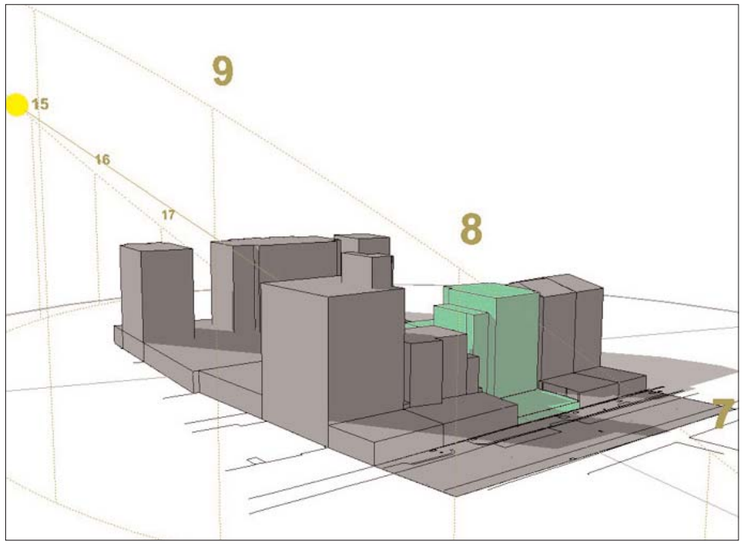
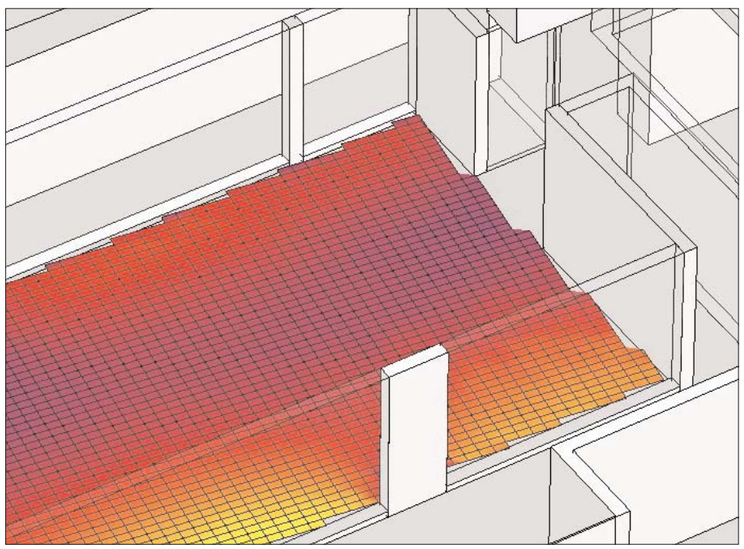
35 Upper Park Road

Daylighting Impact Assessment
Internal Daylighting Analysis

For the Heder Partnership
September 2006





XCO2 1-5 Offord Street London N1 1DH Tel: (020) 7700 1000 Fax: (020) 7700 4455 mail@xco2.com www.xco2.com

Part 1 - Daylighting Study

Executive Summary

The proposed demolition of an existing three-storey house and construction of a six-storey apartment building on 35 Upper Park Road will in general create a negligible impact on the daylighting potential of the surrounding buildings as measured using the guidelines set out in the BRE document 'Site Layout Planning for Sunlight and Daylight'.

The impact on skylight and sunlight have been assessed using the methodology set out in the BRE guidelines, which are accepted to be the relevant targets and definitions in the UK. This assessment has been completed determining angles of visual access to sky and the demonstration of shadow impacts. The completion of a Vertical Sky Component analysis was not necessary due to the lack of windows on facades facing the project site. Although additional assessments can be completed to augment these results, they were required here as the results from the first assessments were considered to be conclusive enough.

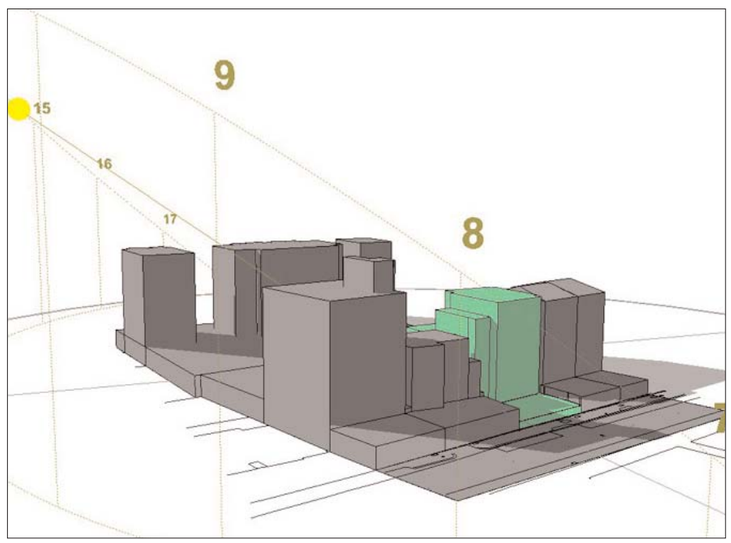
The overshadowing assessment indicates that the proposed building will create a limited amount of additional over-shadowing to the surrounding buildings, with limited impact on neighbouring properties. The additional shading created by the proposed development, falls for the majority of the year within the shadows of the existing buildings on the site.

The shading analysis indicates that any additional shading will not impact upon the minimum required amount of sunlight access for the adjacent open spaces. Although additional shadows will be cast on the property directly to the North on March 21st (Spring Equinox) , the portion of that open space with no sunlight on that day will be about 15%, therefore less than the 25% maximum recommended by the BRE.

In short, based on XCO2's analysis using the information provided to us by the architect and the methodology set forth in the BRE guidelines, the new development has only a negligible impact on daylight and sunlight levels of the neighbouring properties (house numbers 33 and 37).

Finally, it is worth noting that although the BRE guidelines are commonly cited by planning authorities as the standards that should be achieved, the same document also clearly states that the guidelines are intended to provide assistance in the development of viable building and site design, rather than as an instrument of the planning process. Paul Littlefair, the author of the BRE guidelines writes:

'The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and this document 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 because natural lighting is only one of many factors in site layout design'.



A view of the 3D computer model used in this assessment

Introduction

XCO2 were commissioned to complete a daylighting study of a proposed six-storey (including one basement) apartment building where currently a three-storey house stands at 35 Upper Park Road, to assess its impact on the internal daylighting potential of surrounding premises, in particular, the residential buildings (numbers 33 and 37) adjacent to it and another one located West of it. This report details the results from analysis used to determine the likely impacts of the proposed scheme.

As outlined by the site plan to the right, the proposed development occupies most of the rear of the site, although the majority of which is one storey above street level, and to the level of the backyard of the building directly to the west. Therefore, significant shadow effects will only come from the area roughly aligned with the neighbouring buildings, at the front of the site. Additionally, although there is a difference of two above-ground storeys between the existing and the proposed development, the existing building is set about three metres above street level, while the proposed development is aligned at street level. As a result, the difference in total height will be of one level only, albeit at a larger footprint.

The aim of this assessment is to determine the impact of the additional height and footprint on the adjacent buildings, with direct comparison with the existing situation to allow an objective assessment of the impact to take place. The assessment has been completed using drawings supplied by Heder Architects and a site visit by XCO2.

Methodology
Two aspects need to be analysed: Daylight and Sunlight impacts.

For *daylight* assessments, the first step in any assessment is to determine any possibly affected facades. This is done by drawing a 25-degree line from windows of any adjacent facades towards the new development. If the line intersects such development, there is a chance that such facades may be affected.

In that case, it is necessary to ascertain the vertical sky component for given reference points along such facades. Under the BRE guidelines, it is necessary to make a comparison in the vertical sky component between the existing and proposed situations. Where a new development creates a negative impact, and the impact reduces the VSC to below 27% and 0.8 times its former value. It is only when both criteria are met that the guidelines consider the negative impact to be potential serious and noticeable, at which point daylight factor calculations for neighbouring buildings would need to be carried out. This methodology reflects the requirements set out in BRE document 'Site Layout Planning for Daylight and Sunlight' by Paul Littlefair.

For *sunlight* assessments, the same 25-degree analysis and further vertical sky component analysis may be needed. Additionally, the impact on adjacent open spaces should be analysed in terms of the portion of of the space which receives no light at any time of March 21st. For that reason, a shadow study was completed to compare the likely shading impact of the proposed scheme and the existing building.

The results from this are presented on the following pages as still hourly images for the March equinox, and winter and summer solstices. These images can be used to ascertain a clear understanding of the year-round shadows created by the proposed scheme.

OS map of the area, with the existing buildings marked in grey and the proposed addition marked.


The proposed building and adjacent properties

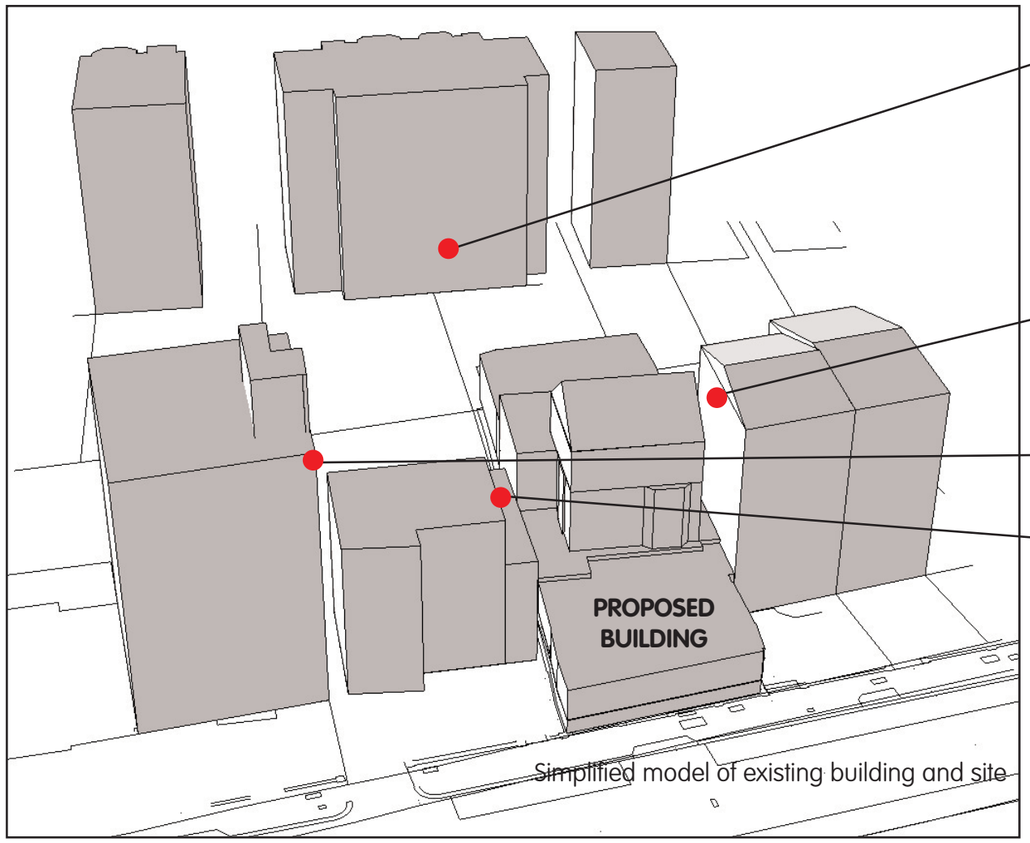
Daylight Impact

Based on a visual assessment, the properties which could be potentially affected by the proposal are the adjacent buildings on Upper Park Road and the one on Lawn Road whose backyard abuts the project site.

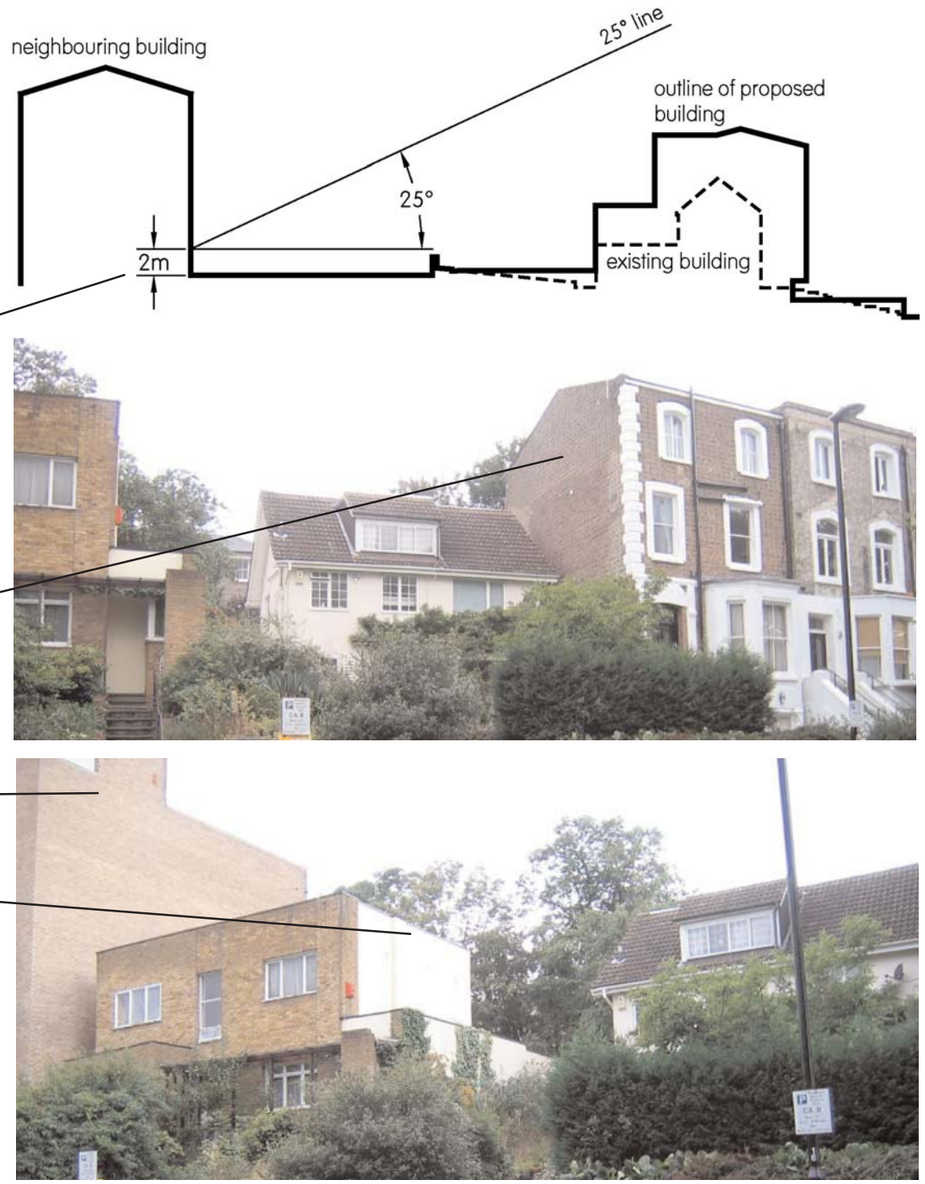
The BRE Skylight Indicators need to be calculated for any windows on potentially affected facades. However, as seen in the photographs on this page, none of the adjacent dwellings have windows facing the proposed building. Therefore, it can be concluded that the current daylighting for those properties will not be affected.

The property on Lawn Road has windows facing the proposed building, although it was not possible to ascertain their heights. Nonetheless, an indicative lowest window centre location was assumed at 2 metres above the ground (BRE's standard reference height). From that point, a 25-degree line was drawn in the direction of the proposed building, in accordance with the BRE guidance. The space above that line is not intersected by the new building; therefore, it was verified that no daylight impact occurs for that property either. Even if there are any basement windows present, it is clear from the graph to the right that these would be under no risk of being obstructed by the new development.

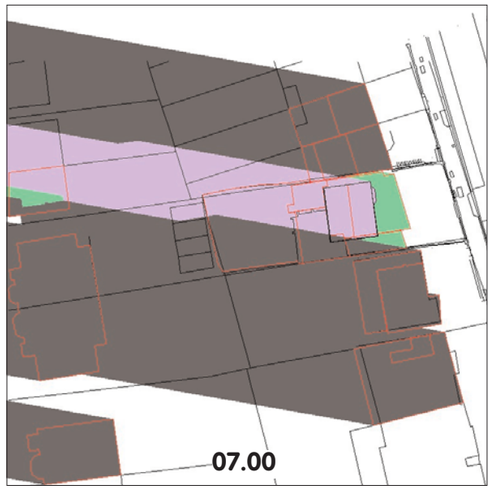
Finally, it should be noted that the site is leafy, with the presence of several deciduous trees; comparatively, those reduce the view of the sky more significantly than most of the adjacent building (Lawn Road House).

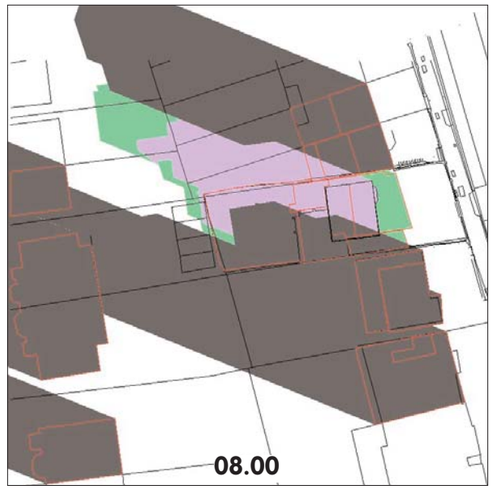


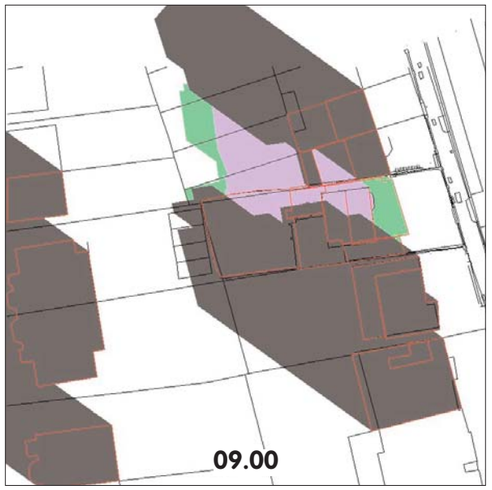
Simplified model of existing building and site

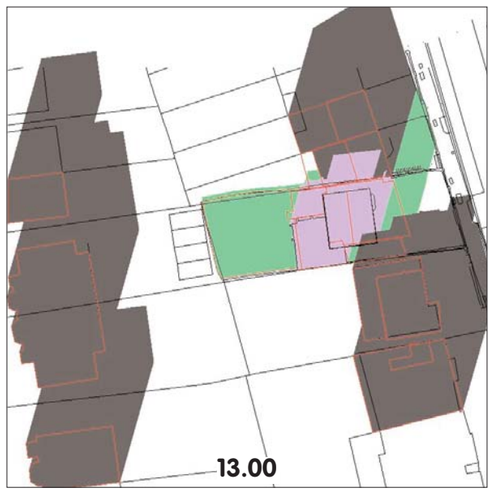


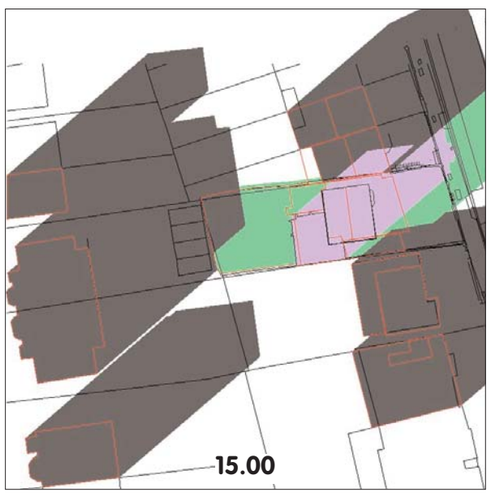
Shadow Study - March 21











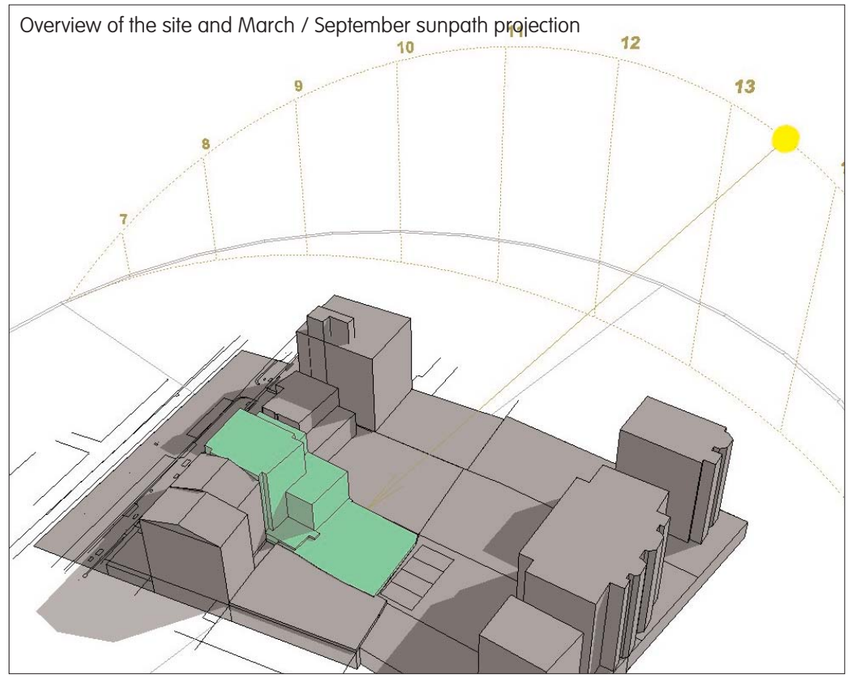
The BRE guidelines provide an assessment method for calculating the impact of a proposed development on the direct sunlight received by neighbouring properties. However, this is only considered relevant for new developments that are within 90 degrees of south of a potentially affected wall, and within the 25-degree line. Therefore, there are no facades of concern in this instance.

However, it is still necessary to analyse the sunlight impact on adjoining gardens and open spaces. The BRE guidance methodology for that consists of a shadow analysis for the equinox (March 21st). The suggestion is that no more than two-fifths and preferably no more than a quarter of such spaces should be prevented by buildings of receiving any sunlight of sun angles higher than 10 degrees to the horizontal on that day. If the area is already obstructed by existing buildings, then the area receiving sunlight should not be reduced by more than 0.8 times the former area.

In London, the 10 degree altitude is exceeded on March 21 between the hours of 8:00 and 17:00. The following images are presented to illustrate the shadows cast by all the buildings in the immediate vicinity of the proposed scheme. The shadows from the neighbouring buildings are coloured dark grey, the additional ones from the existing building, purple, and the additional shadow from the new building, green. Please note that the buildings' footprints are also shown in the same colour.

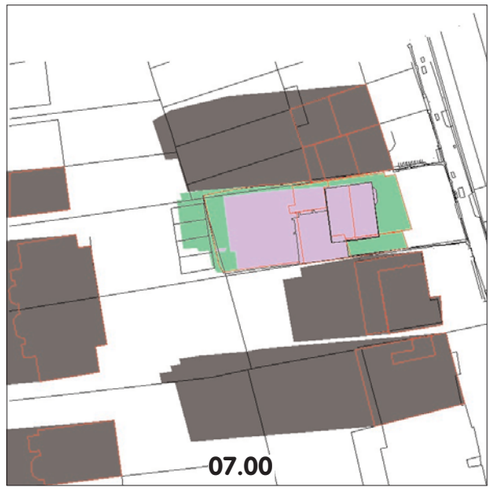
It can be seen from the images that the only property with portions of its open space overshadowed by the new building is the one directly North of it. However, as shown in the image for 14:00, only about 15% of that property is constantly shaded. Therefore, no significant sunlight impact was found.

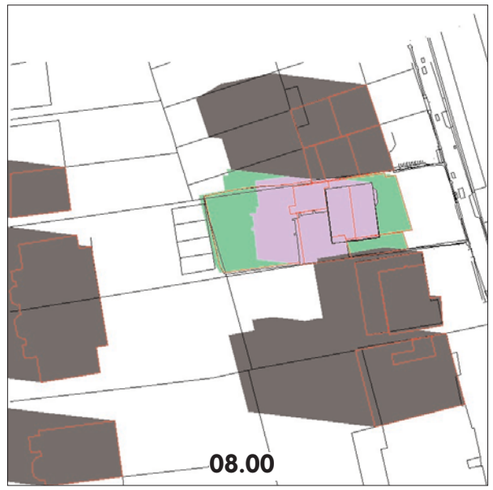
Overview of the site and March / September sunpath projection

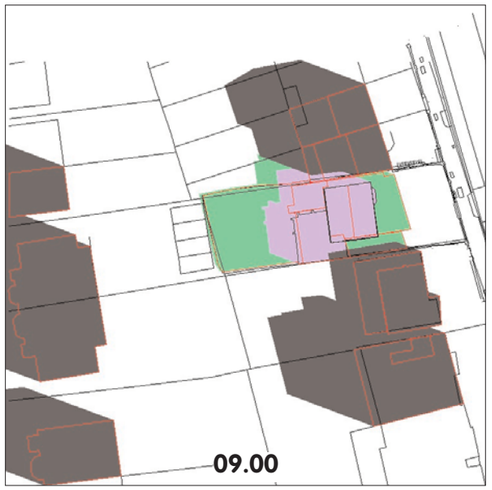


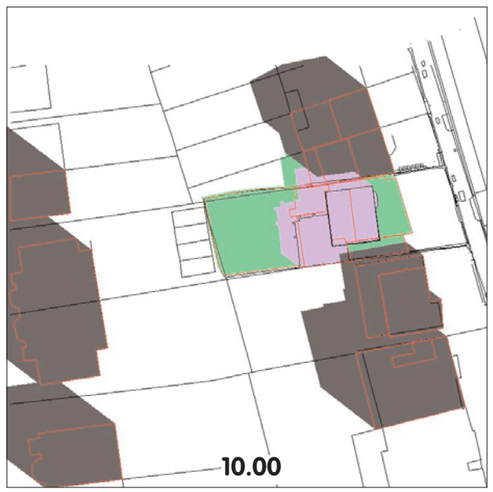
XCO2 1-5 Offord Street London N1 1DH 020 7700 1000

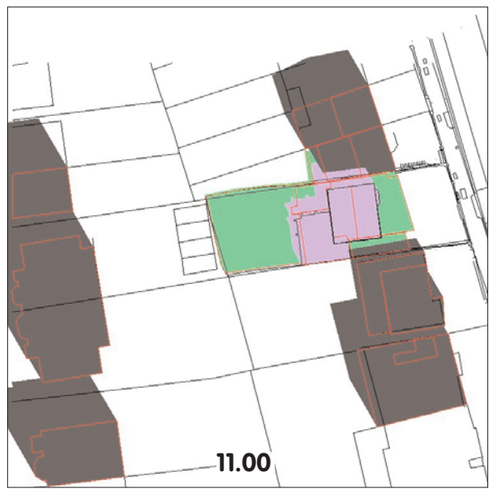
Shadow Study - June 21







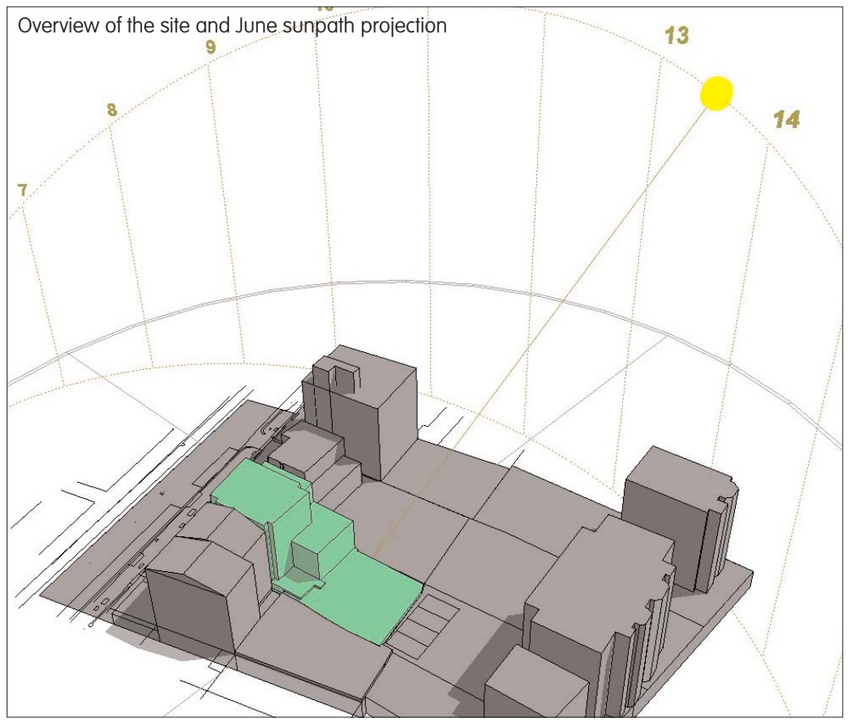




Although the assessment only needs to be carried out for the spring equinox, these diagrams are shown here to illustrate the shadows cast by all the buildings in the immediate vicinity of the proposed scheme on June 21st, (for indicative purposes only).

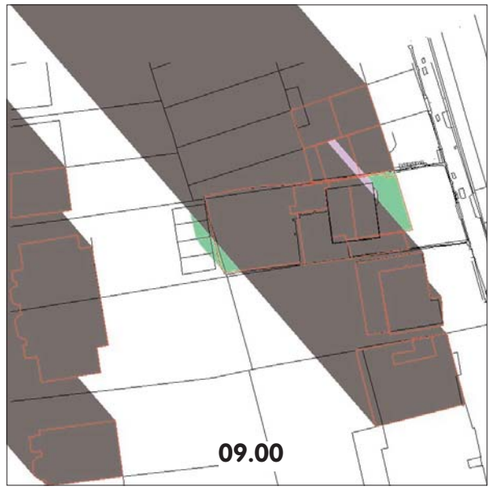
Any additional overshadowing in the summer months will be barely perceptible for most of the day, as the shadows from the proposed development fall inside of the site.

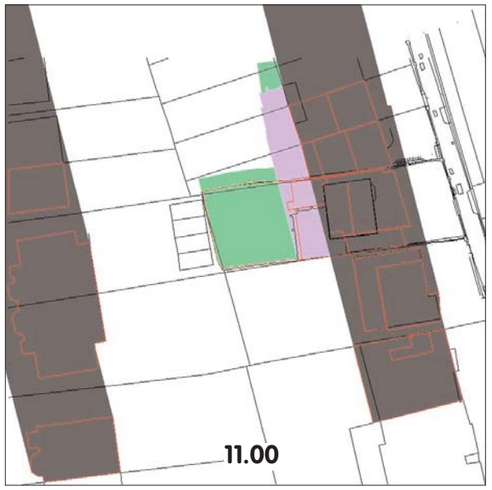
Some difference will be noticeable at dawn and dusk, but realistically, this will not form a noticeable impact for the local residents.

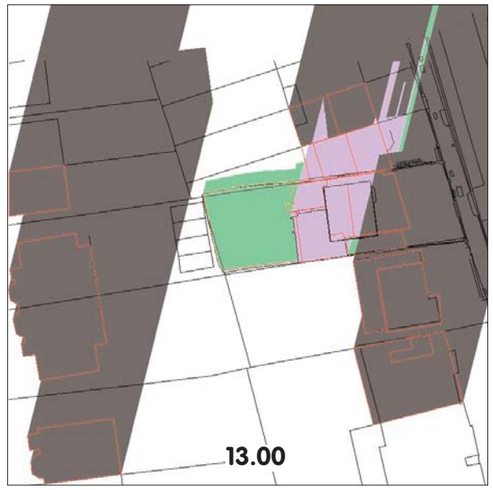


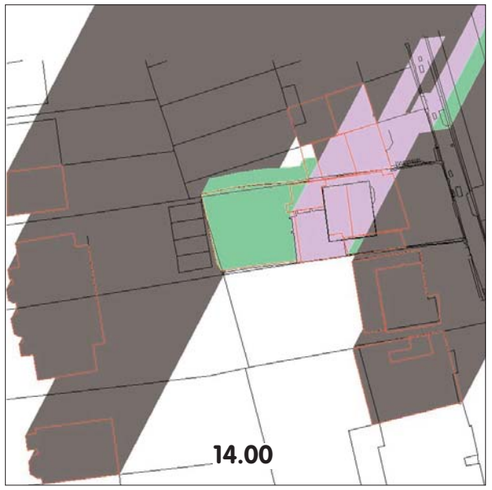
XCO2 1-5 Offord Street London N1 1DH 020 7700 1000

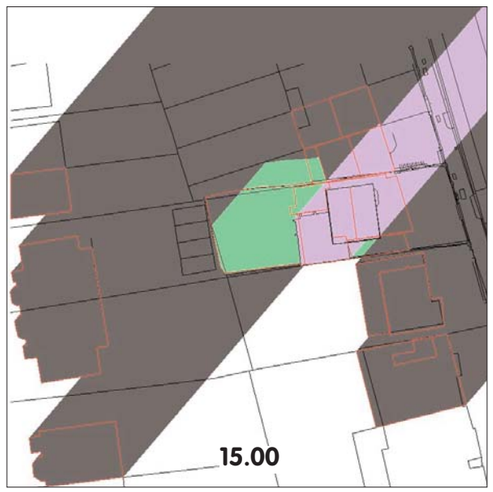
Shadow Study - December 21





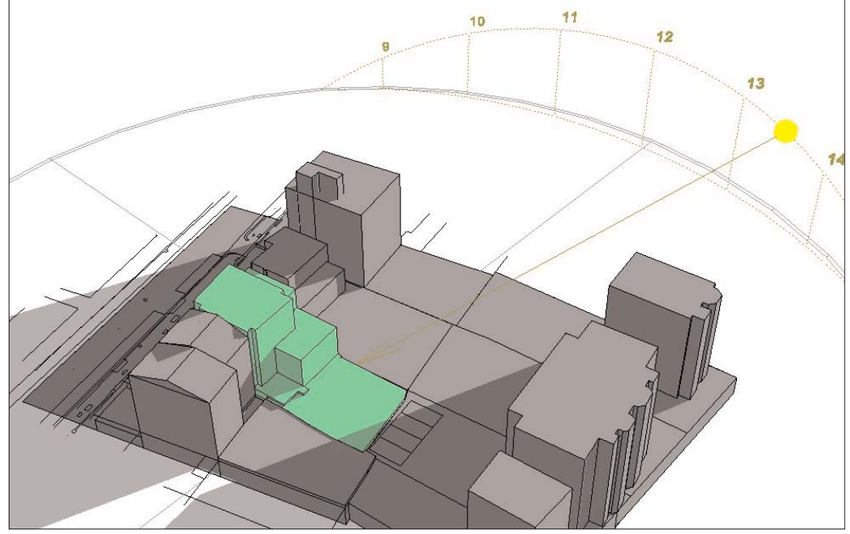






In winter, solar angles are their lowest, from the south. Therefore, the proposed scheme will introduce some limited additional shading to properties located north of it. However, given the existing shading on site from neighbouring buildings, that increase is insignificant.

Overview of the site and December sunpath projection



XCO2 1-5 Offord Street London N1 1DH 020 7700 1000

Rights to Light

Rights to light are a legal right which a property may acquire over the land of another. These rights can be acquired by legal agreement, or if the light has been enjoyed uninterrupted for at least 20 years.

The rights to light refer only to a right to a minimum level of daylighting, which is often below the levels set by the British Standards, which are the basis for the guidelines developed by the BRE. There are no rights to direct sunlight or to a view.

Therefore, a window which has rights to light, but which after development still achieves the standards set out in the BRE document is unlikely to be considered to have lost a significant level of light.

One area where this may be challenged is where the building losing the light has been specifically designed to maximise all the available daylighting potential, for example passive-solar design homes and greenhouses.

It is contended that the current proposals, in general will not create an impact on the rights to light for the adjacent existing buildings.

Part 2 - Internal Daylighting Analysis

Introduction

Daylight, in comparison to artificial lighting, is extremely efficient at providing illumination with less unwanted heat gain.

The description of internal daylight conditions is complex due to rapid and constant change throughout any given day. Internal levels of daylight can therefore only be realistically described as a ratio of external illuminance levels. In addition to this, the description of a particular sky condition, such as sunny, cloudy or partially cloudy provide insufficient accuracy. Therefore, there are a number of internationally recognised 'sky types' defined by the International Commission on Illumination (CIE) that can be used in the modelling and assessment of daylight design for buildings.

There are a number of different sky types and models; however, the three most commonly used are clear sky, overcast sky and uniform sky. Each of these skies represents a theoretical or mathematical description of a sky which can be summarised as follows:

Clear Sky
A clear blue sky with no cloud cover.

Overcast Sky
A sky with complete cloud cover, but where the zenith is theoretically three times as bright as the horizon. The brightness of the sky reflects the minimum value achieved by the given location for 80% of working hours. For London, the overcast sky is around 8500 lux for 80% of normal working hours.

Uniform Sky
A sky with complete cloud cover, but where all points of the sky are of equal brightness.

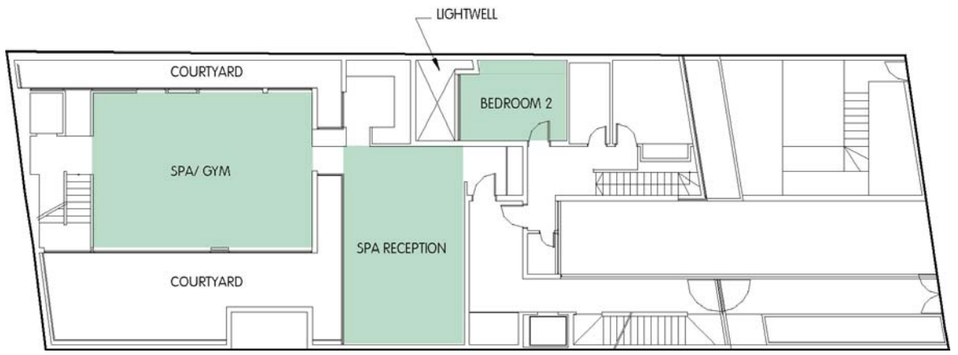
The overcast sky is used for daylight assessments when completing either, Average Daylight Factor (ADF) and Daylight Factor (DF) calculations.

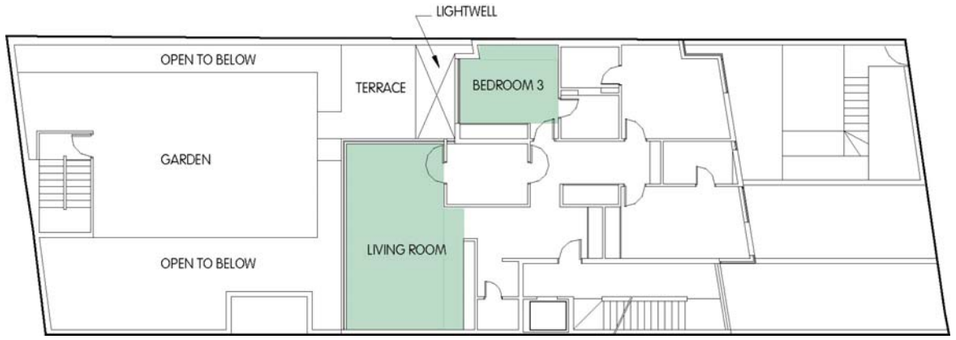
A daylight factor is a ratio, expressed as a percentage, which compares an internal level of daylight to the simultaneous external levels of illuminance as measured on an unobstructed horizontal surface, such as a flat roof. Therefore, under a 10,000 lux sky, a reference point with a daylight factor of 2% within a room will receive 200 lux.

Under most scenarios, the daylight factor is used under an overcast sky to determine a worst case scenario for internal daylight availability. The images show here are internal daylight factor under an overcast sky of 8,500 lux worst case.

35 Upper Park Road Analysis
The spaces analysed for interior daylight factor were the rooms at the back of the site, which had the potential to be overshadowed due to being located at lower levels or blocked by surrounding rooms. The design team has placed lightwells and open courtyards in order to provide daylight access to those spaces, and the purpose of this analysis was to verify that the proposed space configuration allowed for acceptable daylight levels.

The rooms of potential impact are highlighted below. Results are shown on the next page.





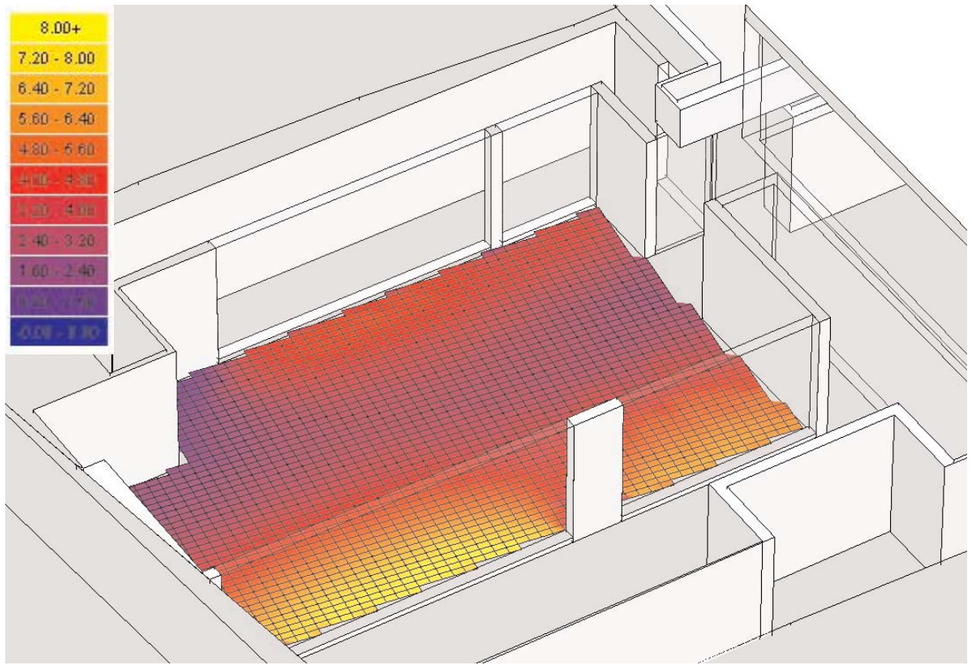
Ground Floor:
First Floor:

Daylight Factors - Ground Floor

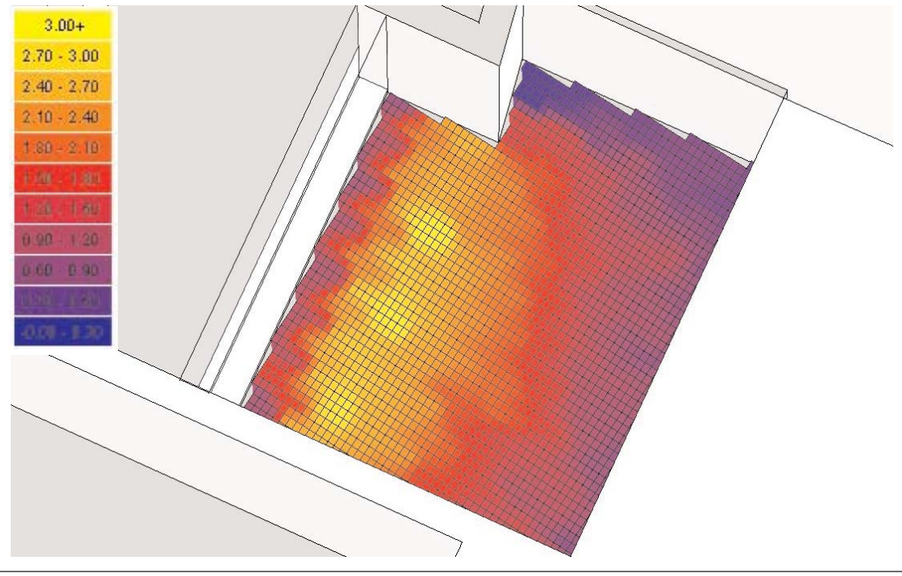
Daylight Factor *- Ratio of the illuminance at a point on a given plane due to the light received directly or indirectly from a sky of assumed or known luminance distribution, to the illuminance on a horizontal plane due to an unobstructed hemisphere of this sky.*

Gym - 9%

The space achieves an Average Daylight Factor of 9%. This is due to vast lengths of glazing on either side of the room, accessible to the interior courtyard. Although lighting levels decrease towards the interior of the space, they are above 5% in the majority of the area. The CIBSE Daylight Guide suggests that a daylight factor of 5% is suitable for a Gym type space.



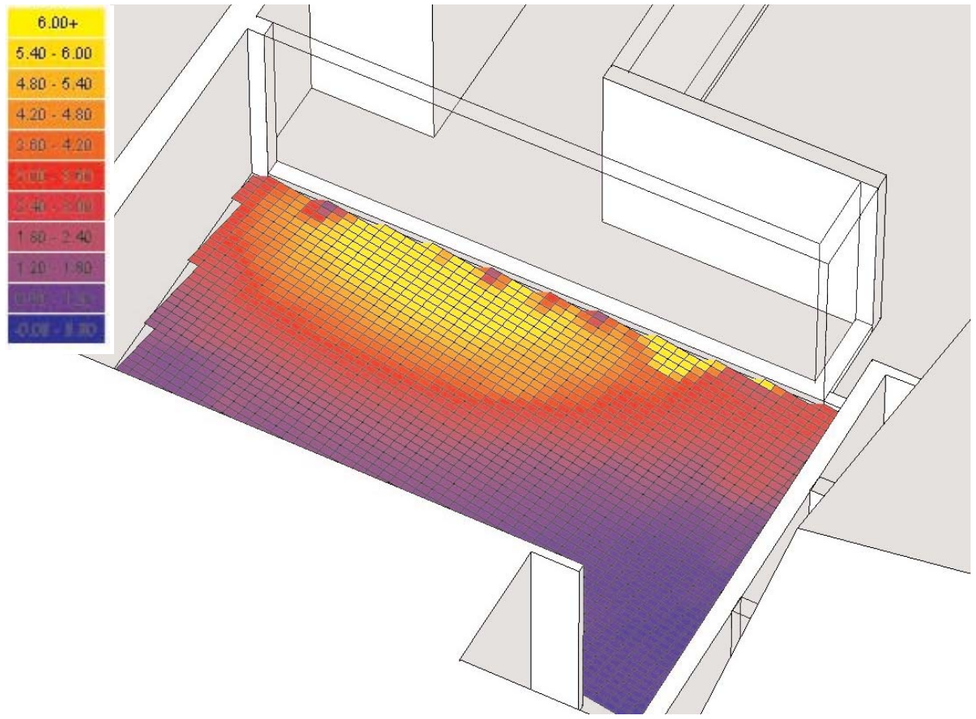
Bedroom 2 - 1.4%



The space achieves an Average Daylight Factor of 1.4%. Although daylight levels are lower farther from the window which faces the lightwell, the daylight factor exceeds 1% for the majority of the space. A minimum average daylight factor of 1% is recommended by the BS 8206 Code of Practice. Therefore, the daylight levels are acceptable.

Gym Reception - 1.85%

The space achieves an Average Daylight Factor of 1.85%. The function was assumed to be similar to that of a living room, for which BS 8206 recommendations are 1.5% Therefore, daylighting levels are acceptable. Due to the depth of the room and the one-sided natural illumination configuration, lower levels will be achieved at the back of the room. It is thus advisable to provide bright ceilings and walls in order to increase surface reflectances and increase daylight factors in that area.



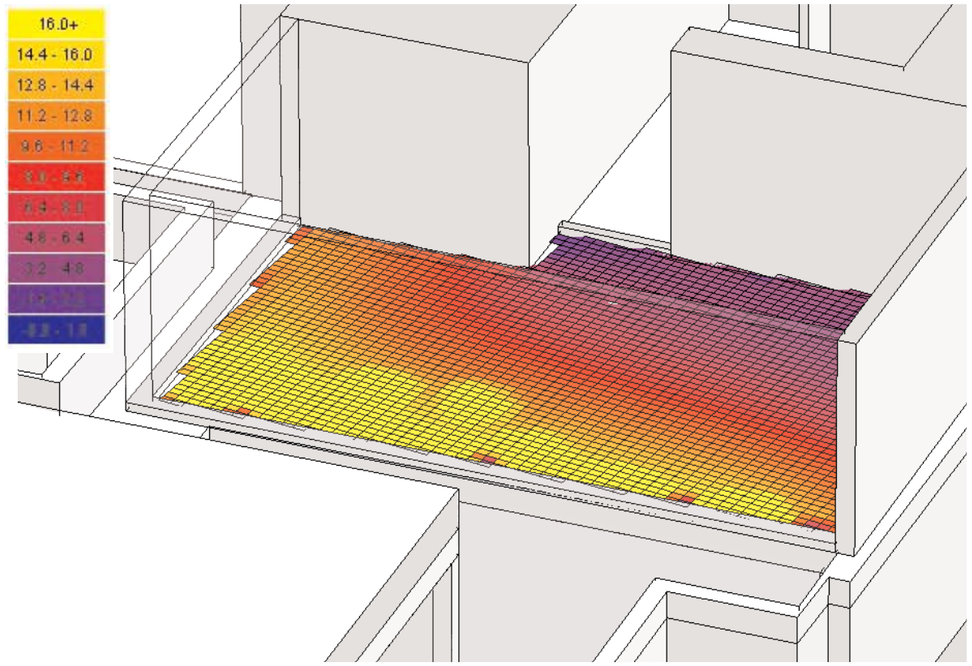
Conclusion

The rooms analysed on this level show acceptable daylight factors for their functions. Better lighting distribution can be achieved by increasing surface reflectances inside the room and outside it (e.g. the courtyard walls which face the Gym Reception window can be painted white; the same could be done to the lightwell walls and floor).

The risk of glare and overheating on this level is low, due to the mostly indirect character of light in the spaces analysed. Because of the use of the space and orientation of the glazing, the gym area may require simple south-facing horizontal louvers or overhang.

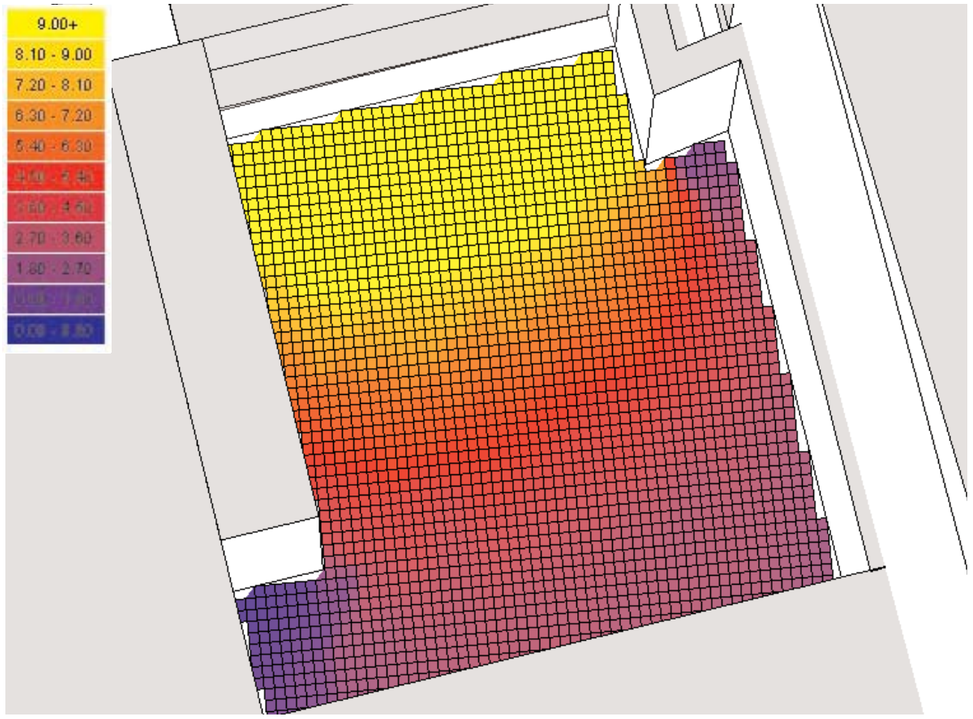
Daylight Factors - First Floor

Living Room - 9%
The space achieves an Average Daylight Factor of 9%. This high lighting level will be achieved with two full height windows which are largely unobstructed. The minimum recommended Average Daylight Factor for living rooms by the BS 8206 Code of Practice is 1.5%. Therefore, this space exceeds the recommendation even in its least lit areas.



Proper balancing of daylighting and solar radiation is crucial. Due to the large areas of exposed, West-Southwest-facing glazing, this space is particularly susceptible to direct solar radiation in the hottest time of the day and, therefore, summer overheating. It is important to provide proper shading, preferably exterior vertical fins for this orientation. This will certainly decrease the daylight levels in the space, but based on current levels, it is safe to assume that if proper shading is applied, daylight factors will remain well above minimum recommended levels.

Bedroom 3 - 5.3%
The space achieves an Average Daylight Factor of 5.3%. This is well above the minimum average daylight factor of 1% is recommended by the BS 8206 Code of Practice. Therefore, the daylight levels are acceptable. Because of partial blocking Southwest of this room, most of the light received in the space will be indirect, which will reduce the risk of glare and overheating. Nonetheless, it is recommended that some attention is given to those issues.



Conclusion

Daylighting levels for the rooms analysed on the First Floor significantly exceed minimum recommendations. This is due to limited blocking in front of this room. By proxy, it can be assumed that the rooms above this level with similar glazing-to-floor area ratio will also achieve good daylight factors, although specific calculations should be carried for such rooms if they attract any particular concerns.

Glare and overheating are issues which should be considered for this level and orientation. Although they involve design issues outside the scope of this analysis, it should be said that careful shading can satisfactorily address those issues. Additionally, the existing large deciduous tree Southwest of the building and the proposed ones on the garden level are very likely to provide good protection against summer overheating whilst allowing solar gains in winter.