EAL CONSULT BUILDING SUSTAINABILITY SINCE 2008

DAYLIGHT & SUNLIGHT ASSESSMENT

PROPERTY ADDRESS
Heathrow Point West,
234 Bath Road,
UB3 5AP

DATE
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PREPARED BY
EAL Consult

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EXECUTIVE SUMMARY

This daylight assessment has been prepared to evaluate whether the proposed hotel rooms at Heathrow Point West, UB3 5AP, will meet acceptable daylight and sunlight standards for future guests. The assessment includes a detailed analysis of daylight quantity and distribution, as well as sunlight availability for the relevant rooms. The findings should be reviewed alongside the proposed architectural drawings.

The main objective of this daylight assessment is to:

- **Determine the daylight and sunlight levels** within all habitable rooms of the proposed hotel development, ensuring high standards of comfort and well-being for its future occupants.

The methodology set out in this report is in accordance with BRE's 'Site Layout Planning for Daylight and Sunlight' (BR209, 2022), which is accepted as good practice by Planning Authorities. In June 2022 a new version of the Guidelines was published, which changes the criteria and methodology to assess daylight and sunlight within newly proposed schemes. However, the aim of the new guidance is the same as the old one, which is "to help ensure good conditions in the local environment considered broadly, with enough sunlight and daylight on or between the buildings for good interior and exterior conditions", as stated in Paragraph 1.5 of the new guidance.

The following assessments were carried out:

Daylight Assessment

- **Proposed units at Basement level only**
  Daylight and Sunlight into Proposed Windows and guest rooms
  An assessment of daylight & sunlight into rooms within the proposed re-development has been carried out. This is to ensure future occupiers will benefit from the well-being of adequately daylit rooms. This will include the calculations of:

    a. Target Daylight Factor Levels for each habitable bedroom

The assessment of daylight and sunlight to the proposed hotel rooms, indicates that the target daylight factor meets the recommended values set by BRE for most proposed units.

The proposed drawings supplied by the architect were used for the purpose of modelling and for the calculations, including location, site plan and proposed floor plans.

TERMS AND DEFINITIONS

Daylight Factor (D)
Ratio of total daylight illuminance at a reference point on the working plane within a space to outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% D would mean that the indoor illuminance at that point in the space would be one hundredth the outdoor unobstructed horizontal illuminance.

Target Daylight Factor
Daylight factor value equivalent to the target illuminance to be exceeded for more than half of annual daylight hours over a specified fraction of the reference plane within a daylit space.

Minimum Target Daylight Factor
Daylight factor value equivalent to the minimum target illuminance to be exceeded for more than half of annual daylight hours over 95% of the reference plane within spaces with vertical and/or inclined daylight apertures.

CIE standard overcast sky
A completely overcast sky for which the ratio of its luminance Lγ at an angle of elevation γ above the horizontal to the luminance Lz at the zenith is given by: (1 + 2 sin γ) Lγ = Lz 3 A CIE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead).

Daylight, natural light
Combined skylight and sunlight.

No sky line
The outline on the working plane of the area from which no sky can be seen.

CURRENT POLICIES, REGULATIONS AND BENCHMARKS

People expect good natural lighting in their homes and in a wide range of non-domestic buildings. Daylight makes an interior look more attractive and interesting as well as providing light to work or read by. Access to skylight and sunlight helps make a building energy efficient; effective daylighting will reduce the need for electric light, while winter solar gain can meet some of the heating requirements.

The quality and quantity of natural light in an interior depend on two main factors. The design of the interior environment is important: the size and position of windows, the depth and shape of rooms, and the colours of internal surfaces. But the design of the external environment also plays a major role: e.g. if obstructing buildings are so tall that they make adequate daylighting impossible, or if they block sunlight for much of the year.

Obstructions can limit access to light from the sky. This can be checked at an early design stage by measuring or calculating the angle of visible sky θ, angle of obstruction or vertical sky component (VSC) at the centre of the lowest window where daylight is required. If VSC is:

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

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

- at least one main window wall faces within 90° of due south and
- a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. This is assessed at the inside centre of the window(s); sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted.

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

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

receives less than 25% of annual probable sunlight hours and less than 0.80 times its former annual value; or less than 5% of annual probable sunlight hours between 21 September and 21 March and less than 0.80 times its former value during that period;

- and also has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

The British Standard "Daylight in buildings" (BS EN 17037) contains advice and guidance on interior daylighting. The guidance contained in this publication (BR 209) is intended to be used with BS EN 17037 and its UK National Annex[C1]. Other European countries have their own versions of EN17037, which do not include the UK National Annex.

BS EN 17037 supersedes BS 8206 Part 2 "Code of practice for daylighting"[C2], which contained a method of assessment based on Average Daylight Factor, which is now no longer recommended. For daylight provision in buildings, BS EN 17037 provides two methodologies. One is based on target illuminances from daylight to be achieved over specified fractions of the reference plane (a plane at tabletop height covering the room) for at least half of the daylight hours in a typical year. The other, alternative, method is based on calculating the daylight factors achieved over specified fractions of the reference plane.

BS EN 17037 gives three levels of recommendation for daylight provision in interior spaces: minimum, medium and high. For compliance with the standard, a daylit space should achieve the minimum level of recommendation.

Daylight factor method

The daylight factor is the illuminance at a point on the reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The CIE standard overcast sky[C3] is used, and the ratio is usually expressed as a percentage.

Table C2 gives the daylight factor targets for side lit rooms in London.

Table C2 – Target daylight factors (D) for London

Level of recommendation	Target daylight factor D for half of assessment grid	Target daylight factor D for 95% of assessment grid
Minimum	2.1%	0.7%
Medium	3.5%	2.1%
High	5.3%	3.5%

METHODOLOGY

Surface reflectance

Internal and exterior surfaces and obstructions need to be modelled including appropriate surface reflectances.

Surface reflectances should represent real conditions. Where reflectance values have not been measured or specified, default values to be used in the calculation are given in Table C4.

Table C4 – Recommended default surface reflectances	
Surface	**Default reflectance**
Interior walls	0.5
Ceilings	0.7
Floors	0.2
Exterior walls and obstructions	0.2
Exterior ground	0.2

Where surface finishes have been specified or measured on site, they can be used in the calculations with appropriate factors for maintenance and furniture. To allow for these factors, maximum reflectances for white painted surfaces in the calculations should not exceed 0.8 indoors, and 0.6 outdoors. Maximum reflectances for light pastel walls should not exceed 0.7 in the calculations, and maximum reflectances for light wood floors should not exceed 0.4. Surface reflectances used should be presented in the assessment, along with a specification of the materials if non-default reflectances are used.

Glazing transmission

Glazing transmission factors, including maintenance factors, need to be included in the simulation along with account for, or modelling of, window framing. Where window frames are not specifically included in the model, frame factors should be applied based on the ratio of glass to overall window aperture area for the type of window to be used; this will generally vary with window size and whether the windows have opening lights. Where window types have not been specified, results for the overall window aperture should be multiplied by a default framing factor as given in Table C5.

Table C5 – Recommended default framing factors	
Window type	**Default framing factor**
Windows with small panes	0.5
Normal windows with opening lights	0.6
Patio doors	0.7

Neighbouring Properties

All neighbouring properties and structures have been modelled and included in this assessment.

SITE

The proposed development is situated within a predominantly residential and commercial area. Daylight studies have been conducted to ensure that all proposed hotel guest rooms will achieve suitable natural light levels, providing a comfortable environment for future occupants.

The proposal includes the conversion of the existing building and the erection of a new four-storey hotel extension, which will provide an additional 113 guest rooms with accommodation at both roof and basement levels, linked to the existing hotel building by a covered link bridge, along with associated ancillary works.

Although the BRE 2022 guidelines are typically applied to dwellings, where the assumption is that residents spend significant time indoors, these guidelines have also been used here by analogy to assess daylight provision for the hotel. Hotel rooms, which are typically occupied for shorter periods, do not require the same level of natural light as residential dwellings. Nevertheless, the assessment ensures that the daylight provision for the proposed guest rooms meets an acceptable standard of comfort and well-being for hotel guests.

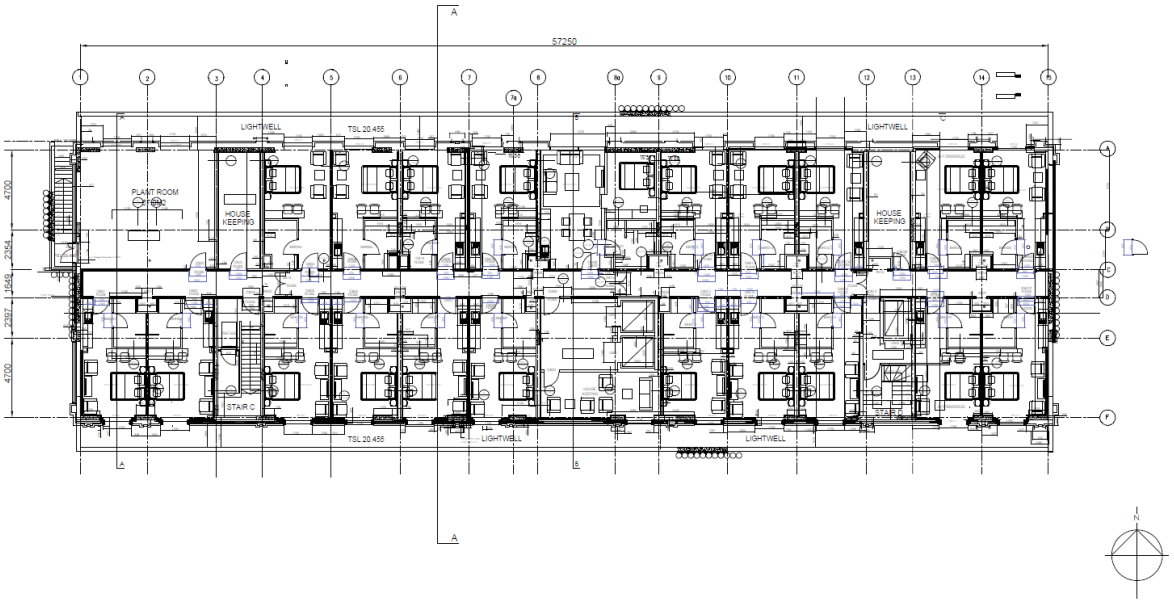

Figure 1 – Proposed guest rooms across at basement level

DAYLIGHT & SUNLIGHT ASSESSMENT
PROPOSED GUEST ROOMS

Daylight factor

The daylight factor is the illuminance at a point on the reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The CIE standard overcast sky[C3] is used, and the ratio is usually expressed as a percentage. The recommendations for side lit rooms are met if both target daylight factors (the median daylight factor over 50% of the reference plane, and the minimum daylight factor over 95% of the reference plane) are achieved.

The table below shows the minimum requirements that each habitable space needs to achieve.

Table C2 – Target daylight factors (D) for London		
Level of recommendation	Target daylight factor D for half of assessment grid	Target daylight factor D for 95% of assessment grid
Minimum	2.1%	0.7%
Medium	3.5%	2.1%
High	5.3%	3.5%

Sunlight: Annual and Winter Probable hours

BRE states: "in housing, the main requirement **for sunlight is in living rooms**, where it is valued at any time of the day, but especially in the afternoon. Sunlight is also required in conservatories. It is viewed as less important in bedrooms and in kitchens where people prefer it in the morning rather than the afternoon."
The BRE guide considers the critical aspects of orientation and overshadowing in determining the availability of sunlight at a proposed development site.
The guide proposes minimizing the number of dwellings whose living room face solely north unless there is some compensating factor. At the same time it acknowledges that the site's existing urban environment may impose orientation or overshadowing constraints which may not be possible to overcome.
"In general, a dwelling or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided that:

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

In paragraph 3.1.11 the BRE guidance suggests that if a room faces significantly North of due East or West it is unlikely to meet the recommended levels proposed by the BS 8206-2. As such, it is clear that only windows facing within 90 degrees of due South can be assessed using this methodology.

Although sunlight assessments are commonly applied to living rooms in residential developments, in this case, the assessment has been carried out for the hotel guest rooms, as these are the primary habitable spaces within the proposed hotel development. The purpose of this assessment is to

ensure that the guest rooms receive adequate sunlight, contributing to the comfort and well-being of future occupants.

The Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH) have been calculated for the relevant guest rooms in accordance with the principles outlined in BRE 209:2022. These calculations help to confirm that the proposed rooms will receive sufficient sunlight throughout the year and during the winter months, meeting the expected standard for guest comfort.

Table 1 - Daylight & Sunlight Assessment

Unit	TDF for half of the assessment grid(%)[1]	TDF for 95% of the assessment grid(%)[2]	Pass	Sunlight Assessment (probable sunlight hours)	
				Annual %	Winter %
Basement					
Room B001	2.1	1.4	Yes	25.8	5.3
Room B002	2.1	1.4	Yes	25.8	5.3
Room B003	2.1	1.4	Yes	25.8	5.3
Room B004	1.9	1.2	No	North facing	
Room B005	2.1	1.4	Yes	25.8	5.3
Room B006	1.9	1.2	No	North facing	
Room B007	2.1	1.4	Yes	25.8	5.3
Room B008	1.9	1.2	No	North facing	
Room B009	2.1	1.4	Yes	25.8	5.3
Room B010	1.9	1.2	No	North facing	
Room B011	2.1	1.4	Yes	25.8	5.3
Room B012	1.9	1.2	No	North facing	
Room B013	2.1	1.4	Yes	25.8	5.3
Room B014	1.9	1.2	No	North facing	
Room B015	2.1	1.4	Yes	25.8	5.3
Room B016	1.9	1.2	No	North facing	
Room B017	2.1	1.4	Yes	25.8	5.3
Room B018	1.9	1.2	No	North facing	
Room B019	2.1	1.4	Yes	25.8	5.3
Room B020	2.1	1.4	Yes	North facing	
Room B021	2.0	1.3	Yes	North facing	

Results:

A total of 21 rooms were assessed. Results demonstrate that all south oriented spaces will meet the required minimum Target Daylight Factor. Furthermore, the assessment shows that the median daylight factor for 50% of the reference plane in the north-facing rooms is 1.9%, which is slightly below the target of 2.1% set for side-lit rooms. However, it is important to consider the unique context of this hotel development, where the occupancy patterns of the rooms differ significantly

[1] Target Daylight Factor
[2] Target Daylight Factor

from residential dwellings. The primary goal of this daylight assessment is to ensure that the hotel rooms are well-lit and comfortable for guests, which is achieved even with the slightly lower median daylight factor. The overall daylight quality and well-being of future occupants is maintained through other factors, such as overall daylight distribution and the minimum daylight factor (which is met in these rooms).

The minimum daylight factor (0.7%) for 95% of the reference plane has been satisfied in all rooms, indicating that a sufficient amount of daylight reaches the room, ensuring adequate lighting for the guests.

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As hotel rooms are used for short-term stays, the exact daylight factor levels required for permanent residences may be adjusted in favor of practicality. Hotel guests generally do not spend long hours in their rooms, and a slightly lower daylight factor does not significantly affect comfort or well-being during their stay.

CONCLUSION

The daylight assessment for the proposed hotel development at Heathrow Point West has been carried out in accordance with BRE 2022 guidelines, with the primary goal of ensuring that all guest rooms provide an acceptable level of natural light. The results indicate that the majority of the rooms meet the required daylight factor targets, with both the median daylight factor for 50% of the reference plane and the minimum daylight factor for 95% of the reference plane being satisfied in most cases.

However, for the north-facing rooms, while the median daylight factor for 50% of the reference plane is slightly below the required 2.1% (at 1.9%), the overall daylight provision remains within an acceptable range, given the unique context of hotel use. These rooms still meet the minimum daylight factor for 95% of the room area (0.7%), ensuring that they receive adequate daylight to support guest comfort.

While the north-facing rooms do not fully meet the strict daylight targets typically applied to residential schemes, their slightly lower daylight factor can be justified based on the short-term occupancy of the hotel rooms, the inherent limitations of their orientation, and the overall well-being of hotel guests. The development, as a whole, provides a high standard of daylight for future occupants, with adjustments or further design considerations recommended for the north-facing rooms if stricter compliance is required by the planning authority.

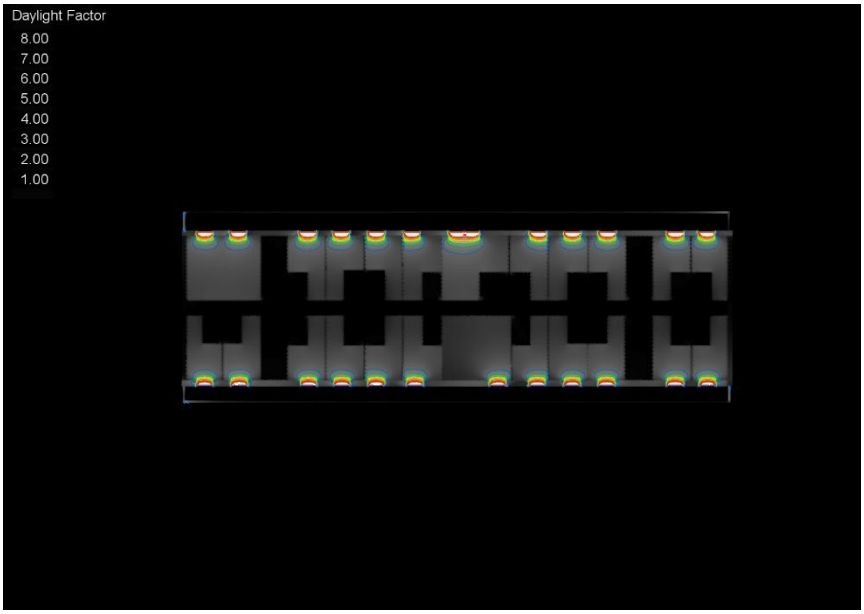

Figure 2 - Target Daylight Factor Diagram within the proposed hotel rooms at basement level

Disclaimer

This daylight assessment report has been prepared solely for the purpose of evaluating the internal daylight performance of the proposed scheme in relation to the BRE guidelines and the target daylight factors specified. The analysis and results are based on the design information, drawings, and data provided at the time of assessment. Any subsequent changes to the design, layout, or surrounding conditions may affect the validity of this assessment.

This document is submitted as part of the planning process and is intended solely for use by the local planning authority and the client. It should not be relied upon by any other party without prior written consent from the author. While reasonable care has been taken to ensure the accuracy of the information and analysis, no guarantee or warranty is provided as to the future performance or actual conditions experienced on site, as these may vary due to factors beyond the scope of this assessment.

The findings demonstrate compliance with the relevant BRE guidance and target daylight factors under the stated assumptions. No liability is accepted for any use of this report other than for its intended purpose.