EALCONSULT Building Sustainability

Site Address:

85 Camden Street, London, NW1 0TP

DAYLIGHT, SUNLIGHT & OVERSHADOWING ASSESSMENT

PREPARED By EAL Consult

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EXECUTIVE SUMMARY

This daylight, sunlight and overshadowing assessment has been prepared to support the Planning Application for the proposed development at 85 Camden Street, London, NWl 0TP. This assessment should be consulted in conjunction with the accompanied planning drawings.

The primary purpose of this daylight, sunlight and overshadowing assessment is to determine the likely loss of light to adjacent buildings resulting from the construction of the proposed development and to conclude whether the proposed rooms will receive sufficient daylight levels. Therefore, the proposed development can be identified as the potential source of impact.

The main objective to carry out this Daylight & Sunlight assessment is to:

• Assess the impact of the proposed development upon the current levels of sunlight &daylight being enjoyed by the existing surrounding buildings.

• Determine the daylight levels in all habitable rooms for the proposed residential dwelling, in order to provide high standards of living to its future occupants.

The methodology set out in this report is in accordance with BRE's 'Site layout Planning for Daylight and Sunlight' 2nd edition 2011, which is accepted as good practice by Planning Authorities.

The following assessments were carried out:

Daylight &Sunlight Assessment

• **Existing neighbouring properties**

a. Vertical Sky Component
b. Annual Probability of Sunlight Hours (APSH) annual and winter calculations

Daylight &Sunlight Assessment

• **Proposed dwelling -Daylight into Proposed Windows**

An assessment of daylight into rooms within the proposed development has been carried out. This is to ensure future residents will benefit from the well-being of adequately daylit rooms. This will include the calculations of:
a. Average Daylight Factor levels for each habitable room (kitchen, dining room and bedrooms)

Neighbouring properties were identified which may be impacted upon by the proposed residential units located next to the proposed site.

The assessment of daylight and sunlight to the surrounding residential properties indicates that the proposal will not cause a noticeable change in light levels to existing occupants. The final analysis also showed that the proposed habitable internal spaces of the residential scheme will achieve all the minimum daylight factor standards set by BRE and will be adequately daylit.

No open spaces were identified that could be affected by the proposed residential scheme.

The Autodesk Ecotect software was used to carry out the daylight, sunlight and overshadowing impact assessment.

A 3-dimensional site model has been created from information supplied by the architect, drawings, including location and site plan, existing and proposed drawings.

TERMS AND DEFINITIONS

Average Daylight Factor (ADF) The average daylight factor is the average indoor illuminance (from daylight) on the working plane within a room, expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane under an unobstructed elE 'standard overcast sky'.

CIE Standard Overcast Sky A completely overcast sky for which the ratio of its illuminance Ly at an angle of elevation y above the horizontal to the luminance Lz at the zenith is given by: Ly=Lz (1+2siny) /3 A elE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead).

No-Sky Line The no-sky line divides those areas of the working plane which can receive direct light from the sky, from those which cannot. It is important as it indicates how good the distribution of daylight is in a room. Areas beyond the no-sky line will generally look gloomy. As an approximation, obstructions that are parallel to the window can be considered infinite.

Working Plane The working plane is a notional surface, typically at about desk or table height, at which daylight factor or the 'no-sky line' is calculated or plotted.

For the purpose of assessing useful daylight, a working plane of 850mm above finished floor level is assumed. It is generally expected that ceiling heights will not fall below 2.4m.

Obstruction Angle The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

Probable Sunlight Hours The long-term average of the total number of hours during a year in which direct sunlight reaches the unobstructed ground (when clouds are taken into account).

Sky Factor Sky Factor is the ratio of the parts of illuminance at a point on a given plane that would be received directly through unglazed openings from a sky of uniform luminance, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. The sky factor does not include reflected light, either from outdoor or indoor surfaces.

Vertical Sky Component (VSC) Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a elE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky.

Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from the buildings.

CURRENT POLICIES, REGULATIONS AND BENCHMARKS

Regulations

European workplace directive -Assess to daylight required

Building Regulations -No minimum daylight standards

Like UK, many other countries have some planning regulations that affect daylight but are not necessarily found as a daylighting regulation. However there is some demand from the planning authorities in these areas (e.g. City of Westminster in London) for improved guide lines, possibly based on typical daylight access in particular city zones.

Rights of Light

In UK, "Rights of Light" legally protects individuals against newly constructed neighbouring properties and extensions that may affect their daylighting. It has been defined in terms of the position of the 0.2% Sky Factor Contour.

Standards

- BS 8206-2 2008 Code of Practice for Daylighting
- Building Bulletin 87 -Guidelines for Environmental Design in Schools
- Building Bulletin 90 -Lighting Design for Schools
- Building Bulletin 95 -Designing Schools for the future
- CIBSE LG2 -Lighting for Healthcare buildings

Guides

- CIBSE SLL Daylighting and Window Design LG10 1999
- BRE Designing Buildings for Daylight
- BRE Designing with Innovative Daylighting
- 3-5 Benchmarks
- Code of Sustainable Homes
- BREEAM
- LEED

Recommendations as to daylight in domestic buildings are to be found in the British Standard BS 8206-02 (BSI, 2002) on Lighting, specifically the section on day lighting, in the publications of the CIBSE and in the publication of BRE (1,2,3).

The recommendations for internal spaces are expressed in three ways:

- A minimum average Daylight Factor (2% for Kitchen, 1.5% for living Rooms and 1% for Bed Rooms)
- The position of the No-Sky Line at working plane height (0.85m). If the area beyond the No-Skyline is more than 50% the room will look gloomy
- Limiting Depth Criteria

To put the first recommendation in context, a room with an average daylight factor of more than 5% is regarded as well daylit, that is electric lights would be used infrequently during daylight hours, but if it is below 2% electric lights would be used frequently. The requirements are therefore minimal. These recommendations are illumination based so orientation is not considered a factor. As the perception of how well a space is daylit may be influenced by the factors orientation, shading control and view hence the orientation factor can be used to reflect the higher levels of illuminance on the South facade.

In regard to a new building affecting an existing recommendations have an origin in solar access in the UK. The new building should not reduce the Vertical Sky Component (VSC) below 27% or if it does it should not reduce it by more than 20%. Where there is horizontally facing Window/skylight VSC can be up to 40%.

In most city centres the Vertical Sky Component is already below 27% at many windows of Building. Planning Authorities have tended to use the 20% reduction guideline when assessing planning permission in such areas which unfortunately has its drawbacks, leading to creeping increased heights in urban areas reducing daylight access.

METHODOLOGY

BRE Guide: Site Layout Planning for Daylight and Sunlight, 2011

This assessment would be based on the various numerical tests laid out in the Building Research Establishment (BRE) Guidelines "Site Layout Planning for Daylight and Sunlight: a good practice guide" 2011. It is important to note that BRE tests in general are based on the requirements of the BS Standards 8206 Part 2.

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

The first step in the methodology is to determine the key sensitive receptors, which windows may be affected by the existing buildings. Key receptors are windows directly facing and located perpendicular -to the site.

Existing Buildings

Using simple geometry, it will be determined whether the daylight to existing buildings and amenity spaces is adversely affected and this will be done using 25 degree and 45 degree methods.

If new buildings are set out in accordance with the 25 degree method for daylight, this will be sufficient to show that the sunlight to the existing buildings will not be adversely affected.

If these two methods of assessments are satisfied, this will be sufficient in showing that the day lighting to existing buildings and their amenity spaces will not be adversely affected by the new development.

Calculation Method of Daylight to Surrounding Windows

A plane is drawn at 25 degrees from the horizontal, at the centre of an existing window. If a new development intersects with this plane, the internal daylight levels of the surrounding windows may be reduced. When an obstruction of the 25 degree plane occurs, a more detailed assessment involving the Vertical Sky Component of the affected window would need to be carried out.

Calculation Method of Vertical Sky Component (VSC)

The Vertical Sky Component is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. To maintain good levels of daylight, the Vertical Sky Component of a window needs to be 27% or greater. If the VSC is less than 27%, then a comparison of existing and proposed levels of VSC level would need to be calculated.

VSC can be determined by calculating the Obstruction angle: **Obstruction Angle= tan-l (HID)**

Where H is the height of the obstruction above the middle of the window and 0 is the horizontal distance from the window to the obstruction.

Good levels of daylighting can still be achieved if VSC levels are within 0.8 of their former value. Otherwise, the Average Daylight Factor of the internal rooms would need to be calculated.

Calculation Method of No-Sky Line

The no-sky line test involves the calculation of percentage of a room's area which can receive direct skylight. Diffuse daylight is likely to be adversely affected if after the development the area of a room receiving direct skylight is 0.8 times its former value.

The depth of no-sky line (d) is calculated as: d=X(H/Y)

Where X is the distance from the outside wall to the obstruction, His height of the window head above the working plane and Yis the height of obstruction above the window head.

From the depth of no-skyline we can calculate liThe percentage of working plane that receives direct light from the sky (D)" which can be calculated as: D= (d/rd) x 100

Where d is the depth of no-skyline and rd is the room depth.

Calculation Method of Limiting Depth Criteria

Where all conditions are required to be satisfied for good day-lighting in major rooms of the proposed development, once ADF calculated, Limiting Depth criteria can be determined by the ratio between the ADF in the front half of the room and the rear half. This should not exceed 3. If a significant area of the working plane lies beyond the no-skyline then the distribution of the daylight in the space will look poor.

Limiting Depth Criteria can be calculated as: L/W+L/H should be less than /

equal to 2/(1-R)

Where L is the depth of the room from the window to the back wall, W is the width of the room measured parallel to the window, H is the height of the window head above the floor level and R is area weighted average reflectance of the room surfaces (walls, floors and ceiling).

Calculation Method of Average Daylight Factor (ADF)

The calculation of ADF takes into account a range of variables e.g size of the window, area of room surfaces, type of glazing, number of windows in a room and factors such as reflectivity of the internal finishes.

BRE Formula to calculate Daylight Factor (OF): OF =(M x W x 0 x T) / [A x (1-R2)]

Where M is correction factor for dirt, W is total glazed area of windows or roof lights, 0 is angle of visible sky, T is transmission factor of glazing, A is total area of all the room surfaces (ceiling, floor, walls and windows) and R is area weighted average reflectance of the room surfaces (walls, floor and ceiling).

Guide Values

Guide values for a typical dwelling with light-coloured walls are as follows:

- Area weighted average reflectance of the room surfaces: R = O.S
- Correction factor for dirt: M = 1.0 (vertical glazing that can be cleaned easily) M =0.8 (sloping glazing) M =0.7 (horizontal glazing)
- Transmission factor of glazing: T =0.7 (double glazing) T =0.6 (double glazing with low emissivity coating) T = 0.6 (triple glazing)
- Angle of visible sky u = 65° (vertical glazing)(default value when there are no obstructions)

Angle of Visible Sky: For rooms with obstructions were calculated taking into account the Distance from Obstruction and Obstruction Height in order to calculate the a and b. Then u =90 -a -b

Assumptions for the proposed dwelling

The following assumptions were made during the calculation of the ADFs:

- Area-weighted average reflectance of the room surfaces, R = 0.5
- A correction factor for dirt, M = 1.0 (vertical glazing)
- Glass transmission factor, T = 0.7 (Double glazing)

SITE

The proposed site is located in a predominantly residential area and therefore, a daylight and sunlight assessment was undertaken to determine the potential impact of the proposed development on these neighbouring areas.

The proposal includes the redevelopment of the existing building and the construction of one residential unit by extending the existing building to the West side. The proposed 3 storey dwelling will have the same volume as the existing building.

Only one residential neighbouring property was identified that could possibly be affected from the new residential scheme, located next to the proposed site.

Figure 1 - Site Location

Figure 2 - Neighbouring Property

Possibly affected properties/neighbouring windows:

Properties located on Camden Street

• 7 windows were identified at No 87 Camden Street

Properties located on Pratt Street

• No windows were identified at No 55 Pratt Street

Figure 3 - Windows located on neighbouring property – 87 Camden Street

Windows identified at No 87 Camden Street:

• lwin - GF Level

• 2win - FF Level

• 2win - SF Level

• 2win - TF Level

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DAYLIGHT & SUNLIGHT ASSESSMENT

Vertical Sky Component (VSC)

VSC analysis of each window was carried out. The results are listed in the following pages. If the VSC is greater than 27%, then enough skylight should still be reaching the window and the levels of daylight experienced in the space should not be seriously affected.

Vertical Sky Component Assessment

Table 1 – Vertical Sky Component for the existing properties, Post development

Vertical Sky Component		Pre development	Post development	VSC after Proposal
Assessed neighbouring property:	Window no.	BRE VSC %	BRE VSC %	>27
87 Camden Street	Ground Floor			
	Win01	19.2	18.9	No
	1st Floor			
	Win02	16.0	16.4	No
	Win03	15.8	16.2	No
	2nd Floor			
	Win04	19.5	19.8	No
	Win05	19.0	19.5	No
	Top Floor			
	Win06	25.6	25.9	No
	Win07	25.5	25.8	No

Results show that the Vertical Sky Component for all windows is less than the recommended value of 27%. Therefore, the proposed residential scheme is considered appropriate for the specific site.

Sunlight Assessment - Annual Probable Sunlight Hours

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

For sunlight studies the APSH (annual probable hours) test calculates the percentage of statistically probable hours of sunlight received by each window in both the summer and winter months. From March 21st to September 21st - Summer period and from the 21st September to 21st of March - Winter period.

Sunlight is measured using a sun indicator which contains 100 spots, each representing 1% of APSH. Therefore, where no obstruction exists the total annual probable sunlight hours would amount to 1486 and therefore each spot equates to 14.86 hours of the total annual sunlight hours.

Following are the recommended Sunlight hours for london. Total recommended sunlight hours:

= 25% of APSH for London

= 25% of 1468hrs

= (25/100) x 1486

= 371.5hrs/yr

Recommended sunlight hours for winter

= 5% of APSH for London

= 5% of 1486hrs

= (5/100) x 1486

= 74.3hrs/yr

Table 2 – Annual Probable Sunlight Hours for existing properties, after the proposed development

Annual Probable Sunlight Hours		Post development
Assessed neighbouring property:	**Window no.**	**>371.5hrs**
85 Camden Street	**Ground Floor**	
	Win01	Yes
	1st Floor	
	Win02	Yes
	Win03	Yes
	2nd Floor	
	Win04	Yes
	Win05	Yes
	Top Floor	
	Win06	Yes
	Win07	Yes

Results show that all neighbouring windows will receive the recommended sunlight hours throughout the year.

Calculations below demonstrate if the windows will also achieve the recommended sunlight hours during the winter period.

Table 3 – Winter Probable Sunlight Hours for existing properties, after the proposed development

Winter Probable Sunlight Hours		Post development
Assessed neighbouring property:	**Window no.**	**>74.3hrs**
85 Camden Street	**Ground Floor**	
	Win01	Yes
	1st Floor	
	Win02	Yes
	Win03	Yes
	2nd Floor	
	Win04	Yes
	Win05	Yes
	Top Floor	
	Win06	Yes
	Win07	Yes

Results show that all windows will achieve the recommended 74.3hours of sunlight during the winter period.

DAYLIGHT ASSESSMENT: PROPOSED HABITABLE ROOMS

The kitchen, living room and bedrooms have been assessed in order to demonstrate the Average Daylight Factor for each room.

The following calculations are based on the assumption values stated on page 11 and the following drawings:

• Proposed Floor Plans

• Proposed Elevations

The ADF takes into account the angle of visible sky reaching the window, as well as the following factors:

• Window size, frame factor and maintenance,

• The number of windows available to the room,

• Room size, use and layout, and

• Room surface reflectance

Average Daylight Factor (AOF) - Proposed Rooms

The proposed habitable rooms should achieve the following minimum standards:

• Bedrooms - Average Daylight Factor: 1%

• living/Dining Rooms - Average Daylight Factor: 1.5%

• Kitchens - Average Daylight Factor: 2%

Table 4 - Daylight Assessment – Proposed Dwelling – 87 Camden Street

	Room Type	ADF	Pass
Basement	Dining/Kitchen	2.95%	Yes
Ground Floor	Bedroom 01	2.10%	Yes
First Floor	Bedroom 02	1.45%	Yes
Second Floor	Bedroom 03	1.50%	Yes
Third Floor	Bedroom 04	1.85%	Yes

The results show that all proposed habitable rooms meet the required Average Daylight Factor.

CONCLUSION

From initial assessment one existing neighbouring property was identified that could be affected from the proposed development. Calculations confirmed that the existing property will still receive adequate annual probable sunlight hours and adequate sunlight hours during the winter period.

Calculations demonstrate that the Vertical Sky Component for the 7 neighbouring windows is less than the recommended value of 27% both at pre and post construction phase. Therefore, the proposed development can still be considered appropriate and acceptable for the proposed site.

An open space/garden was not identified and therefore, an overshadowing assessment was not carried out.

The assessment of daylight and sunlight to the surrounding properties indicates that the proposal will not cause a change in light levels to existing occupants.

The proposed dwelling has been designed with care, achieving as much daylight levels as possible.

The Daylight Factors (DFs) were calculated for kitchen, dining room and the bedrooms.

The results show that:

a. The kitchen, dining room, bedroom 01, bedroom 02, bedroom 03 and bedroom 04 achieve the minimum daylight levels.

Specifically:

Summary of Results		
Basement	ADF	Requirement
Dining/Kitchen	2.95%	>2%
GF		
Bedroom 01	2.10%	>1%
FF		
Bedroom 02	1.45%	>1%
SF		
Bedroom 03	1.50%	>1%
TF		
Bedroom 04	1.85%	>1%

The proposed dwelling should be considered appropriate for the site, as it complies with the living standards by exceeding the minimum daylight levels. Future occupiers will be able to enjoy internal habitable spaces.

It is worth noting that the daylight standards are for guidance and their purpose is to encourage good daylight levels within a dwelling as a whole. In this development the daylight levels have achieve a satisfactory result.