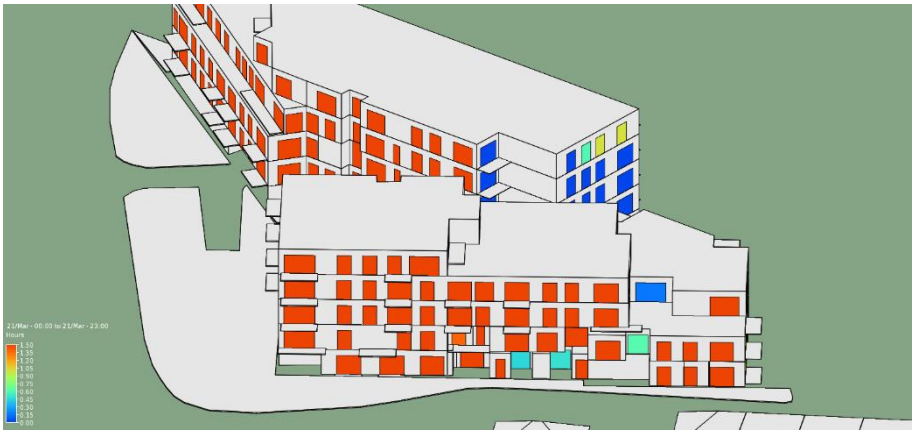

Figure 24: Sunlight Exposure March 21st (EN 17037 Min Recommendation) – East Elevation

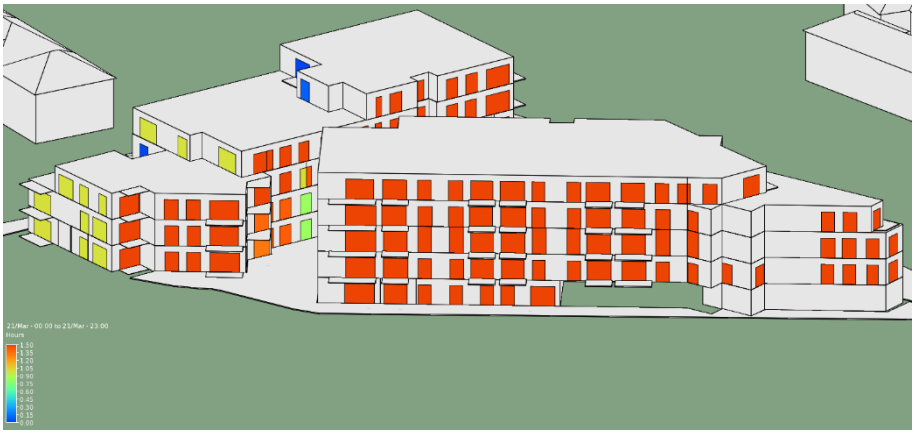

Figure 25: Sunlight Exposure March 21st (EN 17037 Min Recommendation) – North West Elevation

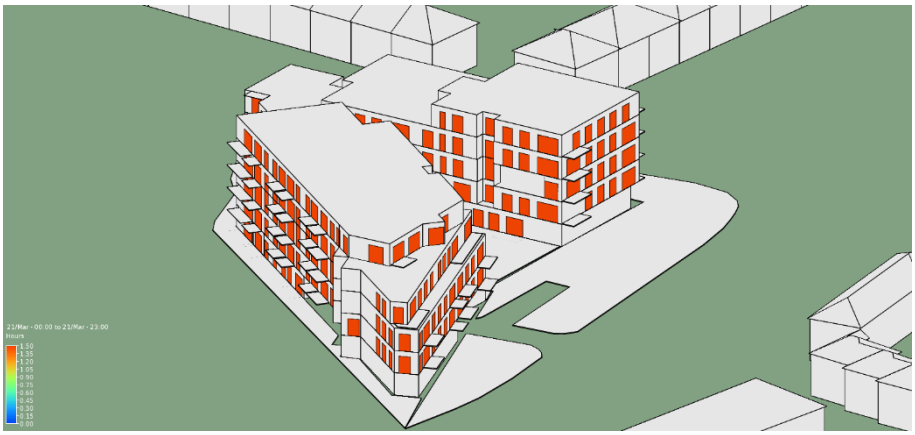

Figure 26: Sunlight Exposure March 21st (EN 17037 Min Recommendation) – South West Elevation

8. ASSESSING THE IMPACT ON SURROUNDING PROPERTIES

8.1. DAYLIGHT & SUNLIGHT IMPACT METHODOLOGY

As per the BRE Guidelines it is important to safeguard the daylight to nearby buildings, from a proposed development, where a reasonable expectation of daylight is required. The flow matrix below outlines the criteria to be assessed, as per the BRE Guidelines, in order to ascertain any potential impact to adjacent buildings from the proposed development.

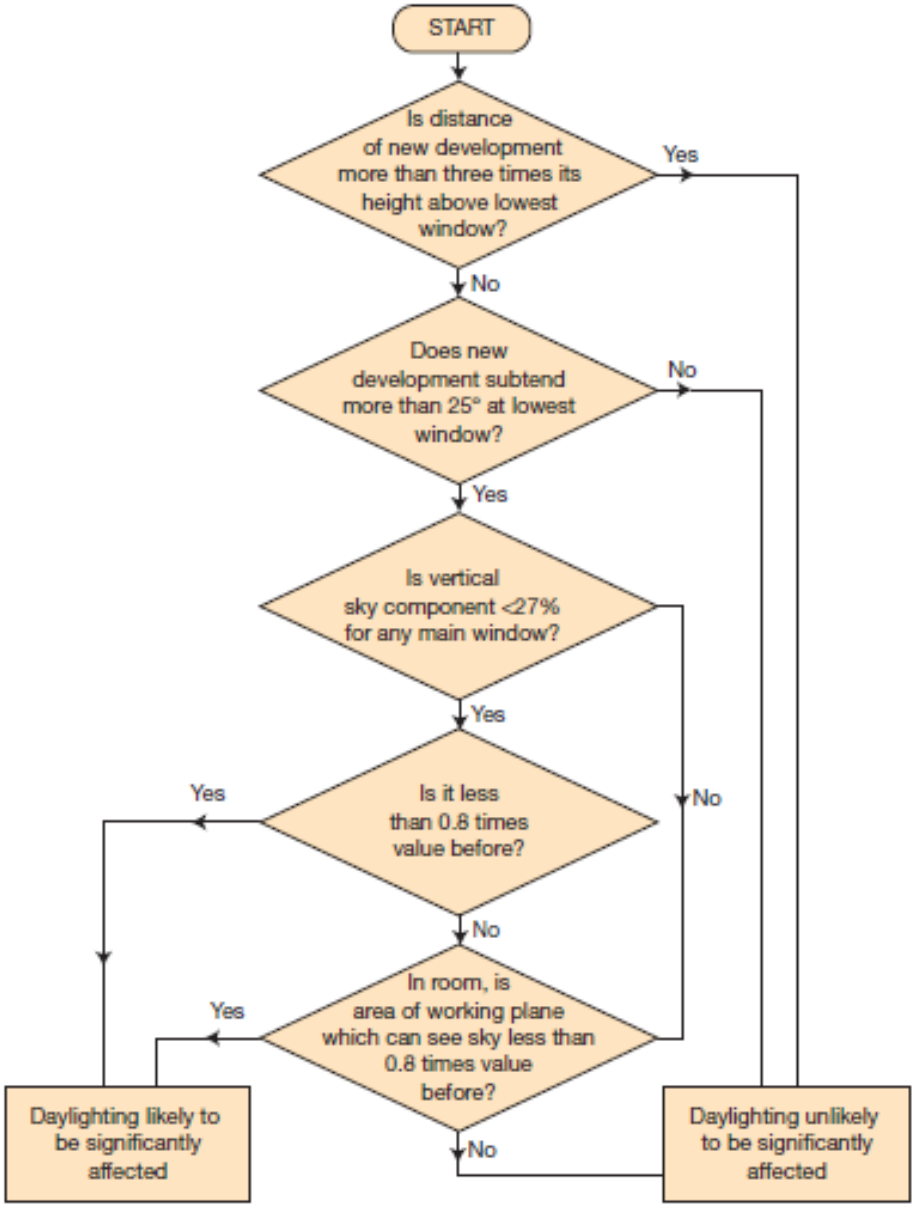

Figure 27 - Daylight Assessment Methodology

As per the flow matrix, the loss of light to existing windows is not required to be analysed 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 windows. Otherwise, BRE guideline provide three main methods for assessing daylight availability.

8.1.1 25° LINE CRITERIA

In the first instance, if a proposed development falls beneath a 25° angle taken from a point 1.6 metres above ground level from any adjacent properties, then the BRE Guidelines say that no further analysis is required in relation to impact on surrounding properties as adequate skylight will still be available. If the proposed development extends beyond the 25° line then further analysis is required (Step 2).

8.1.2 VERTICAL SKY COMPONENT

The second method is known as the Vertical Sky Component (VSC). The VSC calculation is the ratio of the direct sky illuminance falling on the outside of a window, to the simultaneous horizontal illuminance under an unobstructed sky. The BRE Guide sets out two guidelines for the VSC:

- If the VSC at the centre of the existing window exceeds 27% with the new development in place, then enough sky light should still be reaching the existing window.
- If the VSC with the new development in place is both less than 27% and less than 80% its former value, then the reduction in light to the window is likely to be noticeable.
- This means that even if the VSC is less than 27%, as long as the VSC value is still greater than 80% of its former value, this would be acceptable and thus the impact would be considered negligible.

It is important to note that the VSC is a simple geometrical calculation which provides an early indication of the potential for daylight entering the space. However, it does not assess or quantify the actual daylight levels inside the rooms. If the VSC standard is not met on any window, Step 3 is then followed

8.1.3 NO SKY LINE

The third method is the No Sky Line or Daylight Distribution Method. This method assesses the change in position of the No Sky Line between the existing and proposed situations. It does take into account the number and size of windows to a room, but still does not give any qualitative or quantitative

assessment of the light in the room, only where sky can or cannot be seen. Thus, as this method is limited, Step 2 is considered more appropriate.

Sections 8.2 and 8.3 outline the details of the analysis undertaken.

8.2. IDENTIFYING SENSITIVE RECEPTORS

Prior to following the flow matrix, first the key sensitive receptors around the site need to be identified. According to the BRE Guide, sensitive receptors are described as:

- Habitable rooms in residential buildings, where the occupants have a reasonable expectation of daylight;
- Other sensitive receptors are gardens and open spaces on adjacent properties to the new scheme, excluding public footpaths, front gardens and car parks. In accordance with the BRE Guide, windows are selected as sensitive receptors on the basis of being a habitable room facing the proposed development.

Similarly, amenities and open spaces are selected on the basis of being in the immediate vicinity of the proposed development. The primary purpose of a daylight, sunlight and overshadowing assessment is to determine the likely loss of light to adjacent buildings resulting from the construction of the proposed development.

Therefore, in this case, the proposed development is identified as the potential source of impact. The sensitive receptors identified for this study are windows of habitable rooms facing the site where the occupants have a reasonable expectation of daylight. Table 12 identifies all sensitive receptors analysed, whilst Figure 28 identifies their location.

Sensitive Receptors
Mount Carmel Park Properties
Firhouse Road Properties

Table 12 – Sensitive Receptors surrounding the proposed development

The image below identifies the location of the sensitive receptors.

Figure 28 - Location of Sensitive Receptors

8.3. DAYLIGHT IMPACT ON SURROUNDING PROPERTIES

25 º line criteria

As outlined previously, if a proposed development falls beneath a 25° angle taken from a point 1.6 metres above ground level from any adjacent properties, then the BRE Guidelines state that no further analysis is required in relation to impact on surrounding properties as adequate skylight will still be available. The figure below depicts the 25º perimeter line in red.

It is evident from the figure that all properties fall outside the 25º line except for sensitive receptor 1 in Mount Carmel Park. Therefore, no impact on any of the surrounding properties will be perceived with exception of sensitive receptor 1. In order to determine if there will be an impact to sensitive receptor 1, further analysis has been carried out.

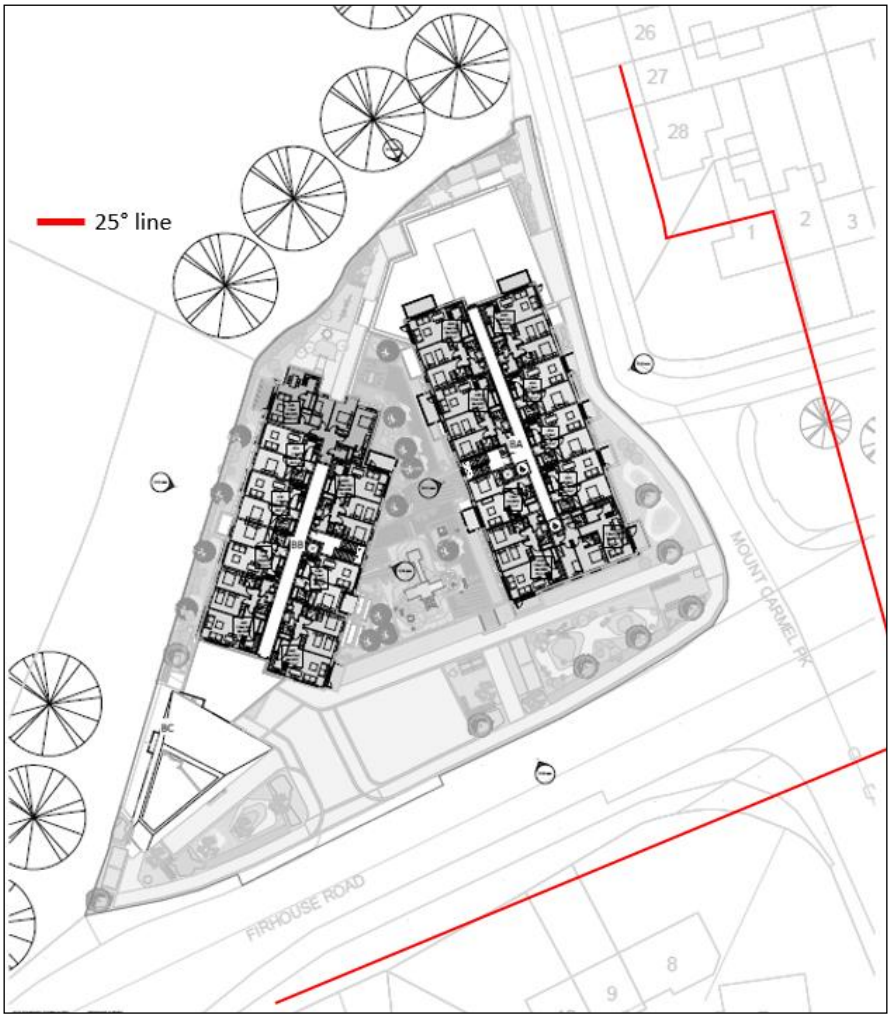

Figure 29 - 25° line

VSC

BRE Guidelines state that if the VSC is ≥ 27% with the new development in place, then enough sky light should still be reaching the existing window. If the VSC value is under 27%, in order for the window to perceive a negligible impact, the VSC with the proposed development in place should still be ≥80% of its former value.

Since the 25° perimeter line has identified sensitive receptor 1, this has been selected for further analysis. The windows on the ground floor level have been selected for analysis representing the 'worst case' scenario. The VSC achieved was greater than 27%, therefore, negligible impact will be perceived.

Figure 30 – Sensitive Receptor 1 Window References

Window Ref.	VSC received once the proposed development is built (%)	Meets BRE Guidelines VSC>27%
1	29.0	Y
2	29.2	Y

Table 13– VSC Results

9. SUNLIGHT IMPACT ON ADJACENT PROPERTIES (APSH)

In order to assess the sunlight access within the adjacent properties of Firhouse development the Annual Probable Sunlight Hours (APSH) have been analysed.

BRE Guidelines outline that if a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlight of the existing dwelling may be adversely affected. This will be the case if the centre of the window:

- Receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between September 21st and March 21st
- Receives less than 80% its former sunlight hours during either period
- Has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours

Since BRE Guidelines outline that obstructions within 90° of due north of the existing windows are not required to be included, the properties selected for APSH analysis are the sensitive receptors located to the north, east and west of the proposed development inside the 25° line.

It must be noted that BRE Guidelines states that to assess loss of sunlight to an existing building, it is suggested that all main living rooms of dwellings should be checked if they have a window facing within 90° of due south. BRE Guidelines also outlines that kitchen and bedrooms are less important, although care should be taken not to block too much sun.

In order to give indicative results on the sunlight impact to adjacent properties, the ground floor level windows within sensitive receptor 1 (only adjacent property inside the 25° line) have been selected for analysis in line with BRE Guidelines recommendations.

As previously outlined, it must be noted that the performance targets outlined within BRE Guidelines should be used with a degree of flexibility as outlined within the guide itself.

Figure 31 - Sensitive receptor 1 Window References

Window Ref.	APSH (%) - Existing development		APSH (%) - Proposed development		Meets minimum APSH values recommended in BRE Guidelines with the Proposed Development in place		Percentage of its former value (%)	
	Annual	Winter (Sep 21st – Mar 21st)	Annual	Winter (Sep 21st – Mar 21st)	Annual	Winter (Sep 21st – Mar 21st)	Annual	Winter (Sep 21st – Mar 21st)
1	NA	NA	30.8	9.2	Y	Y	NA	NA
2	NA	8.5	27.8	4.1	Y	N	NA	48

Table 14 – Annual Probable Sunlight Hours Results

The analysis has shown that window 1 will continue to receive the recommended APSH values once the proposed development is built. Window 2 will continue to receive the recommended APSH for the annual period, however, it falls slightly short on the recommended values for the winter period with the proposed development in place, therefore, the reduction of its former value (existing scenario) has been calculated, showing that an impact will be perceived by this window.

The impact on window 2 is normal due to the comparison between a site with low height development and the construction of any new development higher than that. However, it must be noted that the APSH for the winter period with the proposed development in place is only slightly short of the recommended BRE values. Therefore, even though an impact will be perceived during the winter period due to the proposed development, acceptable levels of sunlight will still be achieved.

In conclusion, it can be stated that good levels of sunlight will still be achieved within the adjacent properties.

10. OVERSHADOWING IMPACT TO SURROUNDING PROPERTIES

The overshadowing impact from the proposed development on surrounding buildings has been analysed. The overshadowing images in the following figures illustrate the overshadowing impact on March 21st, June 21st and December 21st at hourly intervals. There is little overshadowing due to the proposed development, aside from on 4 p.m. in March, and 2 p.m. onwards in December.

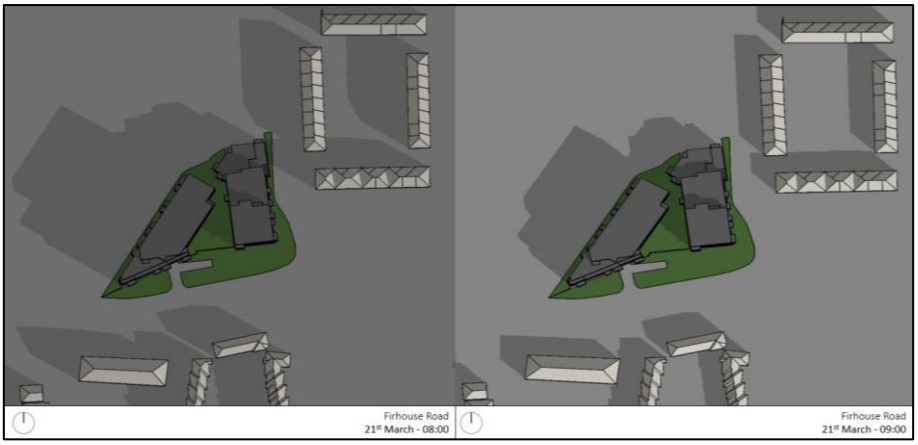

Figure 32: Overshadowing Images on March 21st at 8 a.m. and 9 a.m.

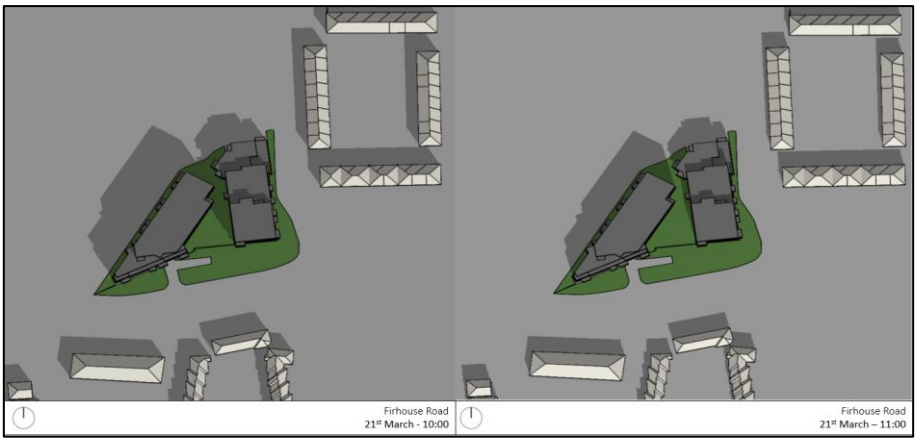

Figure 33: Overshadowing Images on March 21st at 10 a.m. and 11 a.m.

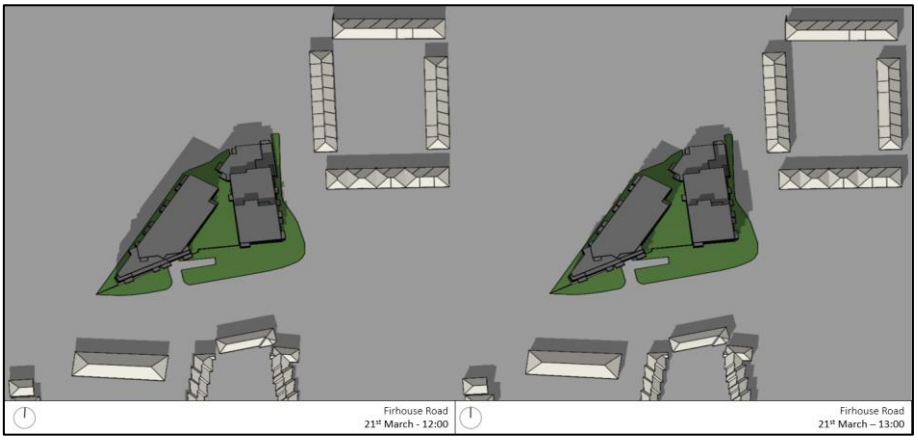

Figure 34: Overshadowing Images on March 21st at 12 p.m. and 1 p.m.

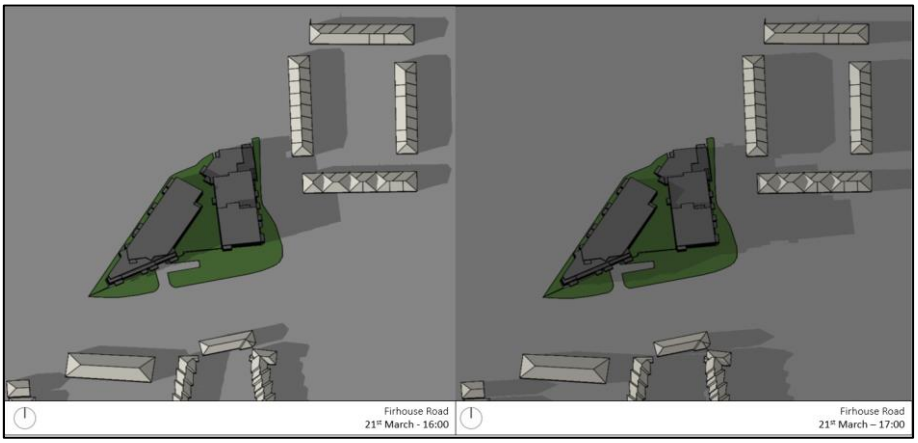

Figure 35: Overshadowing Images on March 21st at 2 p.m. and 3 p.m.

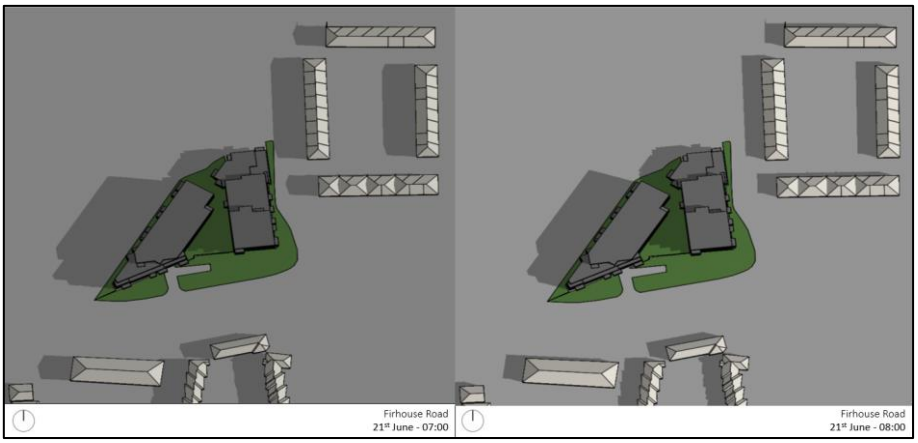

Figure 36: Overshadowing Images on June 21st at 7 a.m. and 8 a.m.

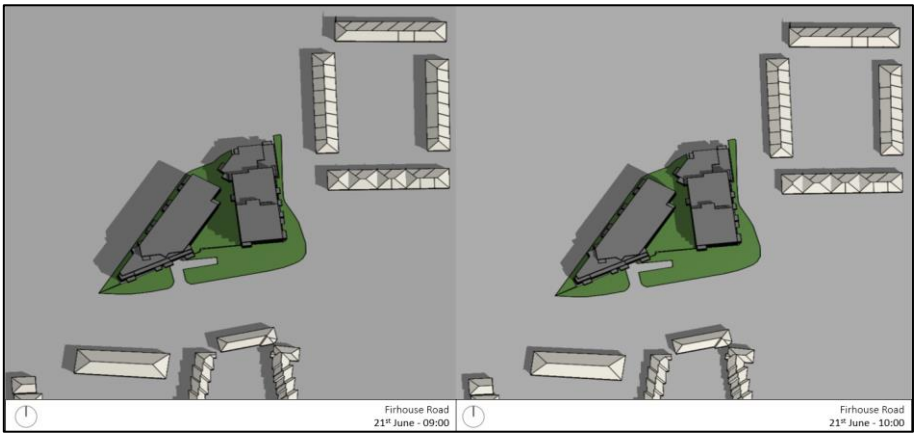

Figure 37: Overshadowing Images on June 21st at 9 a.m. and 10 a.m.

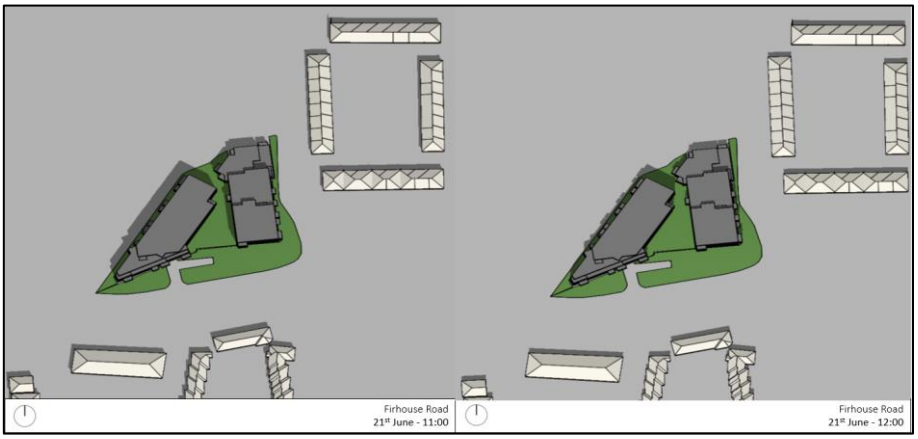

Figure 38: Overshadowing Images on June 21st at 11 a.m. and 12 p.m.

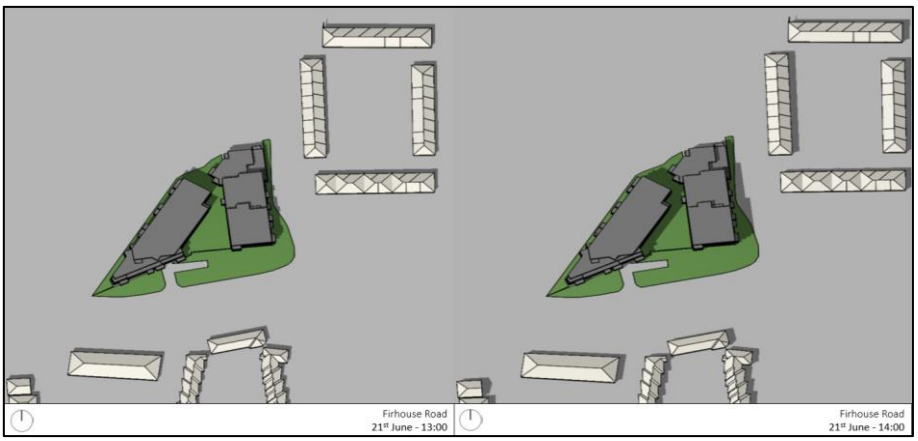

Figure 39: Overshadowing Images on June 21st at 1 p.m. and 2 p.m.

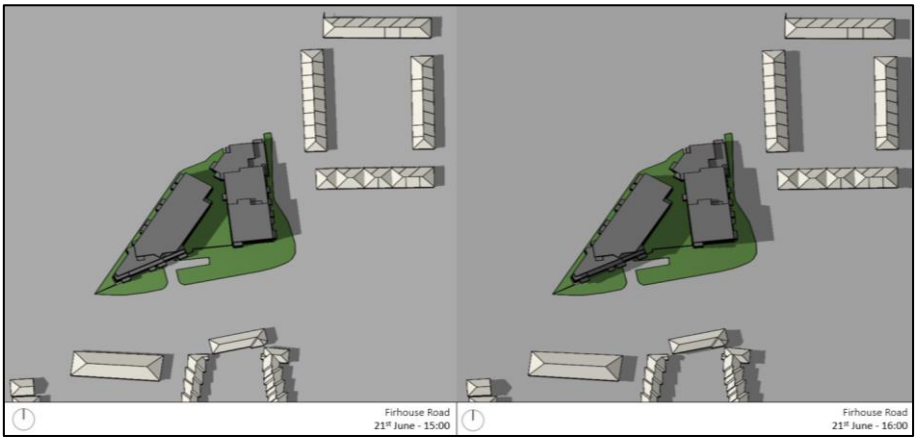

Figure 40: Overshadowing Images on June 21st at 3 p.m. and 4 p.m.

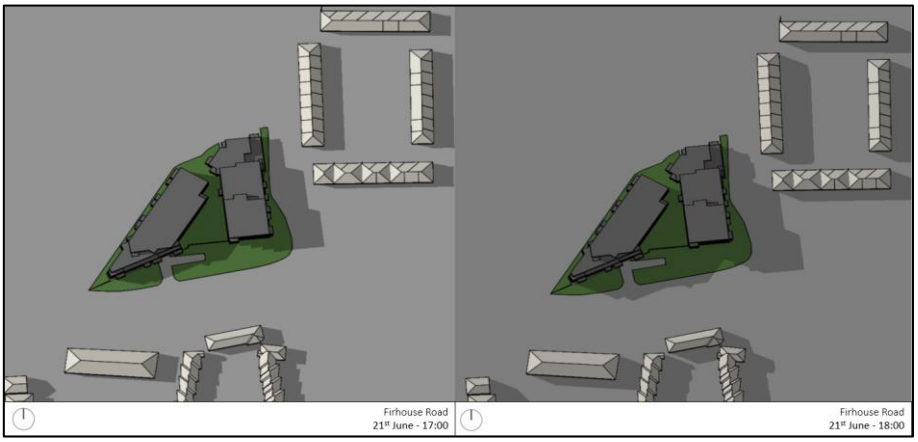

Figure 41: Overshadowing Images on June 21st at 5 p.m. and 6 p.m.

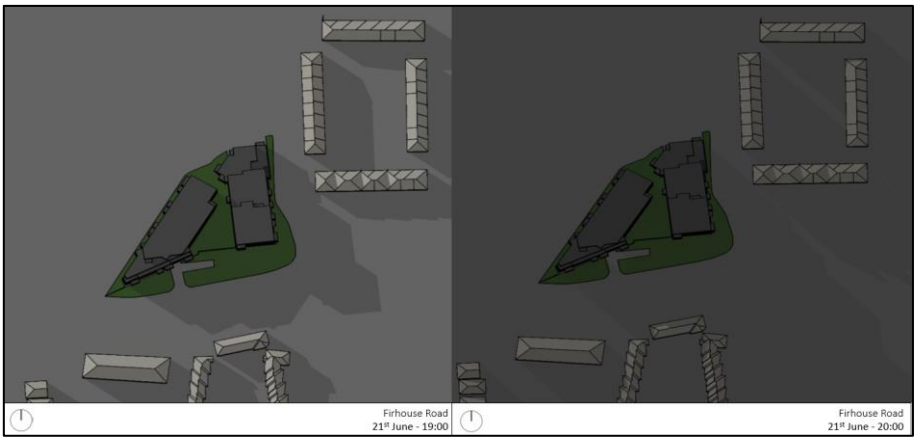

Figure 42: Overshadowing Images on June 21st at 7 p.m. and 8 p.m.

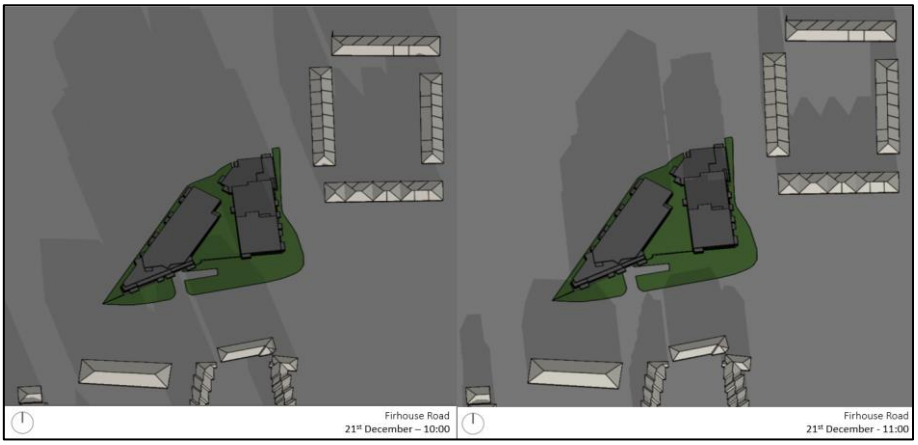

Figure 43: Overshadowing Images on December 21st at 10 a.m. and 11 a.m.

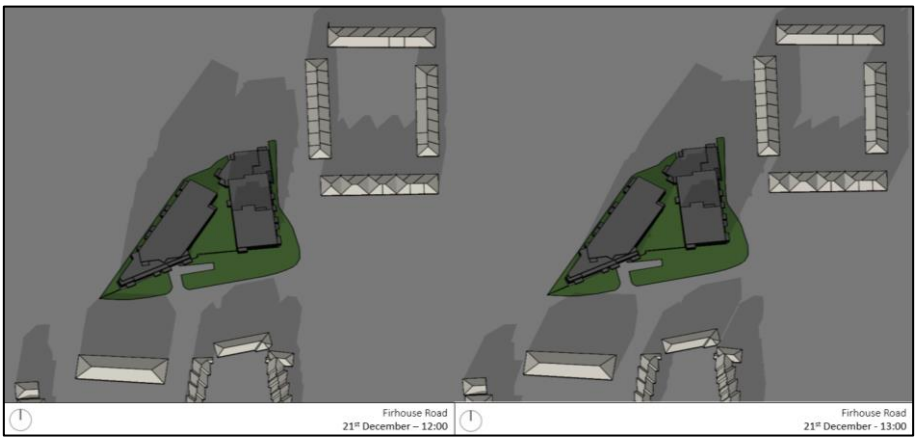

Figure 44: Overshadowing Images on June 21st at 12 p.m. and 1 p.m.

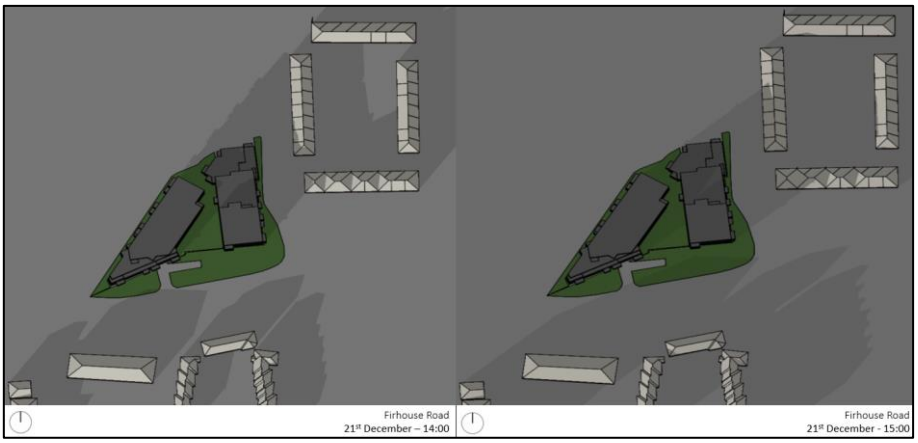

Figure 45: Overshadowing Images on June 21st at 2 p.m. and 3 p.m.

11. GLARE ASSESSMENT

Glare is defined in EN 17037 as follows:

"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. Direct sunlight or high luminance differences between bright and dark areas within the field of view can cause risk of glare."

EN 17037 defines a Daylight Glare Probability (DGP), and sets thresholds which DGP should be limited to, however, the standard also notes that protection from glare is only required in certain cases:

"Daylight Glare Probability (DGP) is used to assess protection from glare for spaces where the activities are comparable to reading, writing or using display devices and the occupants are not able to choose position and viewing direction."

In the case of the dwellings in the Firhouse Development, occupants are free to choose their position and viewing direction. As such, further assessment of glare is not necessary for the development.

12. CONCLUSION

The proposed Firhouse development has been analysed in order to determine the following:

- The daylight levels within the living and bedroom areas throughout the development;
- The expected sunlight levels received by the living areas and bedrooms of the proposed development;
- The quality of amenity spaces being provided as part of the development, in relation to sunlight;
- Any potential overshadowing impact the proposed development may have on properties adjacent to the site.

Calculations and methodology used are in accordance with BRE Guidelines for daylight and sunlight and based on the British Research Establishments "Site Layout Planning for Daylight and Sunlight: A Good Practice Guide" by PJ Littlefair, 2011 Second Edition, as well as EN 17037. However, the following text from BS 8206 should be reiterated as previously outlined:

"The advice given here is not mandatory and this document should not be seen as an instrument of planning policy. Its aim is to help rather that constrain the designer. Although it gives numeral guidelines these should be interpreted flexibly because natural lighting is only one of the many factors in site layout design"

Internal daylight within the proposed development

The analysis confirms that across the entire development excellent levels of internal daylight are achieved, with a compliance rate of 100% across the proposed development against BS 8206, and a 98.5% compliance rate against EN 17037.

Throughout the full development, comfortable and desirable spaces have been designed to enhance the opportunity for improved daylight levels and extensive glazing to every room enabling deep daylight penetration and providing enhanced views to a landscaped area.

Sunlight to proposed development amenity spaces

In terms of sunlight access, excellent levels of sunlight are experienced across the proposed development. The communal amenity spaces provided exceed the BRE guidelines for sunlight on the test day of 21st of March.

An additional test has demonstrated that the majority of balconies within the development will achieve the recommended values within BRE Guidelines for amenity open spaces, with the majority of balconies receiving excellent levels of sunlight. It must be noted that BRE does not provide any guidance for balconies and this test has been carried out for information.

Sunlight to windows within the proposed development

The annual probable sunlight hours assessment has shown that 73% of windows across the development achieve the recommended APSH values stated in the BRE Guidelines, while 78% of windows achieve the recommended values during the winter months, when sunlight is more valuable. The vast majority of windows comply with the direct sunlight recommendations of EN 17037.

Impact to surrounding properties

The 25° line and the Vertical Sky Component analysis have shown that a negligible impact will be perceived by any of the surrounding properties.

In relation to sunlight to windows, the analysis has shown that one of the analysed windows will perceive a minimal impact only during the winter period.

Overshadowing

The overshadowing analysis has shown that there is little overshadowing due to the proposed development, aside from on 4 p.m. in March, and 2 p.m. onwards in December.

Glare

Glare has not been assessed for the development, as occupants are free to choose their position and viewing direction within the dwellings.