For DESIGN ENDEAVOURS Ltd.

DAYLIGHT SUNLIGHT

REPORT

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1. General Summary

1.1. Job Scope

This daylight & sunlight report has been prepared for Design Endeavour Ltd. for the proposed loft conversion and rear extension of 2-storey 2 nos. of flats at 70 West Drayton Road, Uxbridge, UB8 3LA. The objective of this report is to evaluate the daylight sunlight performance of the newly proposed dwellings, and any potential impact of the surrounding buildings on the proposed development.

1.2. Daylight-Sunlight Standards

To confirm the usefulness of this study, a detailed daylight sunlight assessment is carried out following the guidelines set out in

- the 3rd edition 2022 Building Research Establishment (BRE guide BR-209-2022), titled as: **'Site Layout Planning for Daylight and Sunlight – A good practice guide'** and

- British Standard 8206 – 2: 2008 – **'Lighting for Buildings – Part 2: Code of Practice for Daylighting'**.

A brief description of the standards and guidelines employed in this assessment can be found in Appendix A.

1.3. Daylight & Sunlight Assessment Report – A Summary

The architectural plans for the proposed development conform to the daylight & sunlight criteria set forth by the BRE guidelines. Consequently, there are no valid reasons to contest the proposed development concerning the well-being of daylight and sunlight.

1.4. Approach to BRE Guidelines

BRE guidelines offer important benchmarks for construction. However, flexible approach towards BRE guidelines before carrying out computational assessment allows for adaptability, innovation, and responsiveness to changing circumstances and objectives. BRE acknowledge this flexibility, and this approach makes the project handling more practical, sustainable, and community-oriented. Section 3.3 discuss in detail the mitigating factors considered in this study.

2. Introduction

2.1. Job Scope

We have carried out a detailed daylight sunlight assessment for the proposed work at **70 West**

Drayton Road, Uxbridge, UB8 3LA. The assessment is to evaluate the potential impact of the surrounding buildings on the "Right to Light" claim for the proposed design and vice versa.

The proposed development includes the loft conversion and rear extension of the existing single storey dwelling. The proposal will therefore convert the existing single dwelling into two flats spanning across the ground floor and the loft.

2.2. Site Location Plan

As notified in section 1.2, both BRE guidelines and British Standard 8206 – 2: 2008 are taken into consideration while preparing the daylight sunlight report for the proposed design.

The OS Map of the site location in **Figure 1** illustrates the layout of neighboring structures in relation to the proposed design.

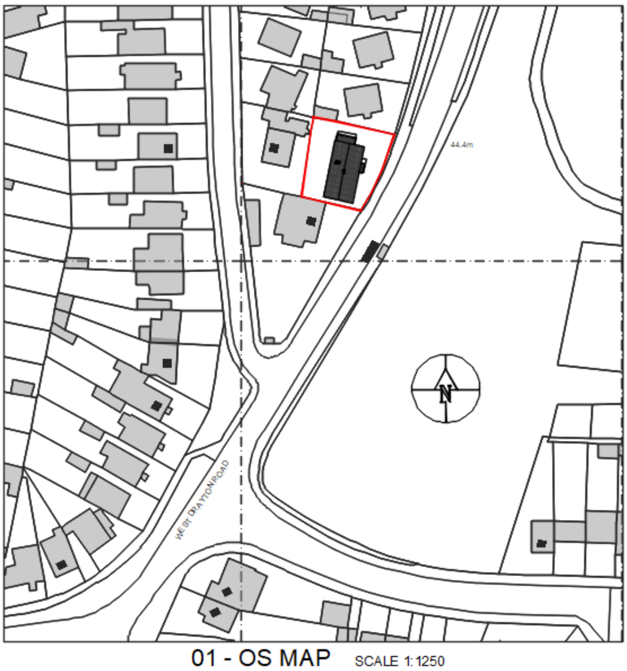

Figure 1. OS MAP of the site under consideration

Table 1 below shows the list of neighboring buildings under investigation that could potentially impact the daylight sunlight access of the proposed building.

It is important to highlight that not all of the surrounding structures need to undergo a comprehensive evaluation. The reasons for this selective assessment are further elaborated in section 3: Results and Considerations.

Table 1. List of nearby structures surrounding the proposed design.

S.No.	Designation	Building Type	Position
1	B1	Residential	North
2	B2	Residential	West
3	B3	Residential	North-West
4	B4	Residential	South-West
5	Main Building (Grey)	*Proposed Design*	-

2.3. Report Assessment Limitations

- Report assessment of the proposed building under daylight sunlight assessment is based on the attached proposed drawings.

- A detailed topographical survey is not required for existing surrounding buildings and ground heights because of its relatively plain topology. Thus, surrounding building locations and any heights are derived through site photographs, CAD drawings, oblique aerial photography, Google Earth, and general visual assessment.

- Developmental drawings and other relevant details required for the daylight sunlight assessment are provided with this report.

3. Assessing BRE Standards & Mitigation

3.1. Daylight Standards

- BRE guidelines recommend a target Vertical Sky Component (VSC) assessment value of 27%. However, in cases where VSC values of the proposed design are lower than 27%, the BRE permits a reduction of 20% from that obtained in the existing building.

These criteria should not be regarded as rigid due to the intricate nature of urban planning. A reduction in daylight distribution exceeding 20% may indeed be noticeable to the occupants, but it's important to note that "noticeable" does not necessarily translate to "significant" or "adverse." Instead, it underscores the need for thorough consideration within the broader context of the development.

In essence, these guidelines remain flexible because urban planning is influenced by a multitude of intricate factors. A decrease in daylight beyond 20% might be perceptible to individuals, but it does not automatically imply a substantial or negative impact. To make informed decisions in urban planning, we must assess the situation comprehensively, taking all relevant factors into account.

3.2. Sunlight Standards

- BRE guidelines recommend an Annual Probable Sunlight Hours (APSH) target value of 25% for living rooms. A 5% of this sunlight should be available during the winter months. However, in cases where APSH values fall below 25%, the BRE permits a reduction of 20% from that obtained in the existing building.

- This flexibility is approached after considering mitigating factors.

3.3. Mitigating Factors

In complex design studies, especially within densely populated areas, a multitude of factors can complicate adherence to the BRE guidelines. Hence, it becomes imperative to meticulously evaluate mitigating factors as an essential phase in the development process.

It's important to consider these mitigating factors alongside the quantitative data at hand. The aim is to adopt a balanced approach that takes into account the concerns and entitlements of neighboring parties while still permitting developers to make reasonable use of the land.

Thus, BRE guidelines emphasize flexibility for designers rather than strict constraints. They are meant to be used as tools to aid in the creation of thoughtful, context-aware designs. This approach encapsulates the essence of responsible and holistic urban planning, where the needs and concerns of both the community and developers are weighed fairly to create a harmonious and sustainable built environment.

Following are some mitigating factors considered in this study;

- **Mitigating Factor #1:** A key mitigating factor arises when nearby buildings are positioned very closely to the planned site boundary. This situation can significantly obstruct light for the intended design. In such instances, it could be difficult to prevent a reduction in daylight or sunlight. Consequently, the local authority may consider applying different target values.

- **Mitigating Factor #2:** In cases where sites are either undeveloped or require infill development, it's often challenging to avoid increased obstruction and more frequent non-compliance with guidelines. For instance, if there's a gap between terraced properties or an existing street with tall buildings, it's generally acceptable in planning to fill such gaps or reinstate previous structures, even if it affects neighboring buildings.

- **Mitigating Factor #3:** The BRE guidelines also acknowledge that when buildings align with the height and proportions of existing surrounding structures, a greater level of obstruction may be inevitable, resulting in more instances of non-compliance.

- **Mitigating Factor #4:** When considering daylight and sunlight assessments, kitchens and bedrooms typically receive less importance compared to primary spaces like living rooms.

- **Mitigating Factor #5:** The orientation and architectural design of the building itself can significantly impact how daylight is distributed within the interior spaces. For example, the north facing spaces are expected to receive less direct sunlight compared to other orientations.

- **Mitigating Factor #6:** The height of the proposed building is a pivotal factor that can greatly impact the availability of daylight for the proposed design.

The preliminary assessment shows that the east facing orientation and the adjacent building B4 can create significant degree of loss in the natural daylight access for the proposed development.

4. Results and Consideration

4.1. Daylight Assessment Report

The detailed results of the daylight tests conducted for the proposed building, in compliance with the BRE recommendations, are provided in Appendix B.

4.2. Assessment Steps & Criteria

To conduct a daylight assessment for the proposed design, we carefully evaluated the nearby structures to understand their potential impact on the new development and vice versa.

4.2.1. Proposed development effects on neighboring structures

- Since Sun traverse from East to West, buildings (B1, B2, and B3) within North to West, can have significant impact on their right to light access from the proposed new development. However, since there is no change in the height of the proposed development and that the neighboring buildings are at a significant distance from the proposed building, thus the effect arising would remain insignificant or unchanged for the inhabitant of Building B1.

- The preliminary analysis on a simulated model revealed that the shadow casted by the proposed development is not significant on Building B1. Other buildings are less affected because of their distance from the proposed structure.

4.2.2. Neighboring structures effect on the proposed development

- Among the surrounding structures, only Building B4, located to the southwest of the proposed development, has the potential to impact its daylight availability. The other structures—B1, B2, and B3—are of the same height and positioned on the northwestern side, resulting in negligible to no impact on the proposed design.

4.2.3. Building orientation impact on the proposed design

- The east-facing side of the proposed development will receive direct sunlight only during the early morning hours. As a result, rooms with openings on this side will have limited exposure to direct sunlight throughout the day. In contrast, west-facing rooms are expected to receive ample sunlight during the afternoon and evening. However, the extent of this sunlight will depend on the shadow cast by Building B4, which may partially obstruct light access depending on the position and height of the windows in context.

4.2.4. General assessments and criteria

- Our analysis revealed that buildings surrounding the proposed development are predominantly residential in nature.

- In our analysis, as depicted in **Figure 2**, we have selectively focused on specific set of structures that is expected to cast substantial shading on the proposed development. Other structures have not been taken into consideration as they are far off from the proposed development.

- When assessing the proposed building, our primary focus is on prioritizing the windows in the living rooms. We have compiled a comprehensive list of all the windows (or window elements) in question and have conducted a thorough evaluation. To provide a detailed assessment, we have further subdivided these windows, considering their positions on the walls, in order to gauge the net daylight impact effectively.

- As for the surrounding buildings, we've estimated their floor areas and heights through a combination of Google Maps data, images, and general on-site surveys. This topographical and building size assessment is observed to closely align with the actual values found at the site.

- Elements such as opaque glazing, soil pipes, stairwells, etc., typically indicate areas like toilets, bathrooms, or circulation spaces, which, as per the BRE guidelines, do not require assessment.

4.3. Proposed development General Site Assessment

The proposed development at **70 West Drayton Road, Uxbridge, UB8 3LA**, is located in the London Borough of Hillingdon, in the western part of London.

- The proposed development site is situated in a well-established urban area, characterized by mostly residential properties.

- It is conveniently located within walking distance of public transportation, including local bus stops and train stations.

CAD drawings are attached with it for more information and detailed planning layout of the proposed structure.

4.4. Assessment of Surrounding Buildings Under Observation

The assessment of daylight and sunlight in relation to the proposed design also considers the impact on neighboring buildings. A preliminary investigation focused on buildings particularly to the South and west of the site was conducted for this analysis. Other buildings are either far off or insignificant to be a part of this analysis. The findings indicate that the proposed development will have a minimal impact on the surrounding buildings. **Figure 2** illustrates the labeling and naming conventions for the proposed building and adjacent structures as used in the IESVE software interface.

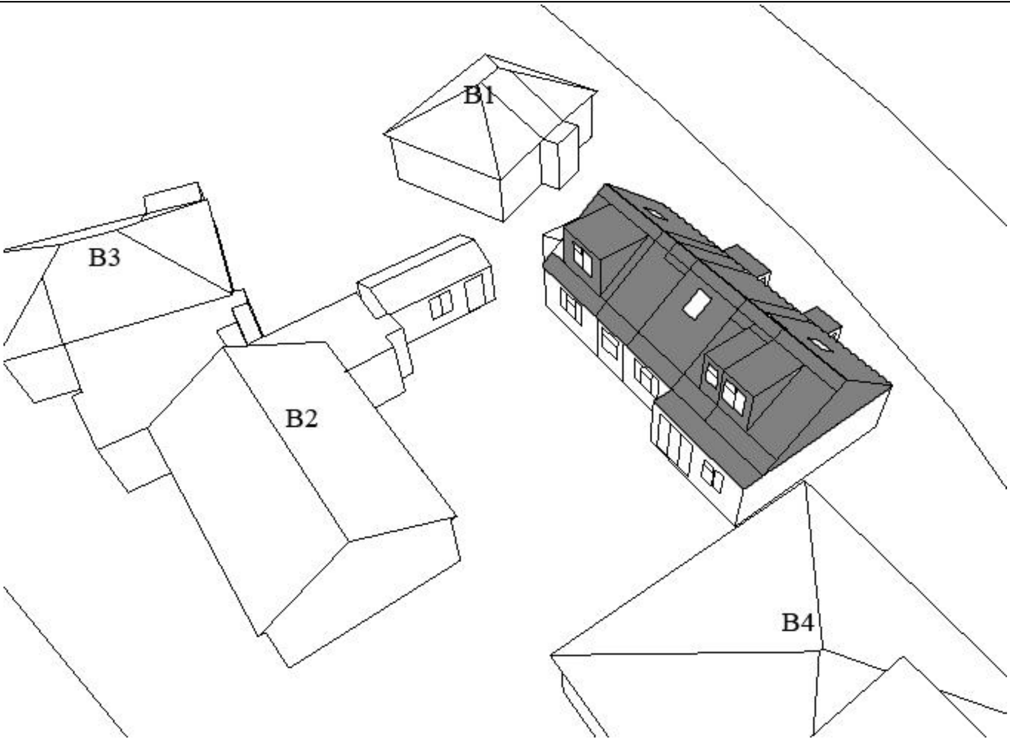

Figure 2. Nomenclature for the proposed building (colored) and its surrounding structure drawn on IESVE software.

4.4.1. Building B1

- From **Figure 1** and **Figure 2**, Structure B1 is located on the northern side of the proposed development. It has a similar height to the proposed development, and one of its windows, positioned to the left of the main door, is expected to be affected by the shadow cast by the proposed development. However, since the overall height of the building remains unchanged, the impact on this window will not significantly change from the existing even after the addition of a dormer.

- There will be no effect of building B1 on the proposed development because of its northward position.

4.4.2. Building B2 and B3

- Buildings B2 and B3 are of a similar height to the proposed development and include some single-storey garages. Due to the distance between these buildings and the proposed development, their impact on the building—or vice versa—will remain negligible, particularly concerning living rooms and bedrooms.

4.4.3. Building B4

- The impact of the proposed development on Building B4 will be negligible, as the proposed development is located to the north of B4. However, the impact of B4 on the proposed development could be significant due to its proximity and similar height. This study will primarily analyze the extent of that impact.

4.5. Daylight Sunlight Summary for the Proposed Design

Figure 3 and **Figure 4** illustrate the window positions in relation to the building elevations and the naming conventions used in this report for all window elements.

Figure 3. Naming conventions of the window elements on the a) front b) rear and c), d) side elevations.

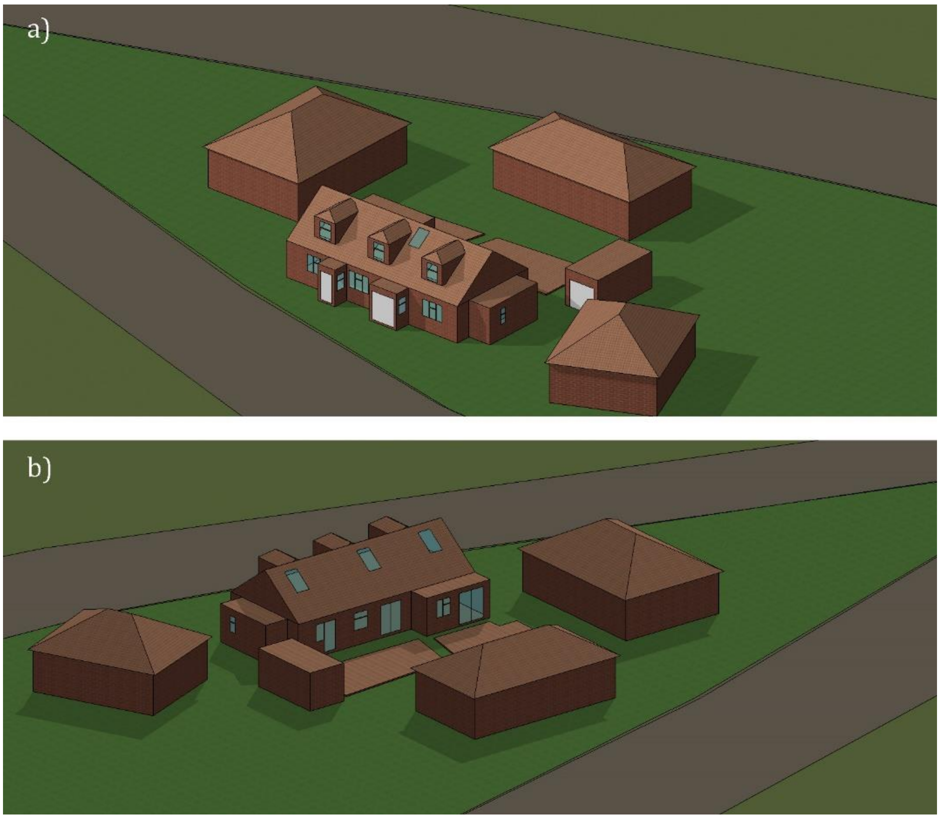

Figure 4. Proposed IESVE model.

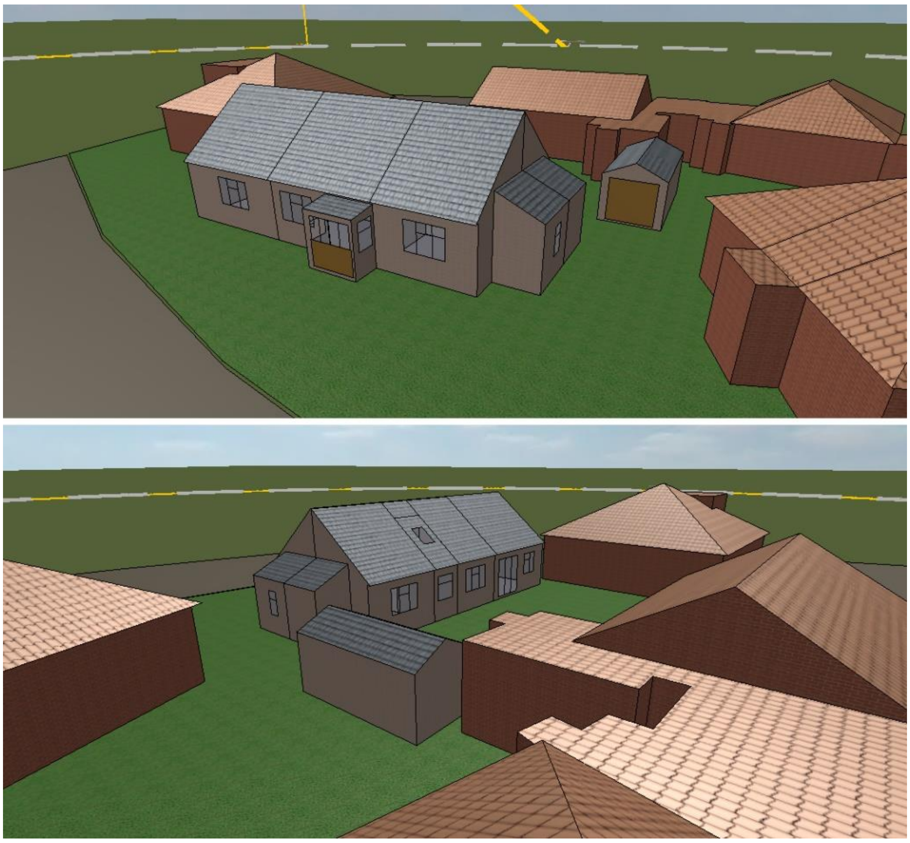

Figure 5. Existing IESVE model.

A detail analysis of all daylight sunlight components is discussed below:

4.5.1. Vertical Sky Component (Daylight):

Almost all the window elements in the proposed development representing bedrooms and/or living/kitchen comply with the BRE guidelines, achieving at least 27% and/or 0.8 times their previous VSC values or above, as shown in **Figure 6**.

For a living/kitchen, window elements attached to the entrance door matches the minimum criteria of 18% and/or 0.6 times their previous VSC values. Their values were still close to 27%. A slight reduction in VSC values in these windows is ascribed to the window orientation and position. As observed, all other prominent window elements representing living/kitchen room or bedrooms successfully achieved 27% VSC values.

The window representing the neighboring building also successfully achieves at least 27% VSC or 0.8 times its original value. **Table 2** in **Appendix B** shows the obtained results for the VSC assessment.

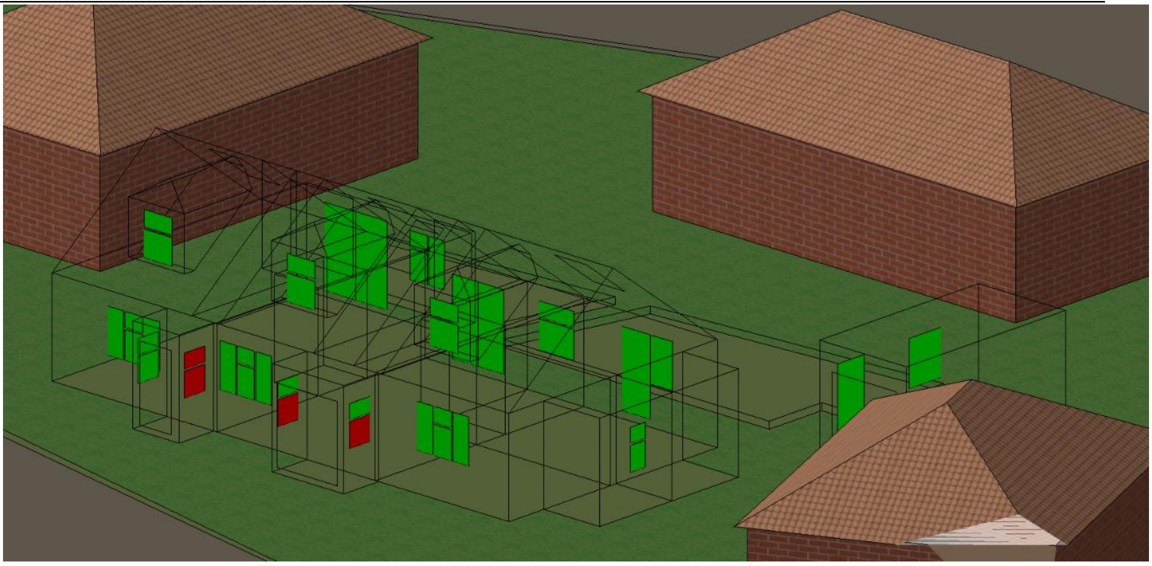

Figure 6. VSC assessment of all window elements.

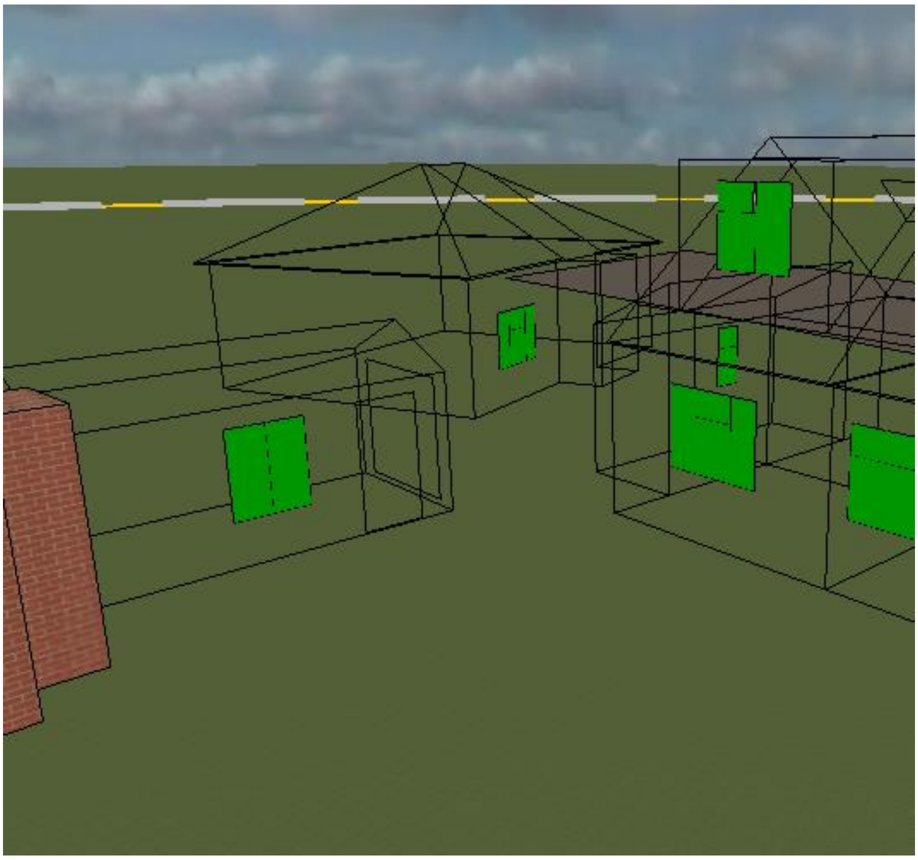

Figure 7 VSC neighbor window

4.5.2. Direct Sunlight Hours (Sunlight):

The proposed development faces east, meaning direct sunlight on March 21st is naturally limited to the early morning hours. When assessing the requirement of at least 2 hours of direct sunlight for Living/Kitchen windows and 1 hour for Bedrooms, **Figure 9** demonstrates that nearly all rooms meet the necessary criteria.

At the entrance porch, some window elements fall short of achieving 2 hours of direct sunlight, primarily due to their north-facing orientation, which inherently limits light exposure on this date.

Additionally, a window on the western side, near Building B4, receives less than 2 hours of direct sunlight. Given the proximity of B4 to the proposed development, its ability to receive direct sunlight is significantly restricted. However, this limitation already existed in the current structure, where the same window also failed to meet the 2-hour requirement.

In addition to the above, the impact on neighboring buildings remains negligible, as their windows continue to receive more than 2 hours of direct sunlight, **Figure 8**. **Figure 10** shows the DSH values of the existing structure. **Figure 11** shows the DSH of the rear garden of the proposed development.

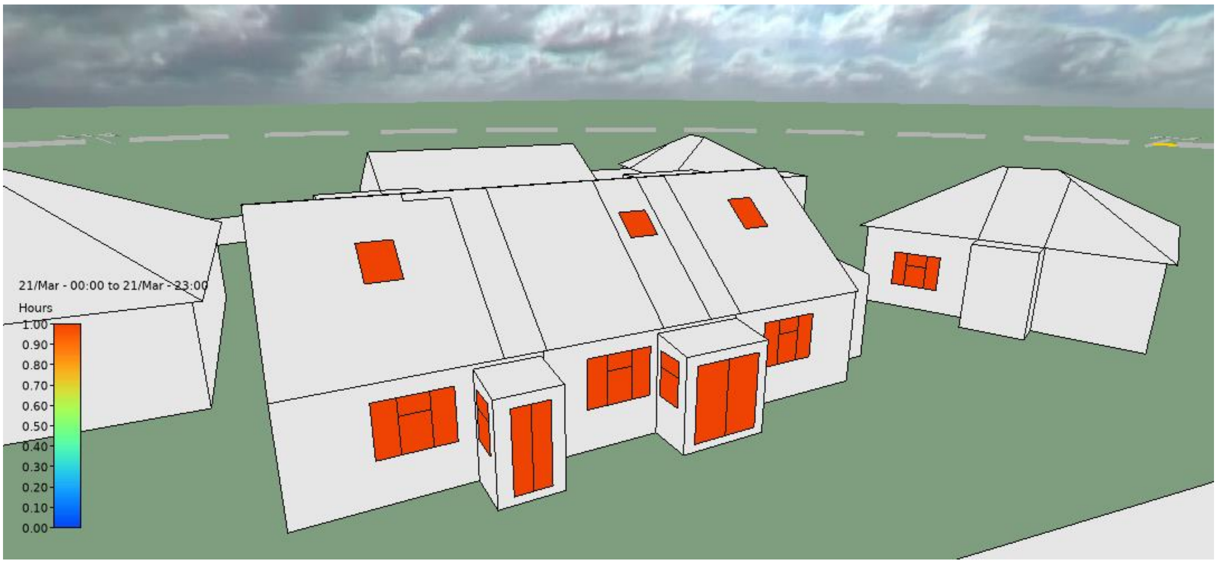

Figure 8 Direct Sunlight Hours on the neighboring window

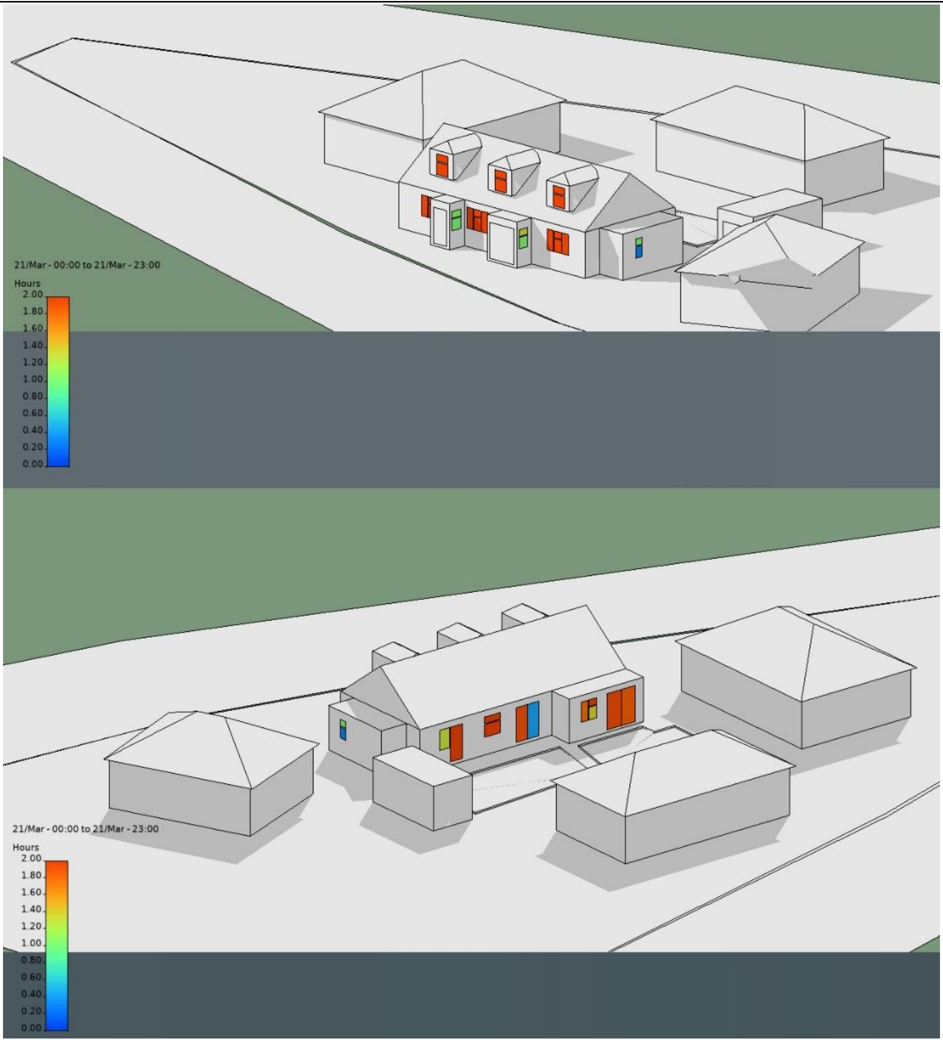

Figure 9. Direct Sunlight Hours analysis of window elements of proposed development on 21st March.

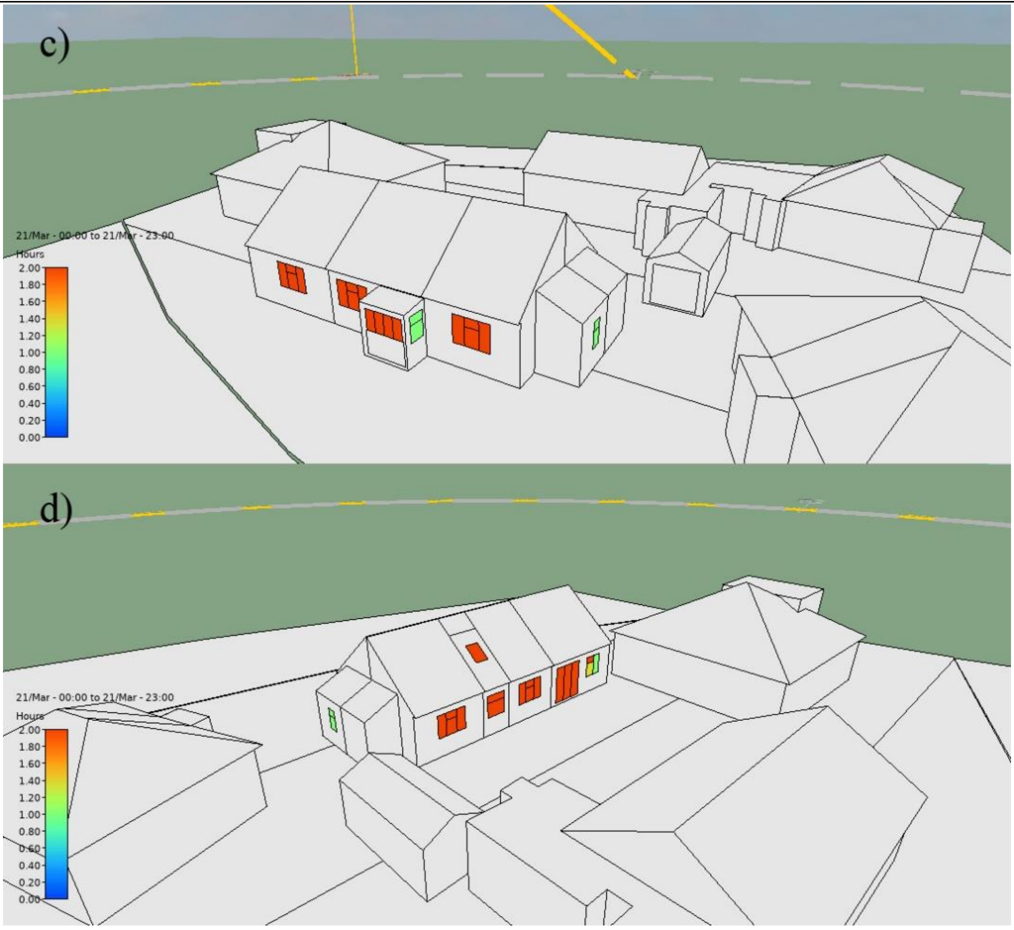

Figure 10. Direct Sunlight Hours analysis of window elements of existing structure on 21st March.

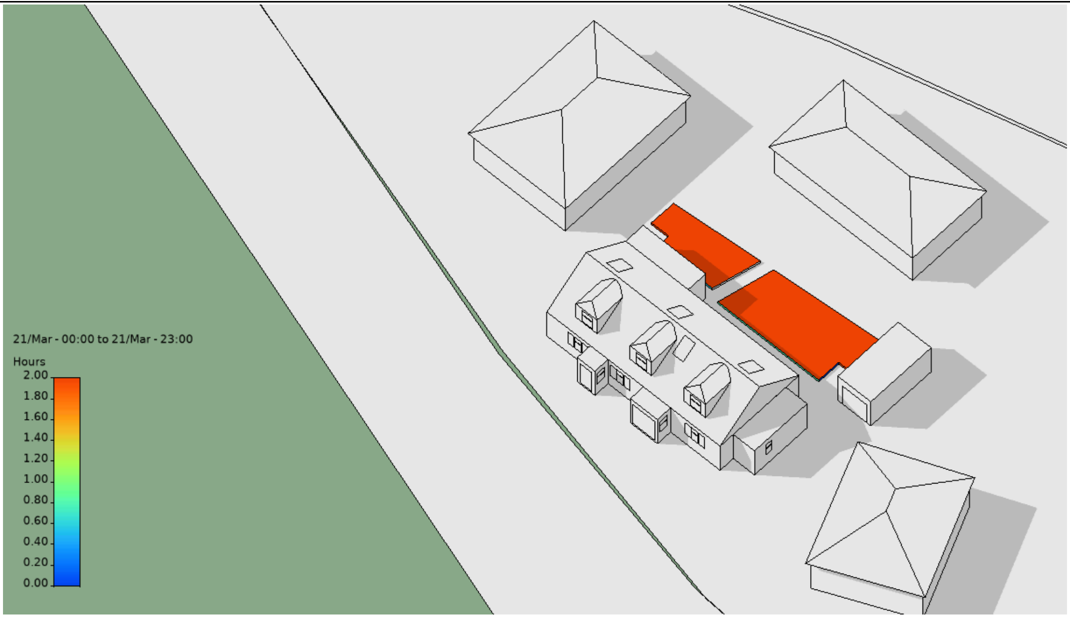

Figure 11. Direct Sunlight Hours analysis of the rear garden on 21st March.

4.5.3. Annual Probable Sunlight Hours (APSH) (Sunlight):

APSH is the total number of hours each year when sunlight is expected to shine on the center of each window, considering the usual cloudiness for the area.

This test is commonly employed to evaluate facades that face within 90 degrees of due south. The BRE Handbook mentions:

"…a south facing window will, in general, receive most sunlight, while a north facing one will receive it only on a handful of occasions. East and west facing windows will receive sunlight only at certain times of day".

For existing residential buildings, the BRE Handbook suggests that:

"all main living rooms of dwellings… should be checked if they have a window facing within 90° of due south. Kitchens and bedrooms are less important, although care should be taken not to block too much sun".

Time Range: Summertime – 21st March-to-21st September:

The proposed structure follows an east-west orientation, with its east-facing windows receiving direct sunlight in the early morning hours. As the sun moves higher and shifts westward, these windows no longer receive direct sunlight, leading to a drop in APSH values. These values meet only the minimum 18% or less and/or 0.6 times the required amount per BRE standards. However, this drop is negligible compared to the existing structure, where all window elements displayed a similar APSH values. On comparing the result, the drop in APSH in the proposed development was found lower than 0.8times of the existing case. Since there was no change in the reception, APSH consistently maintain the same level of sunlight exposure as the existing conditions. Compared to the existing Living/Kitchen/Dining (LKD), a small modification for LKD of flat 2 results in an improved sunlight exposure.

Similarly, the west-facing windows exhibit the same trend but still successfully meet the minimum APSH requirement of 18%. The west-facing windows primarily receive sunlight from the late afternoon to evening, which results in limited direct sunlight exposure and consequently lower APSH values. However, this reduction remains negligible compared to the existing scenario, where all window elements displayed a similar APSH results. Consequently, the drop in APSH is below 0.8 times the values observed in the existing case.

In contrast, neighboring windows consistently achieve APSH values ranging from 18% to 25%, meeting BRE standards. Compared to the existing scenario without dormer windows, the reduction in APSH for neighboring window elements remains above 0.8 times the previous values, indicating no significant perceived change in daylight levels.

Time Range: Wintertime – 21st September-to-21st March:

During winter, the sun follows a lower trajectory in the sky, moving from southeast to southwest. As a result, both east-facing and west-facing windows receive less direct sunlight than in summer, leading to lower APSH values overall. East-facing windows will receive direct sunlight for a brief period in the early morning, but as the sun moves higher, shading from nearby structures and the lower sun angle limit further exposure.

West-facing windows will experience direct sunlight in the late afternoon, but Building B4's proximity casts extended shadows, reducing the APSH values in some cases. However, the APSH values for majority of window elements meet the minimum of 5% of APSH values or remain within 0.8times of the former values. Even in cases where changes are slightly lower than 1.00, the difference is minor and does not significantly impact the overall quality of winter sunlight exposure.

Rooms categorized under Neighbor exhibit a similar change such that the drop in APSH remains within the 0.8 times of the former values.

Nevertheless, these changes are minor and do not compromise the overall adequacy of natural light during winter. The improvements observed in most areas, particularly in the reception and living/kitchen/dining rooms, demonstrate that the proposed development effectively maintains or improves sunlight availability, even during the colder months.

4.5.4. Daylight Factor (DF)

According to the BRE guidelines, the DF is defined as the ratio of the total daylight flux reaching the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane under unobstructed CIE standard overcast sky conditions. For housing, BS 8206-2 provides minimum DF values of 2% for kitchens, 1.5% for living rooms, and 1% for bedrooms.

The daylight factor results for the living and kitchen areas of the proposed house exceed the minimum requirement of 1.5%. Additionally, the DF for bedrooms for both flats exceed the minimum of 1%. These results indicate that the selected rooms comply with the BRE guidelines for daylight factor assessment. **Table 4** in **Appendix B** shows the obtained results for the daylight factor assessment.

5. Conclusion

Assessing daylight and sunlight access for the proposed design at the site requires a detailed interpretation of BRE guidelines, considering various mitigating factors. The goal is to evaluate the daylight performance of the proposed development. Because of the building east-west orientation, restricted daylight access can be perceived particularly during the winter. Despite these limitations and constraints, the proposed development meets or exceed the minimum criteria required as per BRE standards. The analysis reveals that the new design does not significantly affect the daylight and sunlight access of neighboring windows, nor do nearby buildings substantially diminish the access for the proposed design.

In summary, the proposed development fully adheres to BRE guidelines regarding daylight, sunlight, and overshadowing. Consequently, there are no significant grounds to challenge the development based on its compliance with established daylight and sunlight standards.

Appendix A

The 3rd edition 2022 Building Research Establishment (BRE) Report BR-209-2022 titled "**Site Layout Planning for Daylight and Sunlight – a good practice guide**", commonly referred to as the BRE Guidelines, serves as a fundamental resource for building designers and urban planners. These guidelines offer comprehensive advice and recommendations for achieving optimal daylight and sunlight conditions in the context of site layout planning. Here are some key points to expand upon the significance and scope of these guidelines:

- The BRE Guidelines prioritize the well-being and amenity of residents, not only for the proposed development but also for people in open spaces and surrounding buildings.

- BRE Guidelines opts for an optimal balance between new developments and the existing environment. This makes the BRE guidelines an essential part of the legal and planning framework for construction projects in many jurisdictions.

- BRE Guidelines provide methodologies for conducting daylight and sunlight assessments. These assessments involve calculations and simulations to evaluate how proposed buildings will affect natural light levels, both within and outside the development site.

- Maximizing natural light reduces the need for artificial lighting and heating, contributing to energy efficiency and reducing environmental impact.

Within the BRE Guidelines, a set of evaluations and numerical criteria have been formulated to assess proposed developments to determine if they conform to the required standards for ensuring adequate levels of daylight and sunlight comfort. Here are some of the key details provided:

- **Daylight:** This centers on examining the presence and dispersion of natural sunlight within and in the vicinity of the proposed design. Elements such as the daylight factor (which measures the intensity of natural light) and the annual sunlight exposure are employed for daylight assessment.

- **Sunlight:** This concerns on how sunlight reaches various areas within and around a development. These evaluations consider aspects such as the duration of direct sunlight exposure, shading caused by nearby structures, and the potential effects on outdoor areas.

- **3D Computer Modeling:** The BRE Guidelines often recommend the use of 3D computer modeling and simulation software to visualize and analyze the impact of proposed buildings on daylight and sunlight conditions.

- **Mitigation Measures:** In cases where a proposed development falls short of the recommended daylight and sunlight levels, the BRE Guidelines also offer guidance on potential mitigation measures, such as adjusting building orientation or redesigning building elements.

In suburban development sites with lower population density, the BRE Guidelines are typically more suitable, allowing for more flexibility in site layout planning. Conversely, in densely populated urban areas, development sites often face more constraints, often due to neighboring buildings and other factors. Therefore, in dense urban environments, the guidelines should be applied with a degree of adaptability. The BRE Guidelines explicitly acknowledge this aspect in their guide book.

a) Daylight Assessment

The guidelines for evaluating daylight conditions in nearby existing buildings can be found in the pages 4 to 8 of the BRE Guidelines.

Typically, assessments for daylight should focus on habitable rooms within residential structures and the primary rooms within non-residential buildings like schools, hospitals, and offices, where occupants reasonably anticipate sufficient daylight. The primary methods employed to evaluate daylight for surrounding existing buildings are detailed below, along with an additional daylight assessment typically utilized when planning new residential structures.

The 25° section line test serves as a straightforward rule of thumb for assessing whether an existing building can continue to receive sufficient daylight in the presence of a proposed development. It helps quickly gauge if the new construction might negatively impact the daylight conditions of the surrounding structures or vice versa.

This assessment method is most effective in low-density suburban settings, where new developments are spaced apart, relatively short in height, and follow a uniform pattern. In contrast, it may not be suitable for densely populated urban areas, where tall, closely spaced buildings already block more than 25 degrees of the view from existing windows. In such urban scenarios, it's often necessary to conduct more detailed assessments from the beginning because the 25-degree assessment doesn't apply as effectively.

b) The Vertical Sky Component (VSC) Assessment

The Vertical Sky Component (VSC) assessment measures how much natural daylight directly enters a specific window. To evaluate this, the central point of the window, aligned with the outer wall, serves as the reference point. The VSC assessment is crucial for understanding the direct daylight a window can capture. It provides valuable information for optimizing natural lighting within a building, aiding in energy efficiency and occupants' well-being. Although the VSC test is helpful in predicting how a nearby development might affect things, it only looks at the light on one spot. This means it doesn't take into account the window's size or other windows that also brighten up the same room.

A VSC, or Visible Sky Coverage, is represented as a percentage. It signifies the proportion of illuminance received from a Standard Overcast Sky (CIE Sky) on a vertical surface (like a window) in comparison to the illuminance received on a horizontal surface under an unobstructed hemisphere of the same Standard Overcast Sky. In simpler terms, the Visible Sky Coverage (VSC) can be understood as the percentage of direct sky visibility that a window gets, regardless of any obstructions, compared to the direct sky exposure that an unobstructed horizontal roof-light would receive.

The highest amount of direct skylight that a vertical window can receive from a Standard Overcast Sky is 39.62%, which is commonly rounded up to 40%. According to the BRE (Building Research Establishment), when a VSC value of 27% is attained, it signifies that an adequate amount of skylight or direct daylight can reach the window of an existing building. This value is roughly comparable to a uniform obstruction of 25 degrees, as mentioned in the previous assessment.

In general, for new developments in low-density areas, it is advisable for the VSC component to exceed 27%, assuming no mitigating factors are applicable. This ensures that an adequate amount of direct daylight can reach the windows of the new building. However, when such a site is situated in a densely populated area and the VSC assessment of the existing structure on the site was already below 27%, the BRE guidelines specify that the new development on the existing site should only cause a maximum reduction of 20% in VSC. This limitation is in place to ensure that the change in VSC is not significant enough to be noticeable or disruptive to the occupants of the building.

In summary, while the 27% guideline is a general target, it can be adjusted based on the specific context of the development site, especially in densely populated areas, to minimize the impact on existing structures and their occupants.

c) Direct Sunlight Hours

BS EN 17037 is a European standard that provides guidelines for daylight in buildings. Published in 2018, titled as "Daylight in Buildings", this standard aims to establish requirements and recommendations for daylight in buildings. It also ensures the well-being and visual comfort of occupants while promoting energy efficiency.

- Daylight Availability: Amount of daylight available in different spaces within a building.

- Daylight Distribution: This provides guidelines on the distribution of daylight within a building.

The BRE guidance provides recommendations for preserving sunlight in outdoor spaces, both existing and planned. This advice applies to areas like back gardens, parks, playing fields, playgrounds, waterways, and public spaces. However, it excludes the need for assessment in the case of small front gardens and parking areas.

The permanent overshadowing assessment is carried out on March 21st, the spring equinox. This assessment identifies parts of an amenity area where no sunlight will be present during the winter months. However, it's important to note that these areas might still receive some sunlight during the summer.

As per BRE guidelines, a garden or amenity area remains well-lit throughout the year. It is thus advisable for at least half of that area to get a minimum of 2 hours of sunlight on March 21st. If, due to new development, an existing garden or amenity area doesn't meet these criteria, and the portion receiving 2 hours of sunlight on March 21st is less than 80% of what it used to be (a 20% reduction), then people are likely to notice the loss of sunlight in that area.

So, if an open outdoor space, whether existing or proposed, is shaded for over 2 hours, accounting for more than 50% of its area, and this shading is increased by over 20% due to new development, then people are likely to notice the reduction in sunlight.

d) Annual Probable Sunlight Hours (APSH) Assessment

Natural sunlight holds significant value in both residential and commercial structures. It is not only prized for its capacity to provide warmth and create a cheerful ambiance within a room but also for its potential to bestow therapeutic benefits upon occupants, fostering a sense of well-being.

In residential properties, the foremost consideration for sunlight centers on the living room and conservatories. It becomes imperative to evaluate these spaces, particularly when they feature a primary window facing within a 90-degree angle of due south. Conversely, while the significance of sunlight in areas like kitchens and bedrooms is somewhat reduced, it remains imperative to exercise caution and avoid excessive obstruction.

Within commercial or non-residential buildings, the necessity for sunlight varies according to the building's intended use. In accordance with recommendations from the Building Research Establishment (BRE), any space within a commercial establishment possessing a specific or distinctive demand for sunlight should be subjected to comprehensive evaluation.

The assessment of APSH (Annual Probable Sunlight Hours) is conducted for the primary window openings of both residential and commercial structures, specifically when these windows are oriented within a 90-degree range of true south. "Probable Sunlight Hours" can be described as the cumulative count of hours throughout the year during which sunlight is anticipated to illuminate unobstructed ground surfaces, accounting for typical cloud cover conditions.

BRE guidelines state that if a living room in an existing house has a main window facing mostly south, and if a new building nearby casts a shadow that's more than 25 degrees below the window, it can reduce the sunlight coming into the living room. This happens if, over a year, the window's center gets less than one-fourth (25%) of the yearly sunlight hours, including at least 5% between September and March. Moreover, if sunlight hours during those months drop below 80% of what they were before, then the residents of the new development can feel the change.

As a result of a new development, the amount of sunlight reaching an existing building may decrease by up to 20% during either the whole year or the winter months before people start to notice the difference.

e) Daylight Factor (DF)

The Daylight Factor (DF) is a metric used in architecture and building design to evaluate the amount of natural daylight that penetrates into the interior of a building. It is typically expressed as a percentage and represents the ratio of the illuminance (light level) inside a space to the illuminance outside the building on an overcast day.

The DF provides a way to assess the quality of daylighting in a building. A higher DF percentage indicates better natural daylighting conditions, which can lead to reduced reliance on artificial lighting during the day, energy savings, and improved occupant comfort and well-being.

Appendix B

Table 2. VSC assessment report of all window element on the proposed design. GF – Ground Floor, FF – First Floor.

Opening	Zone	Name	VSC New	VSC Existing	Change%	Result
1	GF00000A	Store Garage	30.41	31.37	3.06	Meet
2	GF00000A	Store Garage	30.65	32.06	4.40	Meet
3	GF000006	Store Garage	34.51	34.81	0.86	Meet
4	GF000006	Store Garage	35.43	36.08	1.80	Meet
5	GF000007	Bathroom1F1	36.98	36.89	0.24	Meet
6	GF000007	Bathroom1F1	39.2	39.25	0.13	Meet
7	GF000007	ReceptionF1	39.01	39.21	0.51	Meet
8	GF000007	ReceptionF1	38.19	38.33	0.37	Meet
9	GF000000	ReceptionF1	32.41	39.69	18.34	Meet
10	GF000000	ReceptionF1	36.75	39.67	7.36	Meet
11	GF000000	LKDF2	38.24	39.72	3.73	Meet
12	GF000000	LKDF2	38.56	39.68	2.82	Meet
13	GF000000	LKDF2	33.58	33.5	0.24	Meet
14	GF000000	LKDF2	34.98	34.82	0.46	Meet
15	GF000000	LKDF2	33.4	33.53	0.39	Meet
16	GF000000	LKDF2	34.31	34.34	0.09	Meet
17	GF000000	LKDF2	34.17	34.4	0.67	Meet
18	GF000000	LKDF2	33.88	34.04	0.47	Meet
19	GF000000	LKDF2	28.42			Meet
20	GF000000	LKDF2	25.84			Meet
21	GF000000	LKDF2	27.38			Meet
22	GF000000	LKDF2	23.32			Meet
23	GF000000	LKDF2	39.8			Meet
24	GF000000	LKDF2	39.79			Meet
25	GF000004	LKDF1	34.04	34.82	2.24	Meet
26	GF000004	LKDF1	35.49	36.08	1.64	Meet
27	GF000004	LKDF1	35.05	35.29	0.68	Meet
28	GF000004	LKDF1	32.92	35.24	6.58	Meet
29	GF000004	LKDF1	34.5	35.6	3.09	Meet
30	GF000004	LKDF1	37.04	38.01	2.55	Meet
31	GF000004	LKDF1	29.64	29.83	0.64	Meet
32	GF000004	LKDF1	36	38.24	5.86	Meet
33	GF000004	LKDF1	27.46	29.37	6.50	Meet
34	GF000004	LKDF1	23.78	25.81	7.87	Meet
35	GF000004	LKDF1	39.64	39.9	0.65	Meet
36	GF000004	LKDF1	39.64	39.9	0.65	Meet
37	GF000004	LKDF1	27.94	29.8	6.24	Meet
38	GF000004	LKDF1	24.8	26.57	6.66	Meet

39	GF000003	Bed1F1	35.68	35.91	0.64	Meet
40	GF000003	Bed1F1	34.19	34.19	0.00	Meet
41	GF000003	Bed1F1	34.93	34.79	0.40	Meet
42	GF000003	Bed1F1	34.4	34.8	1.15	Meet
43	GF000013	Bathroom2F1	35.17	35.16	0.03	Meet
44	GF000013	Bathroom2F1	33.77	33.53	0.72	Meet
45	GF000009	Bed1F2	39.15			Meet
46	GF000009	Bed1F2	38.5			Meet
47	GF000009	Bed1F2	38.6			Meet
48	GF000005	Bed2F1	39.44			Meet
49	GF000005	Bed2F1	38.85			Meet
50	GF000005	Bed2F1	39.03			Meet
51	GF00000E	Bathroom3F1	38.72			Meet
52	GF00000E	Bathroom3F1	39.23			Meet
53	GF000002	Neighbor	31.03			Meet
54	GF000002	Neighbor	32.41			Meet
55	GF000002	Neighbor	32.5			Meet
56	GF000002	Neighbor	32.81			Meet

Table 3. APSH results of all window elements of the proposed structure.

Opening	Zone	Room Name	Annual New	Annual Existing	Changes	Result	Winter New	Winter Existing	Changes	Result
1	GF00000A	Store Garage	29.68	29.68	0.00	Meet	2.08	2.08	0.00	Meet
2	GF00000A	Store Garage	31.38	31.38	0.00	Meet	2.08	2.08	0.00	Meet
3 Door	GF00000A	Store Garage	-	-	-	-	-	-	-	-
4 Door	GF00000A	Store Garage	-	-	-	-	-	-	-	-
5	GF000006	Bathroom1F1	19.78	20.4	3.04	Meet	1.39	1.39	0.00	Meet
6	GF000006	Bathroom1F1	17.54	20.83	15.79	Meet	1.39	1.39	0.00	Meet
7	GF000007	ReceptionF1	20.87	21.19	1.51	Meet	1.16	1.16	0.00	Meet
8	GF000007	ReceptionF1	21.21	21.53	1.49	Meet	1.39	1.39	0.00	Meet
9	GF000007	ReceptionF1	20.54	21.53	4.60	Meet	1.39	1.39	0.00	Meet
10	GF000007	ReceptionF1	21.51	21.51	0.00	Meet	1.37	1.37	0.00	Meet
11	GF000000	LKDF2	20.36	21.53	5.43	Meet	1.39	1.39	0.00	Meet
12	GF000000	LKDF2	21.36	21.53	0.79	Meet	1.39	1.39	0.00	Meet
13	GF000000	LKDF2	20.39	21.53	5.29	Meet	1.39	1.39	0.00	Meet
14	GF000000	LKDF2	21.21	21.53	1.49	Meet	1.39	1.39	0.00	Meet
15	GF000000	LKDF2	22	22.02	0.09	Meet	0.48	0.5	4.00	Meet
16	GF000000	LKDF2	22.24	22.6	1.59	Meet	0.94	1.07	12.15	Meet
17	GF000000	LKDF2	22.15	22.16	0.05	Meet	0.63	0.63	0.00	Meet

18	GF000 000	LKDF2	21.19	21.22	0.14	Meet	1.05	1.08	2.78	Meet
19	GF000 000	LKDF2	21.09	21.15	0.28	Meet	0.95	1.01	5.94	Meet
20	GF000 000	LKDF2	21.11	21.08	0.14	Meet	0.81	0.89	8.99	Meet
21	GF000 000	LKDF2	23.01	-	-	Minor	1.96	-	-	Major
22	GF000 000	LKDF2	20.24	-	-	Minor	1.54	-	-	Major
23	GF000 000	LKDF2	5.56	-	-	Major	0	-	-	Major
24	GF000 000	LKDF2	5.56	-	-	Major	0	-	-	Major
25	GF000 000	LKDF2	21.53	-	-	Minor	1.39	-	-	Major
26	GF000 000	LKDF2	21.53	-	-	Minor	1.39	-	-	Major
27	GF000 004	LKDF1	18.92	20.78	8.95	Meet	1.21	1.39	12.95	Meet
28	GF000 004	LKDF1	17.92	21.36	16.10	Meet	1.27	1.39	8.63	Meet
29	GF000 004	LKDF1	18.58	20.54	9.54	Meet	1.22	1.39	12.23	Meet
30	GF000 004	LKDF1	17.27	21.23	18.65	Meet	1.31	1.39	5.76	Meet
31	GF000 004	LKDF1	21.2	21.21	0.05	Meet	1.38	1.39	0.72	Meet
32	GF000 004	LKDF1	20.19	21.18	4.67	Meet	1.39	1.39	0.00	Meet
33	GF000 004	LKDF1	19.84	20.16	1.59	Meet	1.39	1.39	0.00	Meet
34	GF000 004	LKDF1	21.03	21.53	2.32	Meet	1.24	1.39	10.79	Meet
35	GF000 004	LKDF1	23.01	24.07	4.40	Meet	1.96	2.14	8.41	Meet
36	GF000 004	LKDF1	20.24	21.23	4.66	Meet	1.54	1.64	6.10	Meet
37	GF000 004	LKDF1	21.53	21.53	0.00	Meet	1.39	1.39	0.00	Meet
38	GF000 004	LKDF1	21.53	21.53	0.00	Meet	1.39	1.39	0.00	Meet
39	GF000 004	LKDF1	5.56	5.56	0.00	Meet	0	0	0.00	Meet
40	GF000 004	LKDF1	5.56	5.56	0.00	Meet	0	0	0.00	Meet
41	GF000 003	Bed1F1	17.52	20.83	15.89	Meet	1.39	1.39	0.00	Meet
42	GF000 003	Bed1F1	19.78	20.4	3.04	Meet	1.39	1.39	0.00	Meet
43	GF000 003	Bed1F1	19.06	20.54	7.21	Meet	1.39	1.39	0.00	Meet
44	GF000 003	Bed1F1	19.06	20.54	7.21	Meet	1.39	1.39	0.00	Meet
45	GF000 013	Bathroo m2F1	6.45	6.45	0.00	Meet	0	0	0.00	Meet
46	GF000 013	Bathroo m2F1	5.69	5.69	0.00	Meet	0	0	0.00	Meet
47	GF000 009	Bed1F2	34.03	-	-	Meet	2.78	-	-	Moder ate
48	GF000 009	Bed1F2	23.13	-	-	Minor	1.39	-	-	Major
49	GF000 009	Bed1F2	22.92	-	-	Minor	1.39	-	-	Major
50	GF000 009	Bed1F2	22.99	-	-	Minor	1.39	-	-	Major

51	GF00000F	StudyF1	36.34	-	-	Meet	2.08	-	-	Moderate
52	GF000005	Bed2F1	34.37	-	-	Meet	2.78	-	-	Moderate
53	GF000005	Bed2F1	23.61	-	-	Minor	1.39	-	-	Major
54	GF000005	Bed2F1	23.61	-	-	Minor	1.39	-	-	Major
55	GF000005	Bed2F1	23.61	-	-	Minor	1.39	-	-	Major
56	GF000011	Bathroom3F1	33.33	-	-	Meet	2.78	-	-	Moderate
57	GF00000E	Bathroom1F2	22.92	-	-	Minor	1.39	-	-	Major
58	GF00000E	Bathroom1F2	23.13	-	-	Minor	1.39	-	-	Major
59	GF000002	Neighbor	26.07	-	-	Meet	2.01	-	-	Moderate
60	GF000002	Neighbor	30.94	-	-	Meet	2.78	-	-	Moderate
61	GF000002	Neighbor	29.26	-	-	Meet	2.76	-	-	Moderate
62	GF000002	Neighbor	29.25	-	-	Meet	2.57	-	-	Moderate

Table 4. Daylight Factor for Rooms under observation at all levels in the proposed design. Grid Size - 0.2m, Margin - 0.1m.

				Ave. Daylight Factor	
Floor No.		**Room Type**	**Area**	**Proposed**	**Existing**
Proposed					
GF	P-Flat 2	Living/Kitchen/Dining	41.21	3.3	
GF	*Existing*	*Living/Kitchen/Dining*	*39.62*		*1.78*
FF	P-Flat 2	Bedroom	28.27	2.13	
GF	P-Flat 1	Living/Kitchen/Dining	27.64	3.1	
GF	P-Flat 1	Bedroom	15.35	2.22	
GF	*Existing*	*Bedroom*	*16.2*		*2.23*
FF	P-Flat 1	Bedroom	30.34	2.11	
FF	P-Flat 1	Study	21.83	2.22	
GF	*Existing*	*Bedroom*	*12.77*		*1.48*

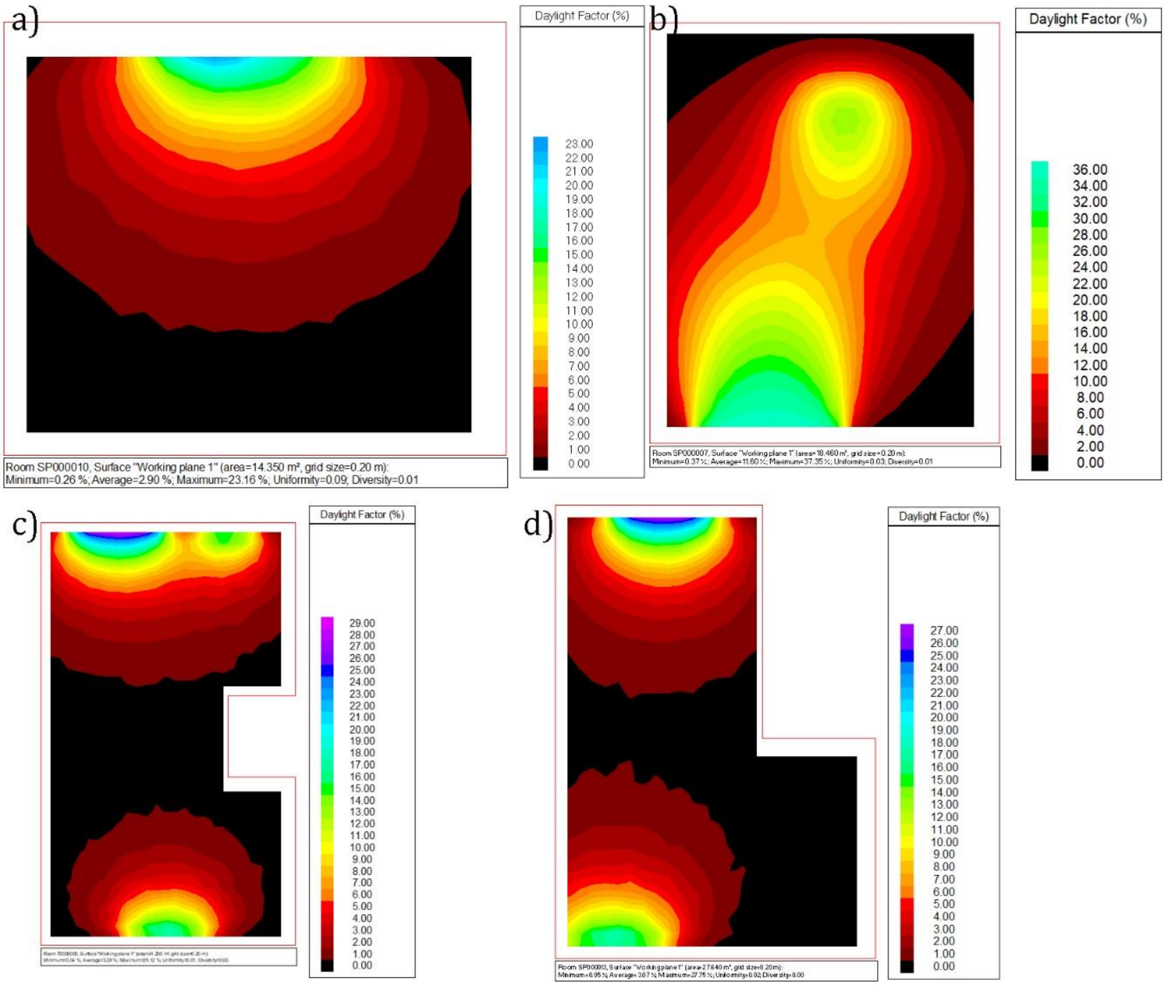

Figure 12 Daylight factor distribution a) F1Bedroom1, b) F2Bedroom1, c) F1LKD, d) F2LKD. LKD refers to Living/Kitchen/Dining.