

For DESIGN ENDEAVOURS Ltd.

DAYLIGHT SUNLIGHT

REPORT

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1. General Summary

1.1. Job Scope

Design Endeavour Ltd. has prepared a detail daylight sunlight report for the proposed conversion of an existing structure into a standalone studio flat at **Uxbridge Road Hayes, London, UK, UB4 8QH**. The objective is to evaluate the potential impact of the surrounding buildings on the proposed development.

Note: The height of the proposed design is only 2.5m, which is less than that of the surrounding structures, resulting in negligible shading effect. Therefore, the assessment will primarily consider how nearby buildings might potentially affect the daylight sunlight access for the proposed design.

1.2. Daylight-Sunlight Standards

To confirm the efficacy 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 extension work performed at **Uxbridge Road Hayes, London, UK, UB4 8QH** conform to the daylight & sunlight criteria set forth by the BRE guidelines. Consequently, there are no valid reasons to contest the proposed development of a studio flat 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

Design Endeavour Ltd, UK has carried out a detailed sunlight daylight assessment for the extension work at **Uxbridge Road Hayes, London, UK, UB4 8QH**. The assessment is to evaluate the potential impact of the surrounding buildings on the “Right to Light” claim for the proposed design.

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.

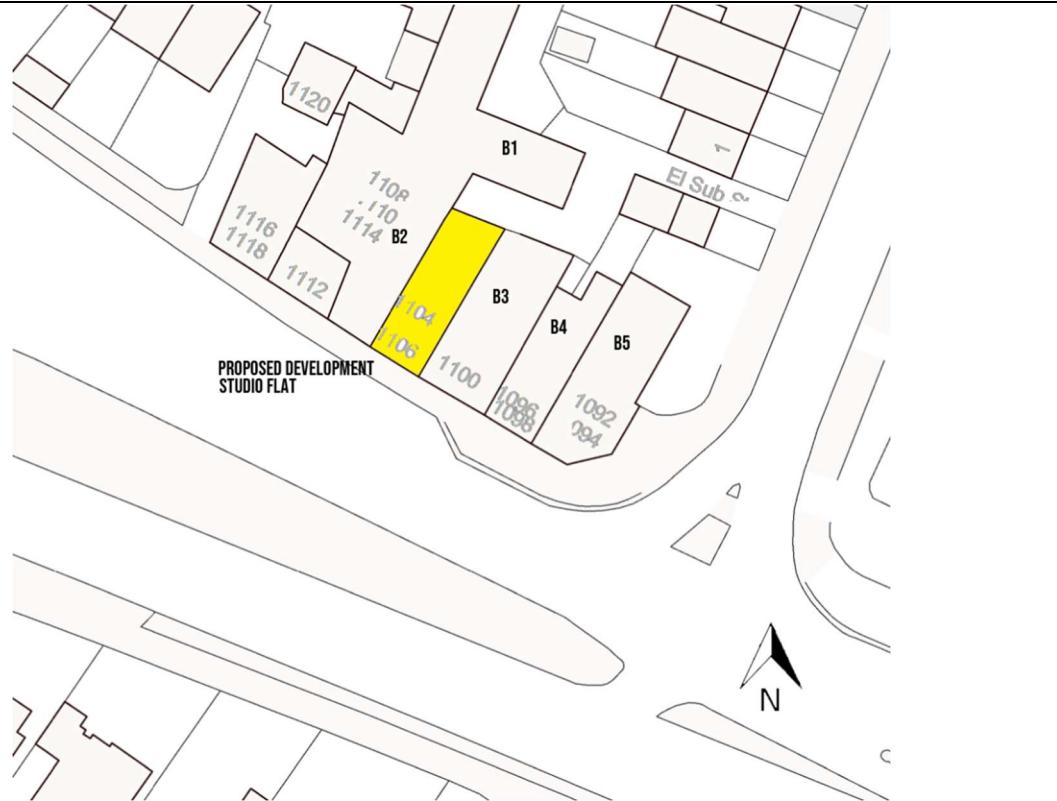


Figure 1. OS MAP of the site under consideration

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-East
2	B2	Residential	North-West
3	B3	Residential	South-East
4	B4	Residential	South-East
5	B5	Residential	South-East

2.3. Report Assessment Limitations

- Report assessment of the proposed building under daylight sunlight assessment is based on the attached developmental 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, 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, just as it does in the current scenario. 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, as appeared in the present case.

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.

- Given that the proposed development is a single storey ground floor development with its edge aligning parallel to neighboring buildings, we anticipate that its impact on the neighboring structures will be minimal, if not entirely negligible. Consequently, this report primarily concentrates on examining how neighboring structures influence the proposed development.
- Our analysis revealed that the buildings surrounding the proposed development are predominantly residential and some commercial in nature.
- The proposed development is oriented in the North-East direction opposite to the main Uxbridge Road. The surrounding structures either run parallel to the proposed development or are constructed at various oblique angles. Some of these nearby buildings are in close proximity to the proposed development, which is expected to have the most significant effect on daylight and sunlight assessments, while others are farther away and unlikely to cast substantial shadows.
- In our analysis, as depicted in **Figure 1**, we have selectively focused on specific structures that is expected to cast substantial shading impact on the proposed development. Other structures have not been taken into consideration.
- We have considered approximately 4 to 5 neighboring structures for the overall assessment. After a preliminary evaluation using computational software, we have excluded some additional buildings on the north-eastern side from this report. They are single storey and farther away to the north-east of 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 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

Uxbridge Road, Hayes, London, UK, UB4 8QH is situated in the Borough of Hillingdon in Greater London. This area is part of the Charville ward and falls within the Hayes and Harlington constituency.

- The proposed development site is a part of an urbanized area, a mix of both residential and commercial properties.
- The proposed development site is located within walking distance of public transportation, such as bus stops and train stations (Hayes and Harlington).
- Nearby amenities include shops, bus stand, railway station, restaurants, and parks.

The proposed development site currently features an existing structure that is slated for modification. The proposed development is in the rear part of the ground floor, the front of which is a commercial space facing the Uxbridge Road. Table 2 highlights the new developmental features in the proposed design from the existing structure as well as the new proposed windows.

Table 2. Existing and Proposed Floor Plans with South-Facing Windows.

Floor No.	Existing Plan	Proposed Plan	North-facing Window
0 (Ground Floor)	No living space, an extension of the shop – 86 m ²	Bathroom, living room + kitchen, A – 33.9 m ²	Skylight inclusion

The building at the proposed development is a three-storey building with its first and second floors are not undergoing any changes under the current scheme.

4.4. Assessment of Surrounding Buildings Under Observation

The consideration of neighboring buildings in the daylight and sunlight assessment concerning the proposed design is a pivotal aspect of this report. Through a preliminary investigation, there are in total of four or five buildings that is expected to influence the daylight sunlight report. Figure 2 displays the labeling and naming conventions used for the proposed building and the adjacent structures within the IESVE software interface.

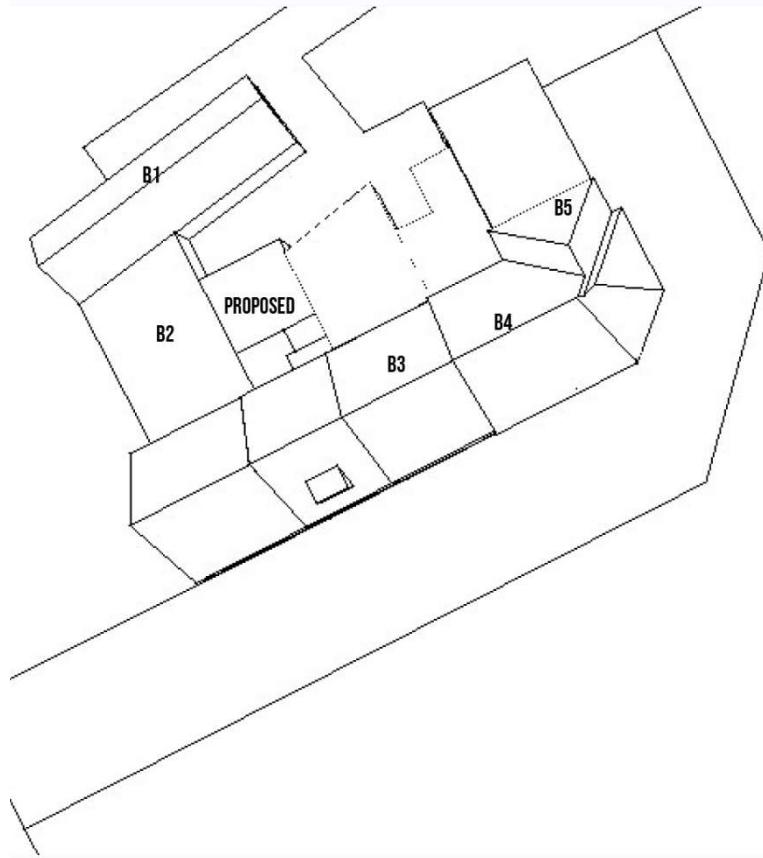


Figure 2. Nomenclature for the proposed building and its surrounding structure drawn on IESVE software.

4.4.1. Building B1

- From **Figure 1**, the structure is on the north-eastern side of the proposed development. Compared to the 2.5m height of the proposed design, the pitch height of Building B1 is approximately 4.45m.
- Building B1 has a potential to cast shadows on the proposed design, primarily during the late evening hours. It is the only time when the proposed development is expected to receive some direct sunlight due to its north-east facing.
- Building B1 with its long length is expected to shade the lower portion of windows, resulting in lower sunlight access.
- Given the proposed skylight, the effect of building B1 on the roof of the proposed development is minimal.

4.4.2. Building B2

- The structure is located on the north-western side of the proposed development. Compared to the height of Building B2, the proposed design is approx. of the same size.

- Building B2 with its extended rear end from the proposed development is casting a maximum shadow during the evening hours. This makes the proposed development to lose a significant proportion of its right to light access.
- Because of the similar height, building B2 is covering relatively half of the exposed wall of the proposed development for most of the evening hours. Therefore, the proposed development is expected to receive limited direct sunlight.
- Since building B2 is almost of the same height as of the proposed building, its effect on the skylight is also limited.

4.4.3. Buildings B3, B4, and B5

- Buildings B3, B4, and B5 are on the southeast of the proposed design. The rear side of buildings B3 and B4 is a single storey space similar to the height of the proposed development. B5, on the other hand, is a two-storey structure on the rear side.
- These structures are expected to cast minimal to no shadow on the exposed wall of the proposed development as well as on the roof where the proposed skylight is planned during the daytime.
- Only in the morning hours, these buildings will have a strong potential to cast shadow on the roof of the proposed design.

4.4.4. Daylight Sunlight Summary of Neighborhood Buildings

Given the discussion made in Section 4.4, Table 3 summarize the key findings of this study.

Table 3. Summary of the Impact of Surrounding Buildings on the Proposed Design.

Building Type	Position	Area Affected	Time Duration
Building B1	North-East	Exposed wall	Late evening hours
Building B2	North-West	Exposed wall	Late evening hours
Buildings B3, B4, and B5	South-East	Roof skylight	Early morning hours

4.5. Daylight Sunlight Summary for the Proposed Design

Utilizing a broad sun-casting evaluation, it is anticipated that the proposed design will experience a notable reduction in its sunlight exposure, primarily due to its relatively lower height as well as its orientation. The height differential, close proximity of neighboring structures, and building orientation are significant factors in contributing to its comparatively limited access to sunlight.

In the context of the existing structure, the rear part of the ground floor is primarily serving the front shop. The exposed wall on the rear side is a part of the WC and a small pantry, where the direct sunlight access is not given significance. Under the proposed development, the rear side is proposed for a studio flat with its access from the rear side. The exposed wall is now supposed to serve the living space. Similar to the existing structure, the living space of the studio flat will retain the similar sized windows. In addition, a skylight is proposed to enhance the daylight sunlight access. It is expected that the new proposed development will enhance the proposed design's exposure to sunlight.

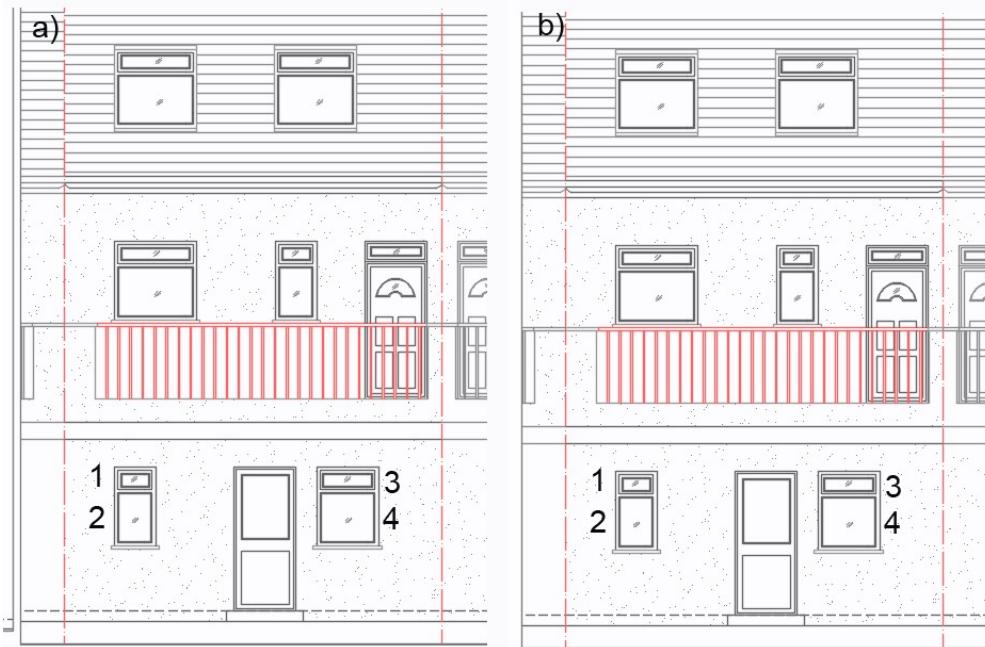


Figure 3. Front elevation drawing of the (a) proposed development with skylight (not shown) and (b) existing structure with window elements used in the daylight sunlight analysis report.

Taking into account the changes made in the proposed design, recognizing the mitigating factors, and evaluating the surrounding neighborhood, it is observed that the Visual Sky Component (VSC) and Annual Probable Sunlight Hours (APSH) will remain the same like the existing structure. However, the daylight factors are expected to significantly improved in the daylight sunlight assessment after the inclusion of the skylight.

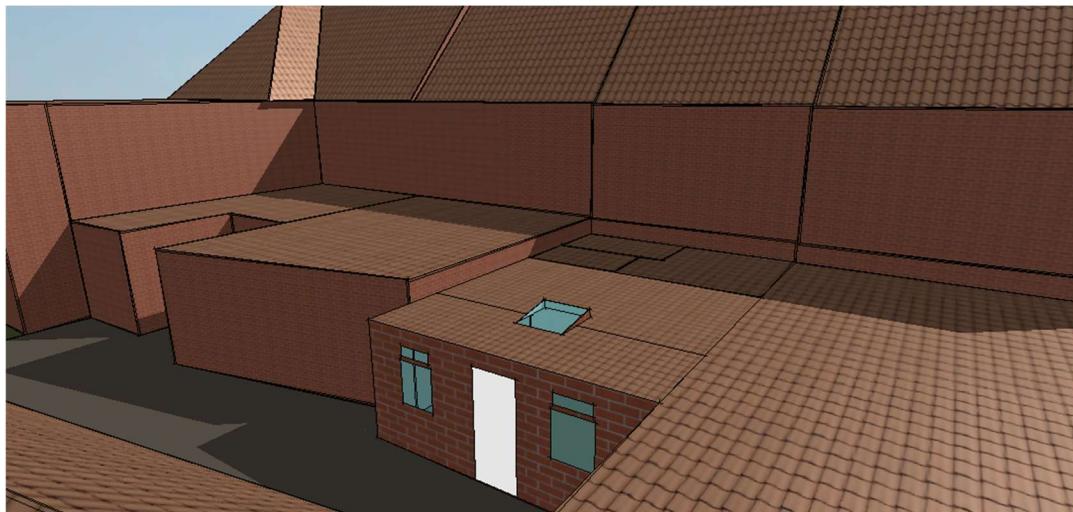


Figure 4. Skylight and window element design in the proposed development.

As shown in **Figure 3**, the window elements remain the same in both the existing and the proposed design. However, a skylight is added in the proposed design, as shown in **Figure 4**. Nomenclature for window elements is presented in **Figure 3**.

A detail analysis of each of these daylight sunlight components are discussed below:

4.5.1. Vertical Sky Component (Daylight):

Almost all window elements of the proposed development meet the BRE requirement of $\geq 27\%$ and/or ≥ 0.8 times of its former value. The window height plays a significant role in accessing the total sunlight during the late evening hours. Due to the north-east facing, the exposed wall of the proposed development was only receiving its share of daylight in the late evening hours. Moreover, the neighboring properties, particularly buildings B1 and B2, further limited its daylight access. In our daylight sunlight analysis, the best position for the direct sunlight access for windows is near the top of the exposed wall and to the right of the door away from Building B2.

Like the existing structure, 3 out of 4 windows for the new development also performed well in meeting the BRE requirement of $\geq 27\%$ and/or ≥ 0.8 times of its former value. **Table 4 in Appendix B** shows the obtained results for the VSC assessment.

4.5.2. Direct Sunlight Hours (Sunlight):

Atleast 2 window elements out of 4 and a skylight tested meet the BRE requirement of receiving ≥ 1.5 hours of direct sunlight on 21st March in the living room of the proposed studio flat, as shown in **Figure 5a**. Therefore, it is considered that the proposed development meets the minimum BRE recommendation of sunlight reception at this dwelling. Only window elements (3 & 4) failed to meet the minimum BRE requirement of ≥ 1.5 hours. It can be understood since these window elements are close to buildings B1 and B2, which are casting maximum shadow on it.

Similar to the proposed development, window elements 1 and 2 successfully meet the BRE requirement of receiving ≥ 1.5 hours of direct sunlight on 21st March, as shown in **Figure 5b**. Since these elements below to the WC zone, direct sunlight assessment is not important to evaluate. Similarly, elements 3 and 4 belong to the small pantry in the existing building where direct sunlight assessment is not considered important. **Table 6 in Appendix B** shows the obtained results for the Direct Sunlight Hour assessment.

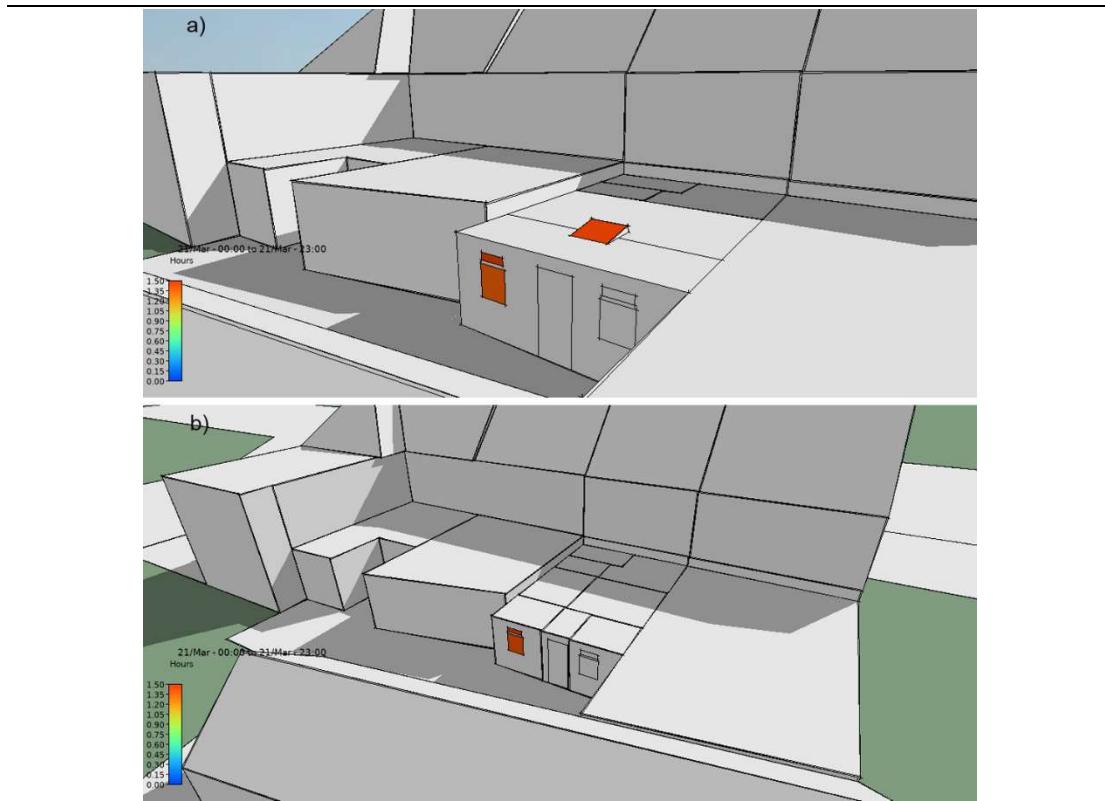


Figure 5. Direct Sunlight Hours analysis of north-facing window elements meeting minimum BRE requirement of minimum of 1.5 hours on 21st March for (a) proposed (b) existing space.

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: For a given time-range, the impact classification for all window elements except for 1 (element 1) is major, where the APSH values remain $\leq 13\%$ of the BRE requirement. This is true for both existing and proposed development. However, given the APSH values of the existing structure, all window elements of the proposed development successfully meet the criteria of having atleast APSH values ≥ 0.8 times of the former APSH value.

Only the window element 1 of both the existing and proposed development successfully meet the BRE requirement of $\geq 13\%$. The existing structure was already having a poor APSH values due to its north-east facing as well as the surrounding buildings, the new development is expected to face the same challenge.

Time Range: Wintertime – 21st September-to-21st March: Since the structure is facing the north-east side, the sunlight reception is already minimal in the existing structure. Some window elements even failed to produce any result, regardless of the proposed or the existing structure. The change in APSH values for the windows in the winter season is noticeable because of the change in the sun angle within winter months. **Table 5 in Appendix B** shows the obtained results for the APSH assessment.

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.

For the existing structure, the DF values for the WC and Pantry are high close to 5.7% and 4.4%, respectively. It can be expected since these spaces are small, close to 3 m^2 only, enabling significant reflection from the closely placed wall structure. On applying the same window elements on the proposed design, the DF value reduced to 1.5%. Because of the comparatively large living space, the DF value is expected to reduce.

On addition of the skylight of size 1m x 1m facing north-east (**Figure 4**), the DF significantly improved from 1.5% to 6.2%. This shows that the incorporation of a skylight in the selected room meets the minimum BRE guidelines regarding DF assessment. **Table 7 in Appendix B** shows the obtained results for the daylight factor assessment.

5. Conclusion

The evaluation of daylight and sunlight access for a proposed design at a specific site involves flexible interpretation of BRE guidelines, considering several material mitigating factors.

The proposed design aims to improve the sunlight access for the planned studio flat through the addition of skylight. The neighboring buildings have been evaluated for their impact on sunlight access, with considerations made for their positions and potential shadow casting. Overall, the assessment indicates that, despite initial limitations, the proposed design is likely to meet the BRE requirements for daylight and sunlight access standards, thanks to its strategic design improvements and considerations for mitigating factors.

In conclusion, the proposed development fully complies with the BRE guidelines for daylight, sunlight, and overshadowing. There are no substantial reasons to contest the extension in terms of its compliance with 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° 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° 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° , 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 4. VSC assessment report of all window elements on the proposed and existing design.

Floor No.	Room Type	Window Ref.	VSC	
			Proposed	Result
Proposed				
Ground	Living Space	1	31.35	Meets
		2	29.05	Meets
		3	29.90	Meets
		4	25.43	Minor
		Skylight	31.83	Meets
Existing				
Ground	WC	3	31.35	Meets
	WC	4	29.05	Meets
	Pantry	1	29.90	Meets
	Pantry	2	25.43	Minor

Table 5. APSH results of all window elements of the proposed and existing design. Compared to the existing structure, proposed design meets ≥ 0.8 times of the existing value.

Floor	Room Type	Window Ref.	Summer	Result	Winter	Result	Avg.	Result
Proposed								
Ground	Living space	1	12.61	Meets	0.69	Meets	13.31	Meets
		2	11.17	Meets	0.09	Meets	11.26	Meets
		3	11.06	Meets	0.00	Meets	11.06	Meets
		4	3.92	Meets	0.00	Meets	3.92	Meets
Existing								
Ground	WC	1	12.61	Major	0.69	Major	13.31	Major
	WC	2	11.17	Major	0.09	Major	11.26	Major
	Pantry	3	11.06	Major	0.00	Major	11.06	Major
	Pantry	4	3.92	Major	0.00	Major	3.92	Major

Table 6. Direct Sunlight assessment of all window elements on the proposed and existing design.

Floor No.	Room Type	Window Ref.	Direct Sunlight Hours	
			Proposed	Result
Proposed				
Ground	Living space	1	1.5	Meets
		2	1.5	Meets
		3	1.5	Fail
		4	1.5	Fail
		Skylight	1.5	Meets
Existing				
Ground	WC	1	1.5	Meets
	WC	2	1.5	Meets
	Pantry	3	1.5	Fail
	Pantry	4	1.5	Fail

Table 7. Daylight Factor for Rooms under observation at all levels in both proposed and existing development. Grid Size - 0.1m, Margin - 0.1m.

Floor No.	Room Type	Area	Ave. Daylight	
			Factor (%)	Illuminance (lux)
Proposed				
Ground	Living space	27.169	6.2	757.50
Existing				
Ground	WC	3.263	5.7	701.3
	Pantry	3.087	4.4	532.8

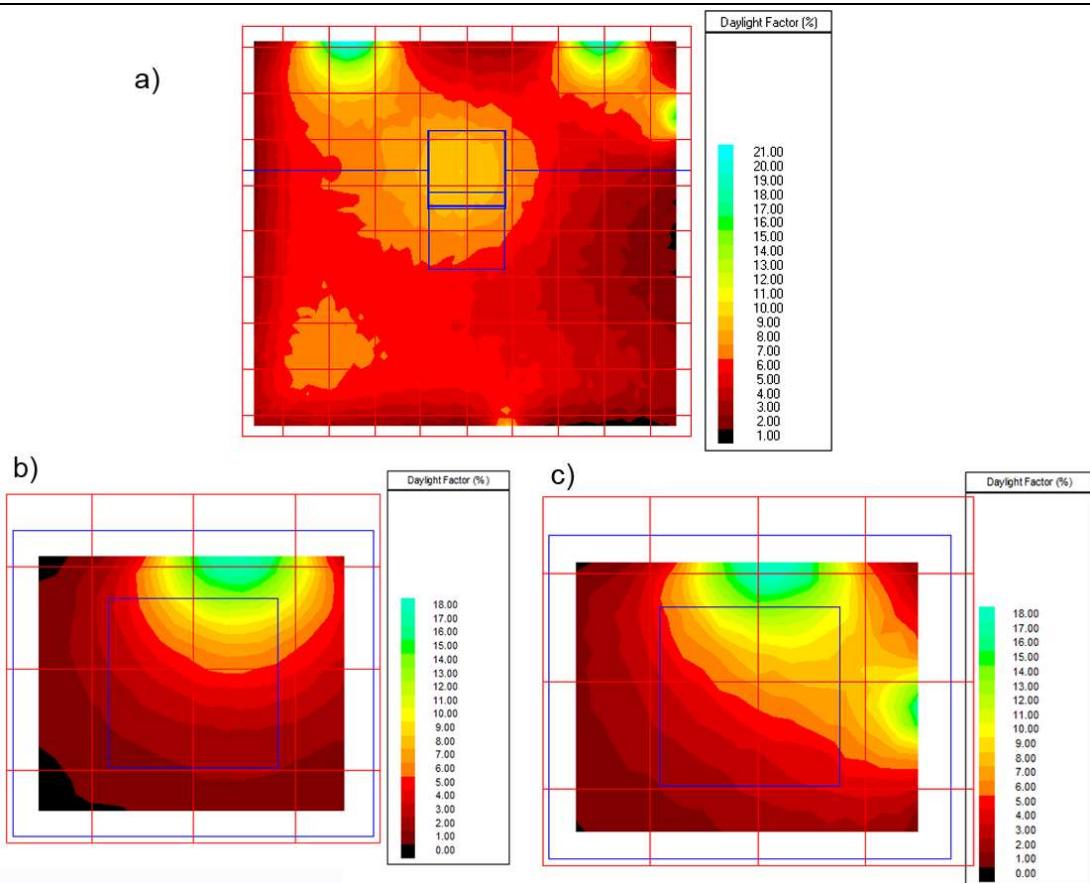


Figure 6. Contour levels of Daylight Factor for Rooms on the ground floor in (a) living space of proposed development, (b) existing WC, and (c) existing Pantry. Grid Size - 0.1m, Margin - 0.1m