September 2019

Units 66 & 67 Fourth Avenue, Cookstown Ind Estate, Dublin 24

Daylight and sunlight analysis

Applicant: Steelworks Property Developments Ltd.

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3D DESIGN BUREAU

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For Design, Planning & Marketing

Contents

Glossary

VSC (Vertical Sky Component)
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.

APSH (Annual Probable Sunlight Hours)
Annual probable sunlight hours (APSH) is a measure of sunlight that a given window may expect over a year period.
The BRE guidance recognises that sunlight is less important than daylight in the amenity of a room and is heavily influenced by orientation. North facing windows may receive sunlight on only a handful of occasions in a year, and windows facing eastwards or westwards will only receive sunlight for some of the day. Therefore, BRE guidance states that only windows with an orientation within 90 degrees of due south need be assessed.

ADF (Average daylight factor)
Ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky.
Thus a 1% ADF would mean that the average indoor illuminance would be one hundredth the outdoor unobstructed illuminance.

Working plane
Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85 m above the floor in houses and factories, 0.7 m above the floor in offices.

Skylight
Non directional Ambient light cast from the sky and environment.

Sunlight
Direct parallel rays of light emitted from the sun.

Daylight
Combined skylight and sunlight.

Definition of impacts
The terminology used in this report to determine the definition of impacts has been taken from 2002 publication "Guidelines on the information to be contained in environmental impact statements"
By The Environmental Protection Agency (EPA) These Definitions can be seen below.

Imperceptible Impact
An impact capable of measurement but without noticeable consequences.

Slight Impact
An impact which causes noticeable changes in the character of the environment without affecting its sensitivities.

Moderate Impact
An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.

Significant Impact
An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.

Profound Impact
An impact which obliterates sensitive characteristics.

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Introduction

3D Design Bureau (3DDB) were commissioned to carry out a daylight analysis, a sunlight analysis and shadow study to assess the quality of daylight and sunlight within the proposed residential development in Cookstown, Dublin 24.

For all target values of daylight and sunlight the 2011 BRE guidelines as set out in “Site layout planning for daylight and sunlight” have been followed.

Note: The BRE Guidelines should be treated as guidelines as opposed to rules, the document clearly states:

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

This analysis has been carried out in 2 parts:

1.) Sunlighting in proposed outdoor amenity areas:
The BRE guidelines recommend that for a garden or amenity area to appear adequately sunlit throughout the year, at least half of it should be capable of receiving two hours or more of direct sunlight on March 21st.

This study will assess the level of sunlight that can be expected in the proposed central public open space at ground floor level in the courtyard of the proposed development as highlighted on page 6.

The results for the study on sunlighting can be found on page 6.
A visual representation of these readings can be seen in the false colour plan on page 6 and in the hourly shadow diagrams for March 21st on pages 7 - 8.

2.) Average Daylight Factor (ADF).
BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well day lit space and 2% for a partly daylight space. Below 2% the room will look dull and electric lighting is likely to be turned on.
In terms of housing, BS 8206-2 also gives minimum values of ADF:
2% for Kitchens, 1.5% for living rooms and 1% for bedrooms.

This study will assess the Average Daylight Factor (ADF) received in all habitable rooms in selected apartments across the ground floor and 1st floor apartments of the proposed development. The assessed spaces have been chosen with the aim to represent all apartment types. Where apartment types are repeated, although the actual ADF will differ due to differences in context, a similar ADF should be assumed. No assessment has been carried out on subsequent floors as the levels of daylight naturally increase as the floor level increases and the lowest floor is deemed to be the worst case scenario.

For definition of spaces and target values applied, please see the methodology section of this report on page 5.

The results for the study on ADF can be seen on pages 12 - 17.

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Methodology

Building the proposed and existing models.
In order to obtain the results of this analysis, 3D Design Bureau (3DDB) were issued with a Revit model of the proposed development by C&W O'Brien Architects.
A combination of survey information, photogrammetry, available on-line photography & ordnance survey information were used to model the surrounding context and assessed buildings.
As the information gathered from on-line sources is not as accurate as surveyed information, some tolerance should be allowed to the results generated.

Trees
Normally trees and shrubs do not need to be included in the studies carried out in this report, partly because their shapes are almost impossible to predict, and partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees). Where a dense belt or group of evergreens is specifically planned as a windbreak or for privacy purposes, it is better to include their shadow in the calculation of shaded area.

Defining Areas.
Many of the living spaces in the proposed development are open plan and connected to a kitchen and dining room (LKD)
In such instances where the kitchens have a window on the external wall, the LKD will be analysed as one space with a target value of 2%.
In instances where the kitchens are completely internal and not serviced by window on the external facade, the kitchen area will be omitted from the analysis area and a target value of 1.5% will be applied.
If the kitchen and living spaces are separate spaces, they will be analysed as separate rooms, with target values of 2% and 1.5% respectively.
A target value of 2% will be applied to studio apartments with circulation areas being removed from the analysis area.
Bedrooms will have a target value of 1%,with circulation areas being removed from the analysis area.

Work plane.
The calculation of ADF is carried out on a hypothetical work plane which lies 850mm from the finished floor level and is offset 500mm from the room boundaries. Room boundaries are taken from the inside face of the interior walls and the centre point of any external windows. Where multipurpose rooms have been separated for analysis purposes, the space boundary has been defined by the architect.
Daylight Factor (DF) has been calculated on the work plane across a series of points on a grid of approximately 200mm.
The average of these figures determines the Average Daylight Factor (ADF)

Generating results.
The 3D models as stated above were brought into specialist software packages using state of the art daylight and sunlight analysis methods.
All target values are obtained from the 2011 BRE guidelines as set out in "site layout planning for daylight and sunlight".

Shadow Study
The shadow study renderings were carried out in order to give a visual representation to the results set out in the sunlight analysis report. Please see pages 7 - 11.
Hourly renderings have been shown from sunrise to sunset on the following dates:

- Spring Equinox: March 21st. Sunrise 6:25 | Sunset 18:40.
- Summer Solstice: June 21st. Sunrise 4:57 | Sunset 21:57.
- Winter Solstice: December 21st. Sunrise 8:38 | Sunset 16:08.
- Note: The Spring and Autumn Equinox yield similar results.

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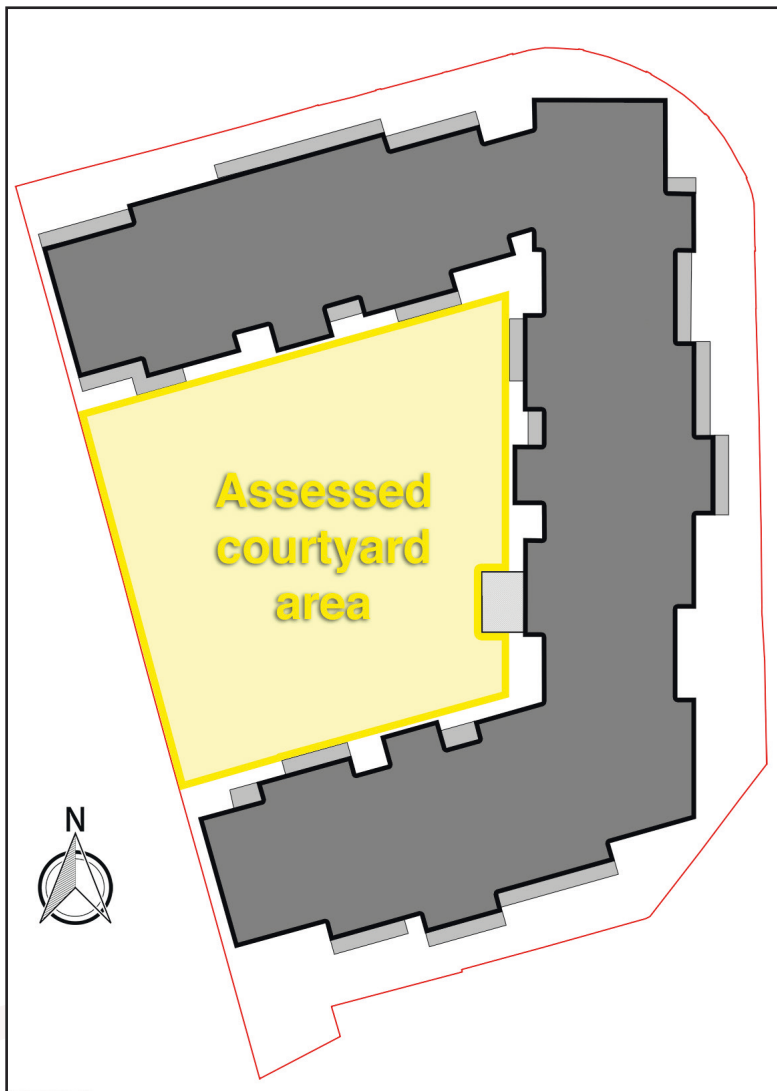
Results

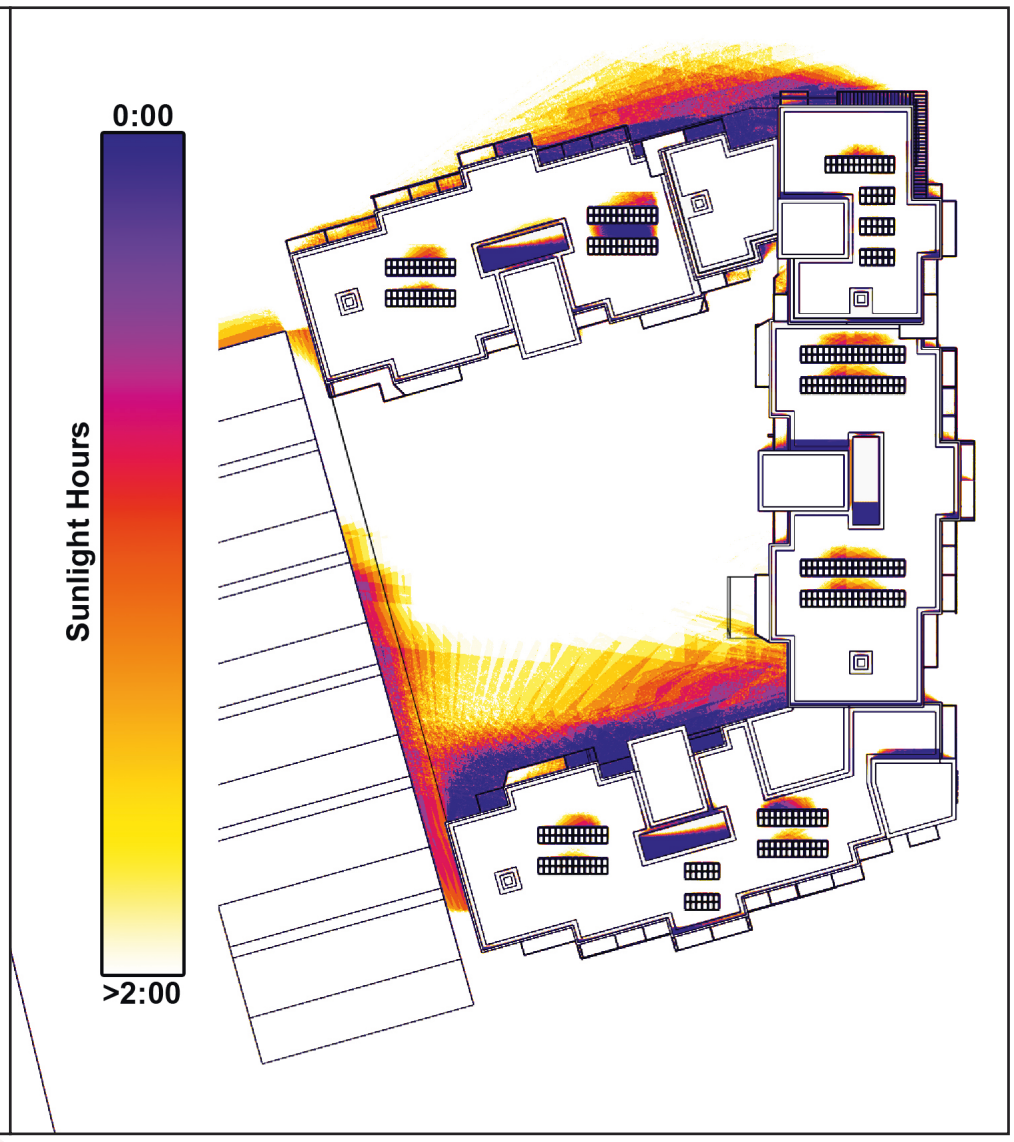
Sunlighting in proposed courtyard

Assessed Area	% of Area to receive above 2 hours sunlight on March 21st (target >50%)	Meets BRE Guidelines*
Courtyard	75.4%	Yes

* The BRE guidelines recommends that for it a garden or amenity 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.



Indication of the area that has been analysed



False colour plan indicating the area capable of receiving 2 hours of sunlight on March 21st

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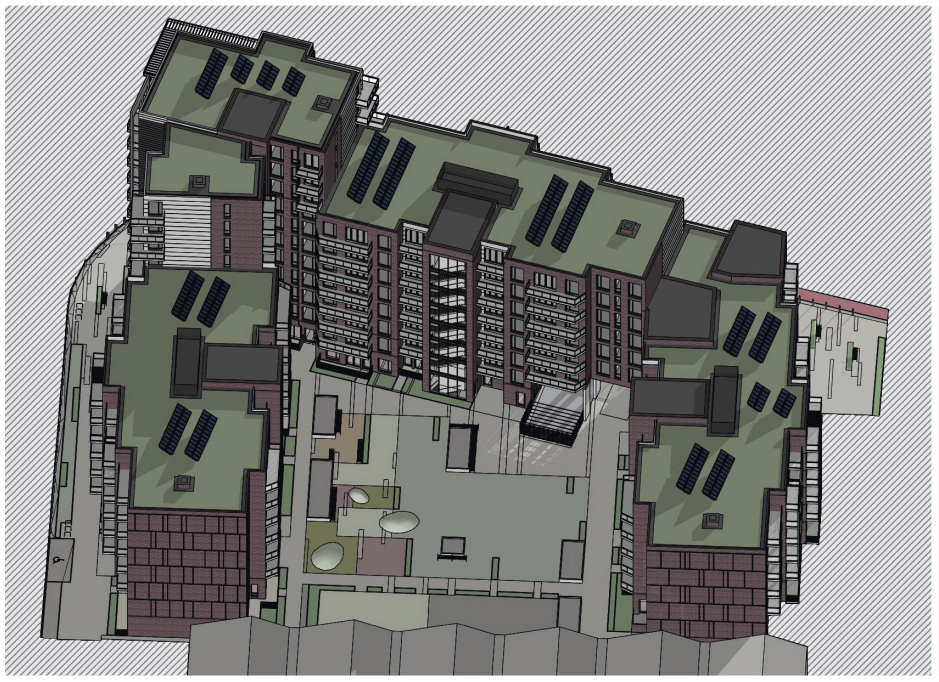
Shadow Study March 21st

N

07:00

08:00



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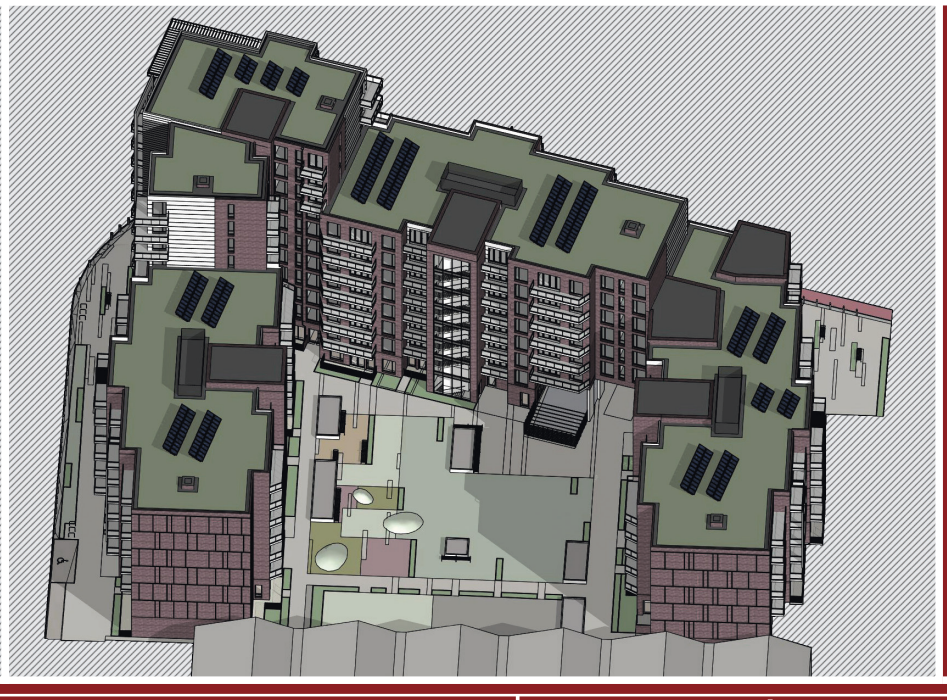

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March 21st
Sunrise 6:25 | Sunset 18:40

Shadow study by

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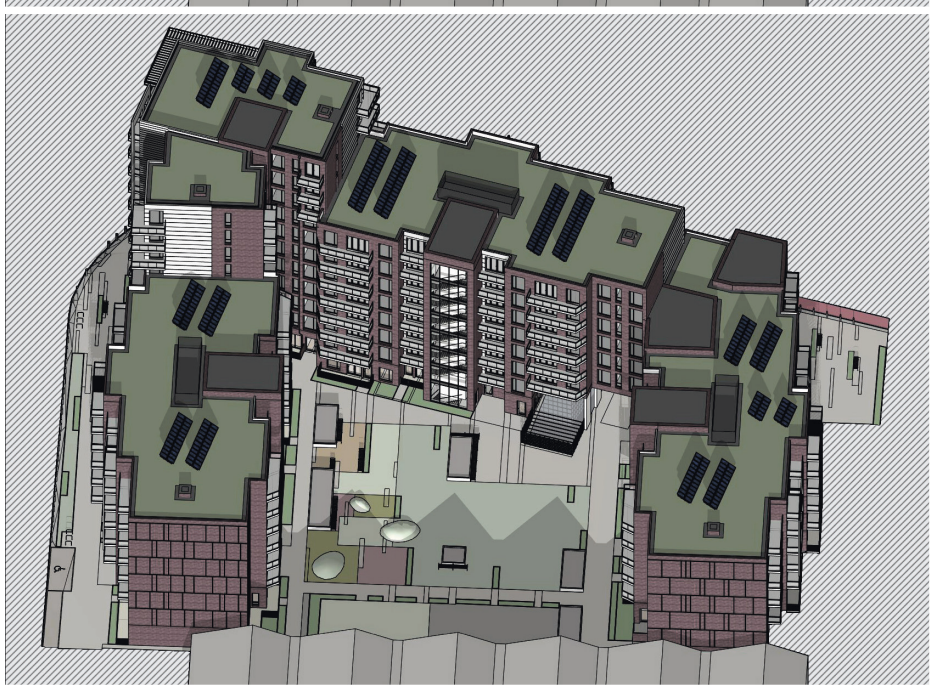
Shadow Study March 21st

15:00

16:00

17:00



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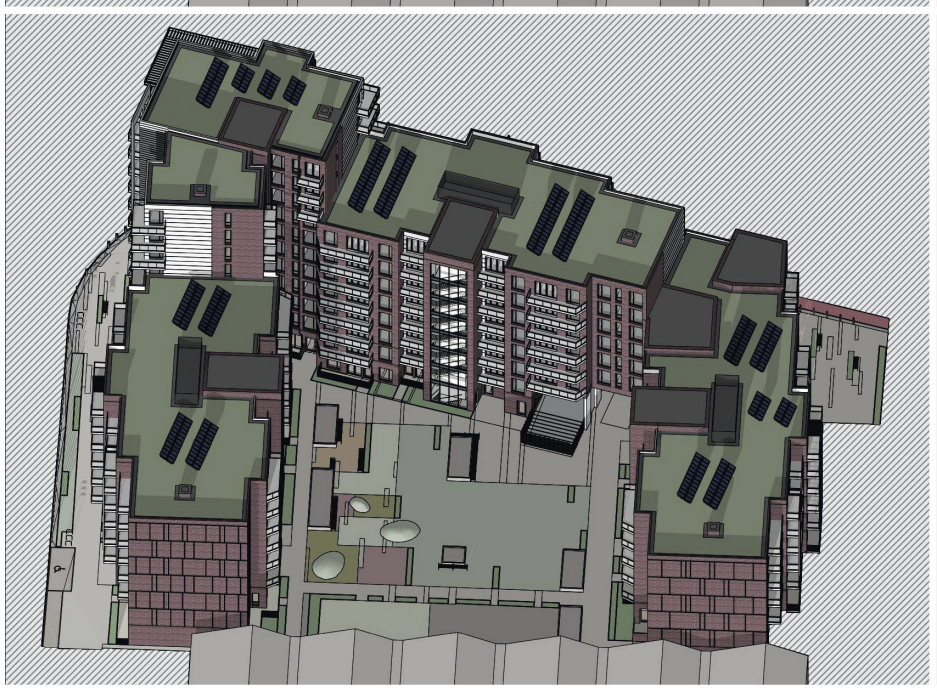

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March 21st
Sunrise 6:25 | Sunset 18:40

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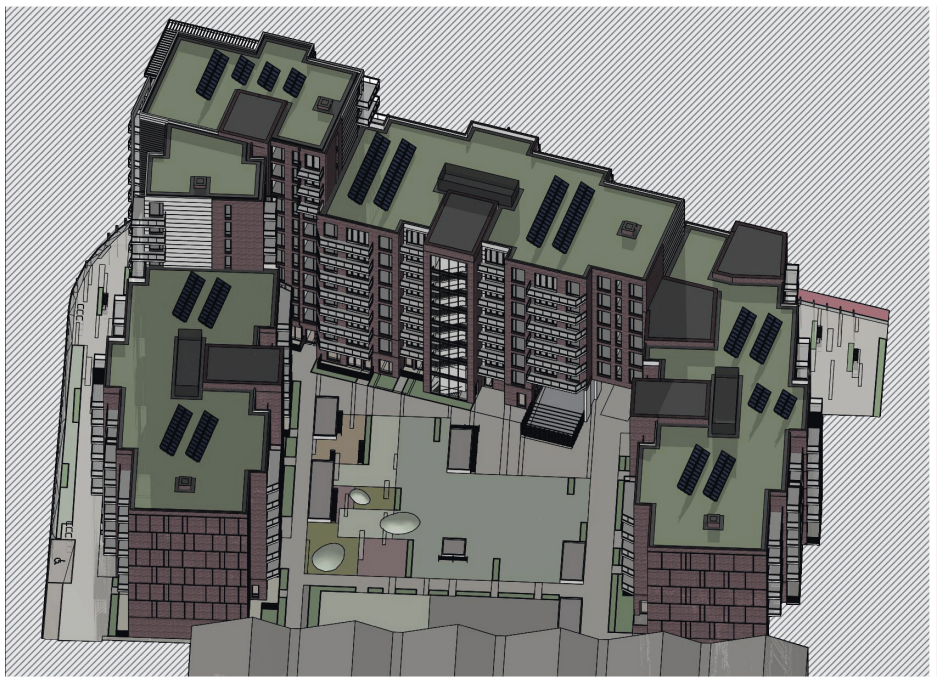
Shadow Study June 21st

N

06:00

07:00



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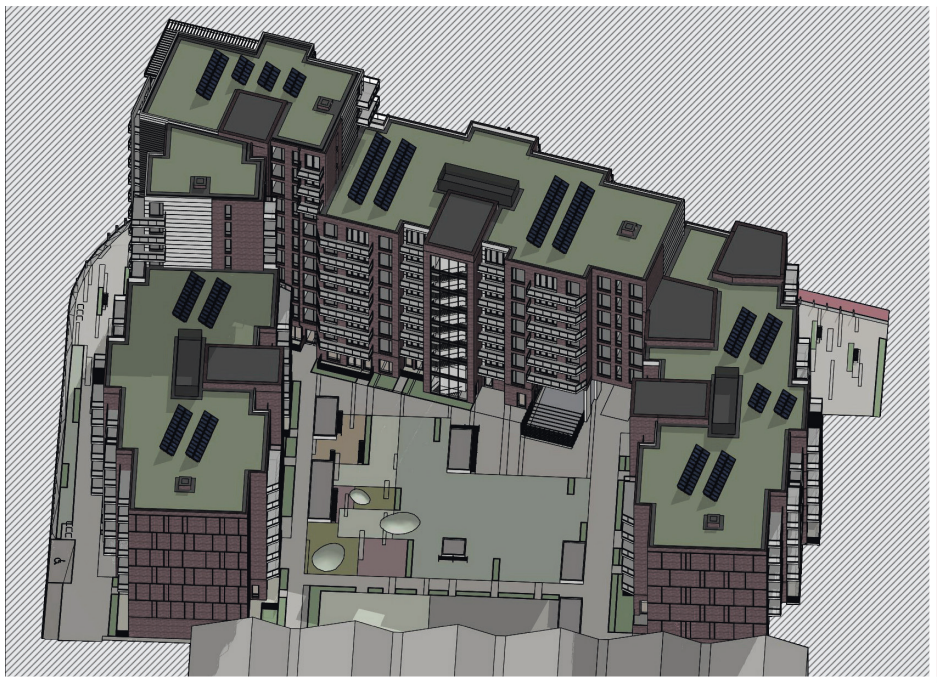

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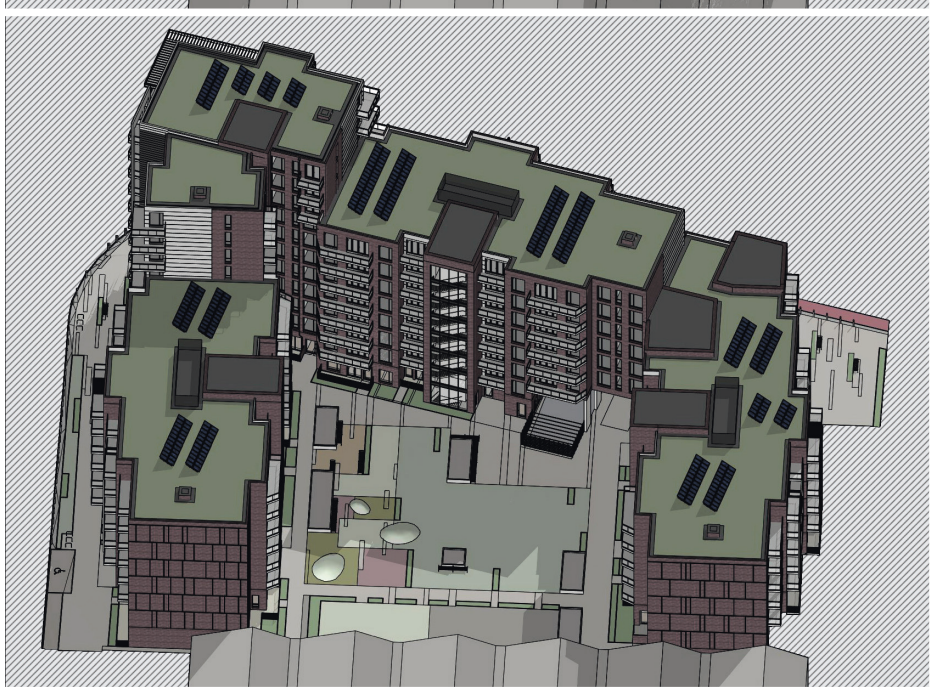

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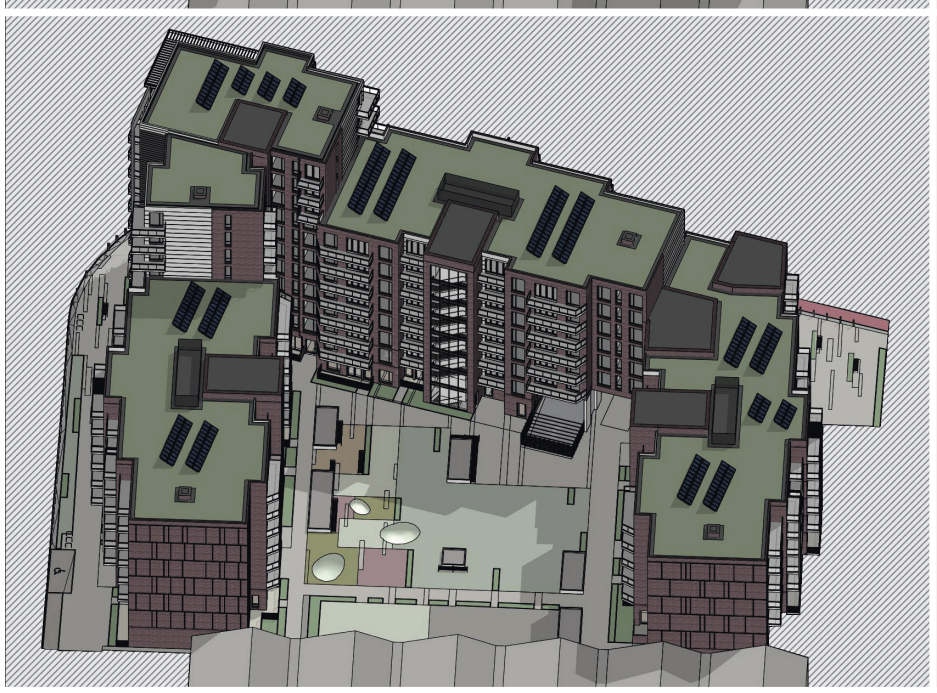

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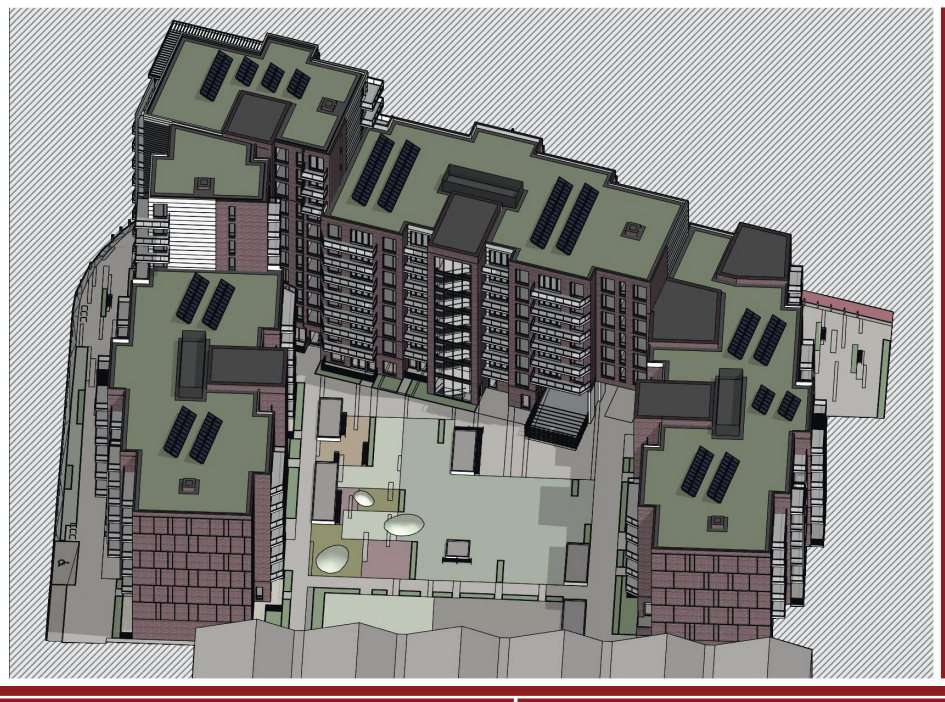

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June 21st
Sunrise 4:57 | Sunset 21:57

Shadow study by

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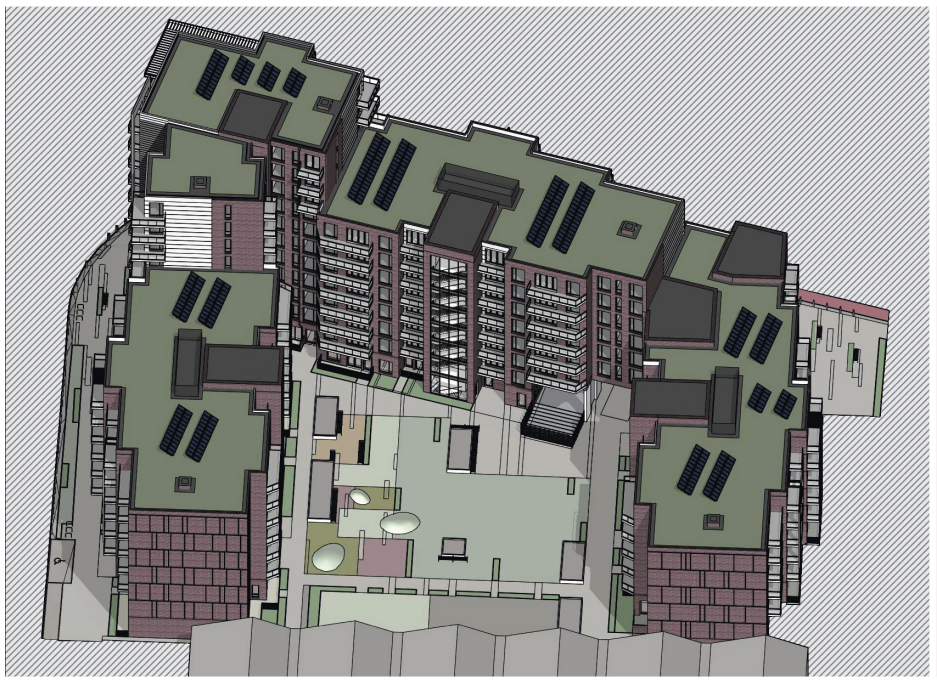
Shadow Study June 21st

N

14:00

15:00



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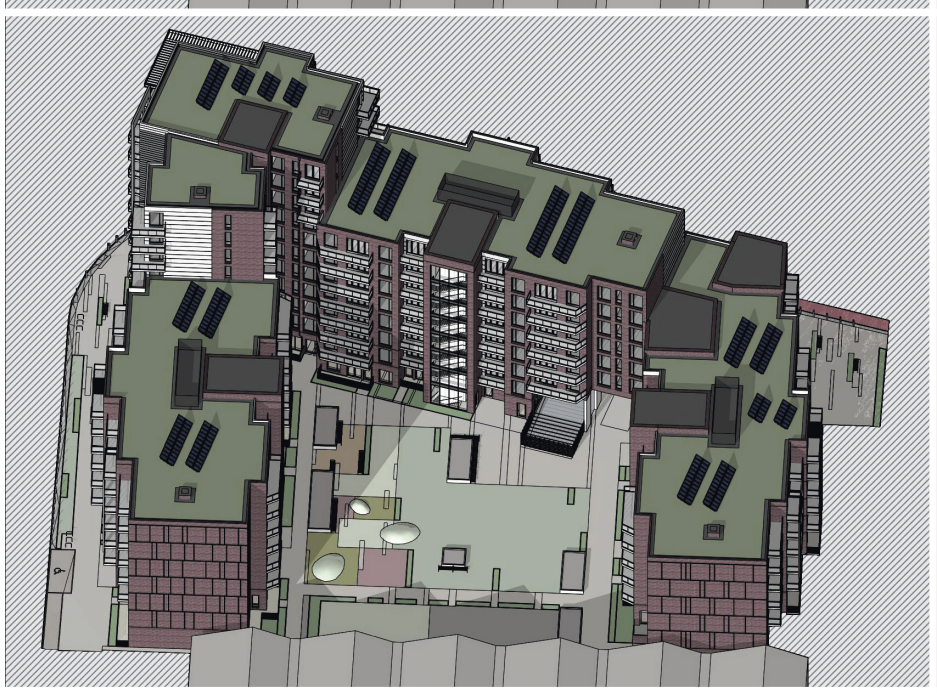

20:00

21:00

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June 21st
Sunrise 4:57 | Sunset 21:57

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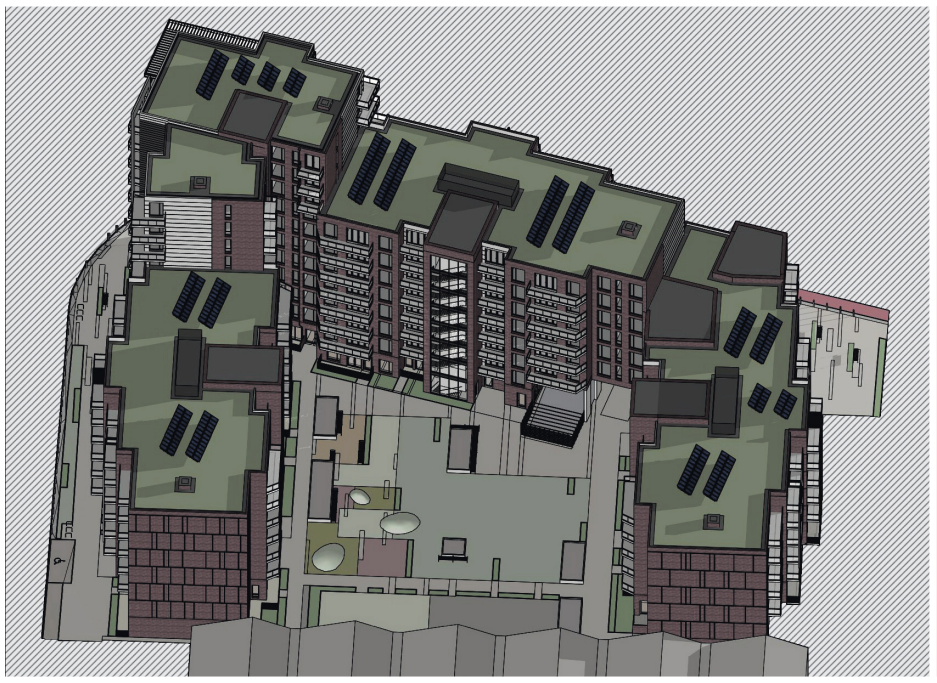
Shadow Study December 21st

N

09:00

10:00



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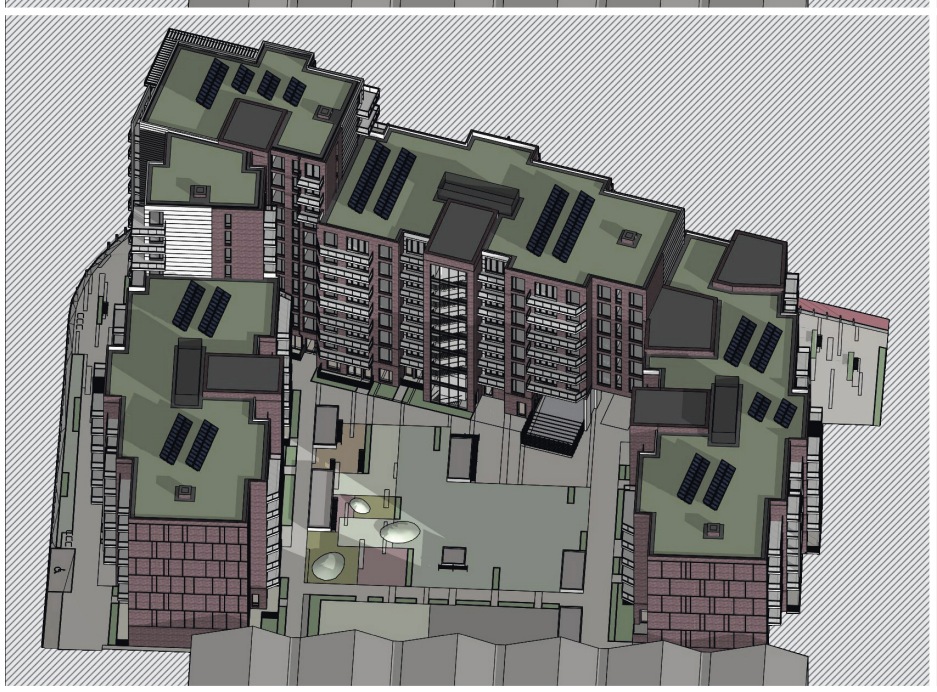

15:00

16:00

Project Title:
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December 21st
Sunrise 8:38 | Sunset 16:08

Shadow study by 3D DESIGN BUREAU

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Results

ADF - Average Daylight Factor

Selected ground floor apartments

Room Number	Room Description	Target ADF	ADF	Meets BRE Guidelines[#]
Ground Floor - South Block				
Apt. 0-01	Studio	2.0%	2.98%	Yes
Apt. 0-02	Living Space*	1.5%	2.48%	Yes
Apt. 0-02	Bedroom 1	1.0%	3.46%	Yes
Apt. 0-02	Bedroom 2	1.0%	1.85%	Yes
Apt. 0-05	Studio	2.0%	2.88%	Yes
Apt. 0-07	Living Space*	1.5%	2.26%	Yes
Apt. 0-07	Bedroom 1	1.0%	3.82%	Yes
Apt. 0-08	Living Space*	1.5%	3.50%	Yes
Apt. 0-08	Bedroom 1	1.0%	4.12%	Yes

[#]BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well day-lit space and 2% for a partly day-lit space. Below 2% the room will look dull and electric lighting is likely to be turned on.
In housing BS 8206-2 also gives minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

*Where kitchens are completely internal and have no expectation of daylight, the kitchen area has been omitted from the analysed area.
As the whole area being analysed is living space and not kitchen a target value of 1.5% has been applied.
In such instances it should be assumed that the ADF of the kitchens would be below their target value of 2%.

Floor plan indicating the rooms that have been analysed

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Results

ADF - Average Daylight Factor

Selected ground floor apartments

Room Number	Room Description	Target ADF	ADF	Meets BRE Guidelines#
Ground Floor - East Block				
Apt. 0-09	Studio	2.0%	3.14%	Yes
Apt. 0-11	Living Space*	1.5%	3.39%	Yes
Apt. 0-11	Bedroom 1	1.0%	3.35%	Yes
Apt. 0-13	Living Space*	1.5%	2.03%	Yes
Apt. 0-13	Bedroom 1	1.0%	1.92%	Yes
Apt. 0-13	Bedroom 2	1.0%	1.15%	Yes
Apt. 0-15	Living Space*	1.5%	1.59%	Yes
Apt. 0-15	Bedroom 1	1.0%	3.42%	Yes
Apt. 0-15	Bedroom 2	1.0%	3.75%	Yes

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Floor plan indicating the rooms that have been analysed

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Results

ADF - Average Daylight Factor

Selected ground floor apartments

Room Number	Room Description	Target ADF	ADF	Meets BRE Guidelines#
Ground Floor - North Block				
Apt. 0-17	Living Space*	1.5%	1.78%	Yes
Apt. 0-17	Bedroom 1	1.0%	3.49%	Yes
Apt. 0-17	Bedroom 2	1.0%	4.60%	Yes
Apt. 0-18	Living Space*	1.5%	2.55%	Yes
Apt. 0-18	Bedroom 1	1.0%	1.81%	Yes
Apt. 0-18	Bedroom 2	1.0%	1.46%	Yes
Apt. 0-20	Living Space*	1.5%	3.71%	Yes
Apt. 0-20	Bedroom 1	1.0%	3.55%	Yes
Apt. 0-23	Studio	2.0%	2.59%	Yes
Apt. 0-25	Living Space*	1.5%	3.21%	Yes
Apt. 0-25	Bedroom 1	1.0%	4.75%	Yes
Apt. 0-25	Bedroom 2	1.0%	3.84%	Yes

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Floor plan indicating the rooms that have been analysed

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Results

ADF - Average Daylight Factor

Selected 1st floor apartments

Room Number	Room Description	Target ADF	ADF	Meets BRE Guidelines#
1st Floor - South Block				
Apt. 1-01	Kitchen	2.0%	2.27%	Yes
Apt. 1-01	Living Space	1.5%	2.83%	Yes
Apt. 1-01	Bedroom 1	1.0%	5.35%	Yes
Apt. 1-01	Bedroom 2	1.0%	6.60%	Yes
Apt. 1-03	Living Space*	1.5%	1.56%	Yes
Apt. 1-03	Bedroom 1	1.0%	4.09%	Yes
Apt. 1-03	Bedroom 2	1.0%	2.31%	Yes
Apt. 1-04	Living Space*	1.5%	2.19%	Yes
Apt. 1-04	Bedroom 1	1.0%	5.24%	Yes
Apt. 1-05	Studio	2.0%	2.40%	Yes
Apt. 1-07	Living Space*	1.5%	1.56%	Yes
Apt. 1-07	Bedroom 1	1.0%	4.09%	Yes
Apt. 1-07	Bedroom 2	1.0%	2.36%	Yes
Apt. 1-10	LKD	2.0%	3.38%	Yes
Apt. 1-10	Bedroom 1	1.0%	7.34%	Yes
Apt. 1-11	Studio	2.0%	2.74%	Yes

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Floor plan indicating the rooms that have been analysed

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Results

ADF - Average Daylight Factor

Selected 1st floor apartments

Room Number	Room Description	Target ADF	ADF	Meets BRE Guidelines#
1st Floor - East Block				
Apt. 1-12	Studio	2.0%	2.58%	Yes
Apt. 1-13	Living Space*	1.5%	2.39%	Yes
Apt. 1-13	Bedroom 1	1.0%	5.41%	Yes
Apt. 1-15	Studio	2.0%	2.60%	Yes
Apt. 1-18	Living Space*	1.5%	1.71%	Yes
Apt. 1-18	Bedroom 1	1.0%	1.44%	Yes
Apt. 1-18	Bedroom 2	1.0%	1.61%	Yes
Apt. 1-19	Kitchen	2.0%	2.45%	Yes
Apt. 1-19	Living Space	1.5%	2.93%	Yes
Apt. 1-19	Bedroom 1	1.0%	1.83%	Yes
Apt. 1-19	Bedroom 2	1.0%	5.33%	Yes
Apt. 1-20	Studio	2.0%	2.91%	Yes
Apt. 1-21	Studio	2.0%	4.21%	Yes

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Floor plan indicating the rooms that have been analysed

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Results

ADF - Average Daylight Factor

Selected 1st floor apartments

Room Number	Room Description	Target ADF	ADF	Meets BRE Guidelines#
1st Floor - North Block				
Apt. 1-23	Kitchen	2.0%	2.60%	Yes
Apt. 1-23	Living Space	1.5%	3.17%	Yes
Apt. 1-23	Bedroom 1	1.0%	2.21%	Yes
Apt. 1-23	Bedroom 2	1.0%	6.44%	Yes
Apt. 1-24	Living Space*	1.5%	1.57%	Yes
Apt. 1-24	Bedroom 1	1.0%	1.52%	Yes
Apt. 1-24	Bedroom 2	1.0%	1.85%	Yes
Apt. 1-27	Studio	2.0%	2.75%	Yes
Apt. 1-29	Living Space*	1.5%	1.83%	Yes
Apt. 1-29	Bedroom 1	1.0%	4.59%	Yes
Apt. 1-29	Bedroom 2	1.0%	2.72%	Yes
Apt. 1-30	Living Space*	1.5%	2.03%	Yes
Apt. 1-30	Bedroom 1	1.0%	4.90%	Yes
Apt. 1-32	Kitchen	2.0%	2.74%	Yes
Apt. 1-32	Living Space	1.5%	3.29%	Yes
Apt. 1-32	Bedroom 1	1.0%	6.02%	Yes
Apt. 1-32	Bedroom 2	1.0%	6.19%	Yes

#BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well day-lit space and 2% for a partly day-lit space. Below 2% the room will look dull and electric lighting is likely to be turned on.
In housing BS 8206-2 also gives minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

*Where kitchens are completely internal and have no expectation of daylight, the kitchen area has been omitted from the analysed area.
As the whole area being analysed is living space and not kitchen a target value of 1.5% has been applied.
In such instances it should be assumed that the ADF of the kitchens would be below their target value of 2%.

Floor plan indicating the rooms that have been analysed

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Summary:

1.) Sunlighting in proposed outdoor amenity areas:
The BRE guidelines recommend that for a garden or amenity area to appear well sunlit throughout the year, at least half of it should receive at least two hours of sunlight on March 21st.

This study has assessed assess the level of sunlight that can be expected in the proposed courtyard at ground floor level of the proposed development.

The assessed space will receive a level of sunlight far in excess of the recommended levels as per the BRE guidelines, which indicates that the proposed courtyard will appear adequately sunlit throughout the year.

The results for the studies on sunlighting can be found in the above table.
A visual representation of these readings can be seen in the false colour plan on page 6 and in the hourly shadow diagrams for March 21st on pages 7 - 8.

2.) Average Daylight Factor (ADF).
BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well day lit space and 2% for a partly daylight space. Below 2% the room will look dull and electric lighting is likely to be turned on.
In terms of housing, BS 8206-2 also gives minimum values of ADF:
2% for Kitchens, 1.5% for living rooms and 1% for bedrooms.

This study has assessed assess the Average Daylight Factor (ADF) received in all habitable rooms in selected apartments across the ground floor and 1st floor apartments of the proposed development. The assessed spaces have been chosen with the aim to represent all apartment types. Where apartment types are repeated, although the actual ADF will differ due to differences in context, a similar ADF should be assumed. No assessment has been carried out on subsequent floors as the levels of daylight naturally increase as the floor level increases and the lowest floor is deemed to be the worst case scenario.

All analysed rooms have met their respective target values for ADF and should be adequately daylight once constructed.

For definition of spaces and target values applied, please see the methodology section of this report on page 5.

The results for the study on ADF can be seen on pages 12 - 17.

Conclusion

Should the proposed development be constructed as proposed the future occupants will enjoy excellent levels of sunlight in the courtyard whilst experiencing good levels of daylight in their respective apartments.

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