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Daylight and Sunlight Assessment

Latimer Road

Wokingham

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Latimer Road,
Wokingham

Our Ref: 8174

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Executive Summary

This Daylight and Sunlight Analysis has been undertaken by Futura Bright on behalf of Doswell Developments (The Client) for the Proposed Development at 10–12 Latimer Road, Wokingham. The report has been prepared to support planning considerations relating to the change in window sizes from the original design and the resulting impact on internal daylighting.

The assessment ascertains the potential impact of the Proposed Developments natural daylight on proposed internal spaces and the surrounding open spaces. All calculations follow the BRE guidance of "Site Layout Planning for Daylight and Sunlight" from PJ Littlefair 2022, and the British Standard of practice for daylight (BS EN 17037-2018).

Vertical Sky Component (VSC), Average Daylight Factor (ADF) and No Skyline (NSL) have each been calculated for a sample of applicable living spaces and bedrooms.

The VSC calculations for the proposed facades indicate that the sampled spaces assessed, are likely to achieve a VSC of over 27%, as required. This suggests that the Development will generally receive a good level of diffuse daylight, resulting in respectable ADF values throughout the scheme.

Across all the assessed samples, the results of our ADF and NSL assessments show that majority of the habitable rooms will meet the ADF and NSL criteria. This is considered a good level of compliance given the urban location, presence of balconies and density of the Proposed Development.

In summary, while the proposed balconies and overhangs do significantly reduce the light entering the windows of the living spaces near them, the Proposed Development still meets the minimum daylighting requirements with some flexibility from the BRE guidelines.

In parallel with the daylight assessment, the proposed design has been developed alongside a detailed energy and overheating strategy prepared by Futura Bright in accordance with Building Regulations Part O. The inclusion of balconies, façade articulation and window reveals, while introducing some localised daylight reduction, also provides beneficial solar shading that assists in limiting summertime solar gains. The final window sizes and layouts therefore represent a balanced design response, carefully considering both internal daylight provision and overheating risk in the context of a dense urban residential development.

As a result, the scheme is deemed acceptable in terms of daylight and sunlight.

Introduction

This Daylight and Sunlight Analysis has been undertaken by Futura Bright on behalf of Doswell Developments (The Client) for the Proposed Development at 10-12 Latimer Road, Wokingham.

The report assesses the daylight and sunlight impact of the Proposed Development. The assessment is undertaken in accordance with "BRE guidance: Site Layout Planning for Daylight & Sunlight – A guide to good practice" PJ Littlefair 2022.

The assessment and the 3D models are based on initial drawings of the Proposed Developments provided by the PDP Architecture.

The assessment has been conducted using the IES VE applications for FlucsDL, Radiance and Sun Cast to produce daylighting and solar shading analysis.

The Proposed Development is in Wokingham and comprises the new construction of residential dwellings. The residential units are distributed across four floors.

MEASUREMENT, CRITERIA AND SUNLIGHT

The BRE handbook provides various methods of calculating daylight, one in relation to daylight/sunlight impact on surrounding properties, and one test in connection with open spaces.

The numerical criteria outlined in the BRE guidelines have been applied to each of the assessments detailed below. However, it is important to note that these guidelines are advisory rather than strict rules and should be applied flexibly, taking into account the specific context of the site.

The following approaches are undertaken to assess the effect on the sensitive receptors of surrounding properties when the Illustrative Masterplan is completed and operational:

- Vertical Sky Component (VSC): Access to daylight to each window of the surrounding buildings are assessed against the VSC criterion, which quantifies the diffuse daylight received from the sky.
- No Skyline (NSL): The habitable rooms of the residential surrounding buildings are assessed against the NSL to estimate the percentage of the working plane that receives no direct skylight. This criterion quantifies the distribution of daylight in the room.
- Average Daylight Factor (ADF): The habitable rooms of the residential surrounding buildings are assessed against the ADF criterion, which quantifies the level of daylight received in a room, taking into account the colours (reflectance) of the walls, floors, and ceilings.

The Proposed Development is in Wokingham and comprises the new construction of residential dwellings. The residential units are distributed across four floors.

FIGURE 1: REGIONAL LOCATION

FIGURE 2: SITE LOCATION

Principles and Methodology

DAYLIGHT - VERTICAL SKY COMPONENT (VSC)

The amount of skylight that reaches the windows of potentially affected dwellings is assessed by determining the VSC. The vertical sky component is a measure of the amount of the sky visible from the centre point of a window. It is the ratio of direct skylight that reaches the outside plane at the centre of a window, to the amount of sky light that reaches the horizontal plane. This ratio is expressed as a percentage.

The maximum VSC that could be achieved for a completely unobstructed vertical window/wall is almost 40%. A window that achieves >27% is considered to provide good levels of sky light.

The BRE guidelines also state that:

"Any reduction in the total amount of sky light can be calculated by finding the VSC at the centre of each main window. In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground (or balcony level for an upper storey) on the centre line of the window may be used ... If a room has two or more windows of equal size, the mean of their VSCs may be taken. The reference point is in the external plane of the window wall. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed."

DAYLIGHT – NO SKYLINE (NSL) METHOD

The BRE Guidelines provide that where room layouts are known, the effect on the daylight distribution can be calculated by plotting the NSL. In terms of the surrounding receptors, it has not been possible to obtain room layouts for all of the properties and therefore layouts have been assumed where information is not available.

The NSL method is a measure of the distribution of daylight at the 'working plane' within a room. The 'working plane' means a horizontal 'desktop' plane 0.85m in height for residential properties. The NSL divides those areas of the working plane which can receive direct sky light from those which cannot. If a significant area of the working plane lies beyond the NSL (i.e. it receives no direct sky light), then the distribution of daylight in the room will be poor and supplementary electric lighting may be required.

The potential effects of daylighting distribution in an existing building can be found by plotting the NSL in each of the main rooms. For houses, this will include living rooms, dining rooms and kitchens. Bedrooms should also be analysed, although they are less important. The BRE Guidelines identify that if the area of a room that does receive direct sky light is reduced to less than 0.8 times its former value, then this would be noticeable to its occupants.

BS 8206 Part 2 states (para 5.7) that the:

"uniformity of daylight is considered to be unsatisfactory if a significant part of the working plane(normally more than 20%) lies behind the no-skyline".

Therefore, it is implied that an NSL of at least 80% would be considered satisfactory.

DAYLIGHT – AVERAGE DAYLIGHT FACTOR (ADF)

Traditionally, daylight has been evaluated quantitatively, using the Average Daylight Factor (ADF). The daylight factor is defined as a ratio that represents the amount of illumination available indoors relative to the illumination present outdoors at the same time under an overcast sky.

ADF is normally expressed as a percentage of the illuminance available to an unobstructed point outdoors, under an overcast sky of known luminance and luminance distribution. This is the most detailed of the daylight calculations and considers the physical nature of the rooms and windows, including window light transmittance, window size, room size, angle of external obstruction and room surface reflectivity.

Although there are various recommendations for typical Average Daylight Factor values, an average value between 2% and 5% is considered satisfactory. The BRE guide recommends an ADF of 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. However, interiors with very high ADFs (over 6%) sometimes have problems with summertime overheating or excessive heat loss in winter.

The minimum recommendations for dwellings, as outlined in the BRE guide to good practice, are:

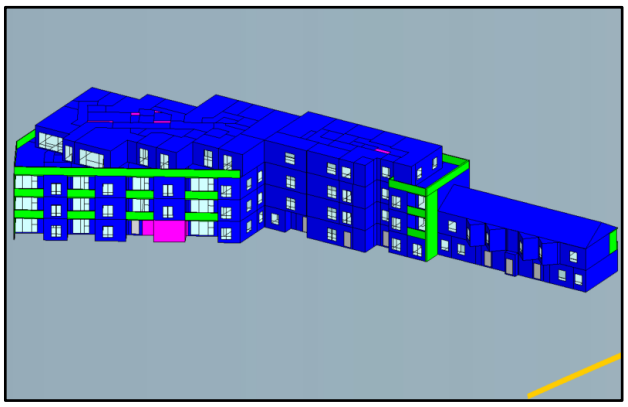
- 2.0% for kitchens,
- 1.5% for living rooms, and
- 1.0% for bedrooms.

For multi-purpose living / kitchen / diner arrangements the higher 2% 'kitchen' target can be difficult to achieve due to the depth of internal space. In such cases, it is generally accepted that the 1.5% target for living rooms be used instead as this represents the predominant use of the space.

METHODOLOGY

A detailed 3D model has been created using the IES VE and ModellT building modeller tool, (see Figure 2).

FIGURE 3: IMAGE OF 3D MODEL



Auto Desk Forma, FlucsDL, and Sun Cast plugins for IES VE are then used to calculate the VSC, ADF and NSL.

The daylight study assesses the Average Daylight Factor of a sample of living and bedrooms spaces.

Key settings of the simulation include:

- Working plane at 0.85 m above the floor,
- Grid points of 0.25 m,
- 0.30 m offset margin from walls and obstructions, and
- Under a standard cie overcast sky.
- Illuminance threshold of 0.20%
- Under a Swindon weather file.

Table 1 shows the key properties that have been applied in the model, including reflectance of the internal surfaces and the visual light transmittance of the windows. They are based on BR 209 2022 recommended default surface reflectance's that are likely to be applied on relevant elements. It should be noted that changes to these figures will influence the overall results of the assessment.

TABLE 1 REFLECTANCE OF THE SURFACES IN THE MODEL AND LIGHT TRANSMITTANCE OF THE GLAZING

	Reflectance Default Values
Internal Walls	50.0
External Walls	20.0
Internal Floor	20.0
Ceiling	70.0
Windows	Light transmittance 71% (including the maintenance factor) with Frame width and shape based on architectural drawings.

ANNUAL PROBABLE SUNLIGHT HOURS (APSH)

An Annual Probable Sunlight Hours (APSH) assessment has not been undertaken as it is primarily used to assess impacts on sunlight to existing neighbouring properties, rather than internal daylighting within a proposed development.

This assessment focuses on the internal daylight performance of the proposed units following a change in window sizes, for which ADF, NSL and VSC are the most appropriate and relevant methodologies. As there are no material changes to the building massing or orientation, and no identified impacts on surrounding sensitive receptors, an APSH assessment is not considered necessary or proportionate in this instance.

Results Summary

INTERNAL DAYLIGHT ASSESSMENT – AV. DAYLIGHT FACTOR (ADF) & NO SKYLINE (NSL)

The daylight assessment was carried out for a sample of habitable rooms, including living rooms, kitchens, and bedrooms.

The BRE guide recommends an ADF of 2.0% for kitchens, 1.5% for living rooms, 1.0% for bedrooms and at least 80% of the working plane that receives direct skylight under the NSL criterion. It is worth noting that the kitchen/living areas are combined open living spaces therefore these have been assessed as one space for the purposes of this analysis. Therefore, a result of >1.5% would appear to be acceptable for these spaces.

TABLE 2 AVERAGE DAYLIGHT FACTOR (ADF) SUMMARY ANALYSIS RESULTS

Room type	ADF Target	Rooms that meet ADF target
Living / Kitchen	1.5%	100% of sample
Bedrooms	1%	100% of sample

TABLE 3 AVERAGE DAYLIGHT FACTOR (ADF) FULL ANALYSIS RESULTS

Room Type	ADF results %	Pass/Fail
LT000035	1.9	Pass
LT000002B	2.0	Pass
LT00004D	1.5	Pass
LT00006D	1.9	Pass
LT000072	3.5	Pass
LT000077	2.2	Pass
LT00007C	2.7	Pass
LT00007F	1.8	Pass
LT000086	2.1	Pass
LT00008A	2.0	Pass
LT00008E	2.9	Pass
LT000116	2.9	Pass
LT000123	1.9	Pass
LT000141	4.2	Pass
LT00003D	2.2	Pass
LT000014	1.7	Pass
LT00011E	2.9	Pass
LT000143	2.1	Pass
LT000007	1.9	Pass

TABLE 4 NO SKYLINE (NSL) FULL ANALYSIS RESULTS

Room Type	NSL	Pass/Fail
LT000035	0.87	Pass
LT000002B	0.94	Pass
LT00004D	0.83	Pass
LT00006D	0.89	Pass
LT000072	0.99	Pass
LT000077	0.88	Pass
LT00007C	1.0	Pass
LT00007F	0.84	Pass
LT000086	0.9	Pass
LT00008A	0.93	Pass
LT00008E	0.91	Pass
LT000116	0.94	Pass
LT000123	0.98	Pass
LT000141	0.96	Pass
LT00003D	0.81	Pass
LT000014	0.85	Pass
LT00011E	1.0	Pass

When applying the recommended assessment methodologies, the ADF assessment results indicate all sampled rooms exceed the criteria outlined in the BRE and British Standard guidance. The compliance for the primary living spaces is considered good for a modern apartment development given the location, orientation, and balcony shading.

The internal daylight analysis for the Proposed Development shows that all the assessed rooms exceed the industry guidance recommendations. As a result, it can be concluded that the Development will generally receive sufficient daylight, contributing to the health, wellbeing, and productivity of the occupants.

It is noted that the BRE guidance is intended to be applied flexibly and with professional judgement, particularly within constrained urban locations. Where daylight targets are met with limited flexibility, this is considered reasonable given the town-centre context of the site, the presence of balconies, and the need to balance daylight provision against other design considerations such as privacy, overheating risk and architectural quality. Overall, the achieved results are considered appropriate and robust for a development of this nature and location.

VERTICAL SKY COMPONENT

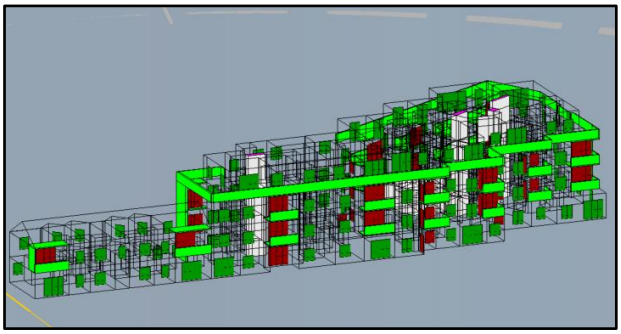
The VSC was conducted for a sample of rooms. The full set of results are shown below on all varying orientations.

As per the BRE guidance, a VSC value of at least 27% on a façade with conventionally sized openings is expected to result in sufficient access to daylight for the respective room. The maximum value is almost 40% for a completely unobstructed vertical wall.

TABLE 5: VERTICAL SKY COMPONENT (VSC) FULL ANALYSIS RESULTS

	Average Vertical Sky Component	Pass/Fail
LT000035	40.5	Pass
LT000002B	40	Pass
LT00004D	34	Pass
LT00006D	39	Pass
LT000072	39	Pass
LT000077	39.9	Pass
LT00007C	40.1	Pass
LT00007F	40.1	Pass
LT000086	36.9	Pass
LT00008A	39.9	Pass
LT00008E	40.2	Pass
LT000116	40.0	Pass
LT000123	31	Pass
LT000141	39	Pass
LT00003D	39.2	Pass
LT000014	37.4	Pass
LT00011E	38.7	Pass
LT000143	36.9	Pass
LT000007	40	Pass

FIGURE 4: 3D MODEL WITH VSC RESULTS



All facades achieve good levels of VSC. The living and bedrooms spaces with balconies and associated shading elements achieve lower levels of VSC. These factors significantly obstruct sky visibility, limiting the amount of natural daylight reaching lower-level windows and courtyard areas, resulting in reduced VSC values.

Conclusions

Futura Bright has undertaken a detailed Daylight and Sunlight Assessment for the proposed development at 10–12 Latimer Road on behalf of Doswell Developments. The calculations and report assess the impact of the revised window sizes on internal daylight performance. The assessment has been carried out in accordance with the BRE guidance "Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice" (2022) and BS EN 17037.

A representative sample of habitable rooms, including living/kitchen spaces and bedrooms, has been assessed using Vertical Sky Component (VSC), Average Daylight Factor (ADF) and No Skyline (NSL) methodologies.

The results demonstrate that:

- All sampled living and bedroom spaces achieve or exceed the recommended ADF targets, with 100% of assessed rooms passing.
- All assessed rooms meet the NSL criterion, indicating an acceptable distribution of daylight across the working plane.
- The VSC analysis confirms that the assessed façades achieve values well in excess of the BRE target of 27%, indicating good access to diffuse daylight.

While balconies and overhangs do reduce daylight availability in some locations, particularly at lower levels and in courtyard-facing rooms, this is an expected characteristic of a dense urban residential development. Notwithstanding these constraints, the results show a strong level of overall compliance with BRE guidance.

On this basis, it is concluded that the proposed development will receive adequate levels of daylight and sunlight, and that the change in window sizes from the original design does not result in any material adverse impact on internal daylighting. The scheme is therefore considered acceptable in daylight and sunlight terms and compliant with the intent of relevant planning guidance.

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