Report on Daylighting and Sunlighting

Britannia Street
London
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for and on behalf of

Origin Housing Group

Date	**December 2006**
Reference	**K/06/0532/A/3 PSD/hmt/G7**

Britannia Street

Purpose of Report

I have been instructed by Mr R Earl, of Origin Housing Group, to provide a report, for planning purposes, on the availability of natural daylighting and sunlighting to the development and the impact on the availability of both to the adjoining properties, which might be caused by the proposed development

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Introduction

The client is proposing to redevelop the site of between Britannia Street and Wicklow Street up to a height of between four and five storeys. I have also been advised that the property at 7-11 Britannia Street has permission for redevelopment and we have been asked to consider the affect of this proposal on the proposed development.

It has not been possible to gain access inside the adjoining properties and so, in order to prepare our calculations, we have made assumptions regarding the probable uses of the rooms behind windows and their sizes.

If our assumptions regarding room sizes or the relative locations of windows to the room are incorrect then this will affect the results. For example if a room is not as deep as expected then the losses will be proportionately less and the Average Daylight Factor greater.

If the window is placed differently within the elevation of the room then the No Sky Line will change.

Basis of assessment

In his BRE guide to good practice on Site Layout planning for daylight and sunlight, Professor P J Littlefair sets out two methods for assessment of daylighting to dwellings and a further two methods for assessing sunlight. These are further explained in the British Standard BS 8206-2: 1992.

The three main criteria considered for daylighting are the average daylight factor, room depth and the position of the 'no-sky' line. This latter is the series of points within the room at 850mm (tabletop height) above floor level where the sky is no longer visible through the window(s).

Littlefair recommended the use of a series of reference points at a height of two metres above ground level, for new developments. If none of the surrounding obstructions subtends an angle to the horizontal (at the 2 metre reference point) of greater than 25 degrees then there will be the potential for good day-lighting in the interior and there should therefore be no need to produce further calculations to demonstrate the levels of daylighting available.

If an obstruction is taller than this then there may still be the potential to achieve a satisfactory level of daylighting if the obstruction is not continuous and is narrow enough to allow adequate daylight around its sides and here further calculations should be used.

Littlefair also describes a simple assessment using 45 degree lines in the horizontal and vertical planes from the extremities of an obstruction and where both these lines crossed above the centre of any window, then there is a likelihood that the daylighting in the room will be adversely affected. For this reason, we have concentrated on those windows, which fall within the 45-degree lines. If the results proved to be adverse for all windows in this area then our scope would be extended.

The amount of skylight falling on a vertical wall or window can be quantified as the vertical sky component (VSC). This is the ratio of direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. The maximum value is 40% for a completely unobstructed vertical wall.

For a room with non-continuous obstructions, there is the potential for good daylighting provided that the VSC at the window position, 2 metres above ground is not less than the value for a continuous obstruction of altitude 25 degrees which is equal to a VSC of 27%. This is a complex way of saying that sufficient day-lighting can be achieved by other means and the guidance suggests that if the VSC of 27% is achieved within 4 metres horizontally from any window then sufficient daylighting is still likely to be achieved.

A modified form of these calculations can be used for existing buildings to determine the impact potential of new developments but, as in this case, we prefer to use our software for this process as the results are more useful and relevant.

Again according to Littlefair, when considering existing buildings, if the VSC or the no-sky line contours produce results which reflect a reduction of daylight, caused by any new obstruction, below 80% of that which was originally available and the VSC is less than 27%, then the loss would be noticeable to the occupants.

A further measure, which can be used, is the average daylight factor (ADF), which is the average illuminance internally, divided by the unobstructed illuminance externally and multiplied by 100% and can be calculated as follows:

The diffusible visible transmittance of glazing (0.8) multiplied by the net area of the window multiplied by the angle of visible sky measured at the face of the window (which is obtained using the VSC and checking the table in the guidance notes) divided by the total area of the rooms internal surfaces multiplied by One minus the average internal reflectance, squared and expressed as a percentage.

The BRE guidance accepts that, where supplementary electric lighting is available, a figure of 2% will produce a predominantly daylit effect but that the recommendations for dwellings are 2% for Kitchens, 1.5% for Living Rooms and 1% for Bedrooms as minimum figures.

Here too it is accepted that a reduction below 80% of the original would be noticeable.

Sunlighting is measured using sunlight availability indicators or sun path indicators, which are also reproduced in the guidance by P J Littlefair for a selection of latitudes. Here too we have computer software to produce the results and it should be stressed that the inaccuracy of the traditional methods is such that a margin should be allowed on the computerised results for comparison purposes. The British Standard recommends that at least 25% of annual probable sunlight hours be available at the reference point, including at least 5% of annual probable sunlight hours in the winter months, between Sept 21 and March 21. This is checked using the horizontal equinox line on the sunlight availability indicator. When using the sunlight indicator, any obstructions to the north can be ignored.

Lightwells, Atria and Internal Courtyards

Additional advice is available in connection with light wells and atria from the Central Sydney DCP of 1996, which recommended the following:

'Lightwells may be used as a source of daylight for dwelling units provided that:

(i) living rooms are not to have lightwells as the only sources of outlook,
(ii) for lightwells with a height up to 18m, the minimum plan dimension is to be 3m, or 6m if overlooked by bedrooms,
(iii) for lightwells with a height between 18 metres and 45 metres, the minimum plan dimension is to be 6m, or 9m if overlooked by bedrooms,

Consideration is to be given to finishes and embellishment of walls abutting lightwell spaces, which are visible from dwelling units.'

Aizelwood ME (1995) also described a "well index" as 'Well Index (WI) = height x (width + length)/ 2 x length x width' when considering daylight distribution.. The well index relates the light admitting area of the well (length x width) to the surface area of the walls of the well (height x (width + length)). A high well index means that the well is tall and narrow; the base receives less light and little light penetrates the adjoining lower floors. A low well index means that the well is wide compared with its height, and adjoining spaces have a better chance of receiving light.

The CIBSE Lighting Guide LG10:1999 pp 37-38 contains a method for calculating the average daylight factor in rooms off an atrium and this is supported/ cross referenced to the BRE document IP 3/98, Daylight in atrium buildings by P J Littlefair and M E Aizelwood.

The first stage is to calculate the Daylight Factor for the atrium or lightwell using the formula $D_{fa} = T \times A_{wa} \times \theta / 2A(1-R)$ where T = transmittance of glass over atria and where there is none, as in a lightwell the value used is 1; A_{wa} = Area of glazing (or light well); θ = angle of visible sky at top of well; A = Atrium or lightwell surface; R = average reflectance. The contribution to the adjoining space is then calculated using the formula $D_{fsav} = 2 \times A_w \times T_s \times D_{fa} / As\ (1-R_s^2)$, where A_w = Area of glazing between space and atrium; T_s = diffuse transmittance of glazing; A_s = room surface; R_s = average reflectance of room

Documents Provided

We have a copy of the Camden Planning Guidance 2006, which deals with Daylight and Sunlight at page 63, and confirm that our calculations conform to this guidance.

I received, by email from David Wood Architects, copies of the following drawings:

F368/sk7/100a, 101a, 102a, 103, 200a, 201a, 202a, 203a, 204a, 300a and 301a.

Site Inspection

I visited the site on 13th November 2006 and took the photographs appended hereto.

The Site is bounded on the North by Britannia Street and on the West with the underground railway line between Kings Cross and Farringdon running under the site and alongside between the site and 15 Britannia Street.

To the East of the Site, is 7 - 11 Britannia Street which appear to be commercial accommodation and is vacant at present and beyond this is 25 – 48 Derby Lodge. To the South of the Site is Wicklow Street with 121 - 144 Derby Lodge abutting the South East corner of the site, with a high boundary wall separating the two.

The property at 15 Britannia Street has windows facing towards the site, across the railway but as this property appears to be commercial in nature, the BRE guidance does not apply. Similarly the property at 4 – 24 Britannia Street which is to the North of the site also appears to be commercial as does 7 – 11 although, as stated above, this does appear to be vacant at this time.

Some of the apartments in Derby Lodge have windows, which overlook the site from various angles, and it is not possible to identify which apartments are served by these windows without being able to gain access. Our referencing system therefore relates to floor level and location only.

We have no details of the proposed redevelopment of 7-11 Britannia Street, apart from its height and footprint. Our calculations would not be appropriate for commercial use but we have included indicative calculations for points C and D to demonstrate that there would be sufficient light if they were used for residential purposes.

Assessment

Sunlight

From the plans issued to us, the main windows face towards the South West, across the railway lines towards the side of number 15 Britannia Street with the remainder being bedrooms facing into two lightwells on the North East side. We have analysed each room at ground floor level and, taken as a whole, the amount of annual sunlight enjoyed by each room is acceptable, apart from where there is a balcony above the window opening (F2-L-1) and the windows to the North East of the site, which are shielded by the boundary wall and Derby Lodge beyond. The winter hours follow a similar pattern and our results are appended (Appendix 1). Windows E, F, G and H are shown as receiving slightly less than the guidance levels on a probability basis but it must be recognised that had the calculations been performed traditionally, there is every chance that they would have produced a slightly higher result.

Vertical Sky Components (VSC)

We have analysed each of the proposed rooms, and a sample of the existing rooms at Derby Lodge and 7-11 Britannia Street, which face towards the development. A low reading was obtained to the window F2-L-1, which is overhung from above, and to the windows which face towards the Garden Wall on the North West side of the proposed development.

The existing readings on all of the surrounding properties tested were also low and the loss caused by the proposed development averages around 26% but this of itself would not mean that the dwellings were poorly lit. It is therefore necessary to undertake ADF calculations for these cases.

The development is largely unaffected by the proposed redevelopment at 7-11 Britannia Street.

Average Daylight Factors (ADF)

ADF calculations have been undertaken for each room served by the identified windows and for the proposed dwellings, rooms F2-L, F3-B and F5-B have values lower than the guidance and, in the case of F2-L, this appears to be solely due to the overhang above Rooms F3-B and F5-B which face into light wells and for the windows which face into the light wells it is appropriate to apply the alternative calculations for ADF and these results appear beneath the table at Appendix 1[1]. Whilst it is difficult to apply in these cases where the light well is of an awkward shape, the results are sufficiently high to suggest that the rooms will be adequately lit.

Of the existing properties, including the commercial rooms at 7-11 Britannia Street, the ADF results are sufficient with the only exceptions being the rooms identified behind windows A and B which are behind the high garden wall surrounding the site. These are unaffected by the development. The dwellings above this and above the height of the garden wall will be affected to a lesser degree than the windows opposite.

[1] Note that we have assumed the light wells will be finished with reflective coating/ materials to give an average reflectance of 0.5

Summary

The majority of the readings obtained for the proposed development would be considered sufficient according to the guidance. Apart from those rooms facing into the light wells for which the appropriate calculations have been applied, the only room that might be considered to be less well lit is the living room F2-L that is shielded by the overhang above. The existing surrounding properties all appear to remain sufficiently lit except those which are already poorly lit because they are behind the garden wall and these are unaffected by the development.

Peter S Defoe DipArb FRICS FCIArb MIQA 12/12/2006

Vertical Sky Components for Proposed Development (note the development of 7-11 Britannia Street has no affect)

Window Reference	VSC Proposed	ADF Proposed	Room ADF
F1-L-1	29.85	1.14	
F1-L-2	29.82	1.14	
F1-L-3	29.79	1.14	3.42
F2-B	23.93	1.77	1.77
F2-L-1	8.94	0.00*	
F2-L-2	23.81	0.86	0.86
F3-L-1	29.94	1.03	
F3-L-2	29.83	1.03	2.06
F3-B2	29.58	2.04	2.04
F4-B	27.96	1.69	1.69
F4-L-1	27.28	1.15	
F4-L-2	26.45	1.13	2.28
F5-B2	24.75	1.77	1.77
F5-L-1	23.45	0.87	
F5-L-2	18.26	0.74	
F5-L-3	16.26	0.69	2.30
F5-B1	7.06	0.00+	
F3-B3	7.24	0.00+	
F3-B1	9.18	0.00+	

* Note the balcony overhangs the window hence the low result

\+ These windows require the atrium calculation

Vertical Sky Components for Existing Properties

Window Reference	Assumed Use of Room	Existing VSC	Proposed VSC	Loss
A	Bedroom	8.75	8.21	0.54
B	Circulation	6.36	3.54	2.82
C	Office	14.89	11.04	3.85
D	Office	17.75	13.52	4.23
E	Bedroom	16.78	11.61	5.16
F	Bedroom	18.19	12.87	5.32
G	Bedroom	16.27	12.06	4.22
H	Living Room	19.25	14.27	4.98

Average Daylight Factors

Window Reference	Assumed Use of Room	ADF Before	ADF After	Loss
A	Bedroom	0.00+	0.00	0.00
B	Circulation	0.00+	0.00	0.00
C	Office	3.17	2.61	0.57
D	Office	4.32	3.60	0.72
E	Bedroom	1.61	1.27	0.35
F	Bedroom	4.45	3.52	0.93
G	Bedroom	2.12	1.73	0.39
H	Living Room	2.90	2.40	0.50

\+ These windows could be recalculated using the atrium calculation

Room F3B

$D_{fa} = T \times A_{wa} \times \theta / 2A(1-R) = 27.83$

$D_{fsav} = 2 \times A_w \times T_s \times D_{fa} / As\ (1-R_s^2) = 2.81$

Room F5B

$D_{fa} = T \times A_{wa} \times \theta / 2A(1-R) = 24.17$

$D_{fsav} = 2 \times A_w \times T_s \times D_{fa} / As\ (1-R_s^2) = 2.73$

Sunlight results for Proposed Dwellings

Window Reference	Annual Proposed		Winter Proposed	
	Hours	%	Hours	%
F1-L-1	301.2	20.3	3.0	0.7
F1-L-2	392.5	26.4	44.1	9.9
F1-L-3	447.7	30.1	102.7	23.0
F2-B	380.9	25.6	70.0	15.7
F2-L-1	106.1	7.1	62.9	14.1
F2-L-2	343.8	23.1	90.0	20.2
F3-L-1	383.4	25.8	36.3	8.1
F3-L-2	460.0	31.0	85.2	19.1
F3-B2	472.1	31.8	98.3	22.1
F4-B	440.2	29.6	64.7	14.5
F4-L-1	434.9	29.3	60.9	13.7
F4-L-2	464.1	31.2	99.2	22.2
F5-B2	356.0	24.0	22.8	5.1
F5-L-1	302.9	20.4	12.4	2.8
F5-L-2	257.0	17.3	9.0	2.0
F5-L-3	232.7	15.7	1.9	0.4
F5-B1	0.0	0.0	0.0	0.0
F3-B3	0.0	0.0	0.0	0.0
F3-B1	0.0	0.0	0.0	0.0

Sunlight Results for existing dwellings

Window Reference	Annual Existing		Annual Proposed		Winter Existing		Winter Proposed	
	hours	%	hours	%	hours	%	hours	%
A	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	398.0	26.8	269.3	18.1	99.2	22.2	9.3	2.1
F	402.0	27.1	298.1	20.0	85.2	17.9	12.1	2.7
G	407.5	27.4	318.3	21.4	77.6	17.4	15.1	3.4
H	462.2	31.1	358.8	24.1	71.8	16.1	10.3	2.3

Appendix 2

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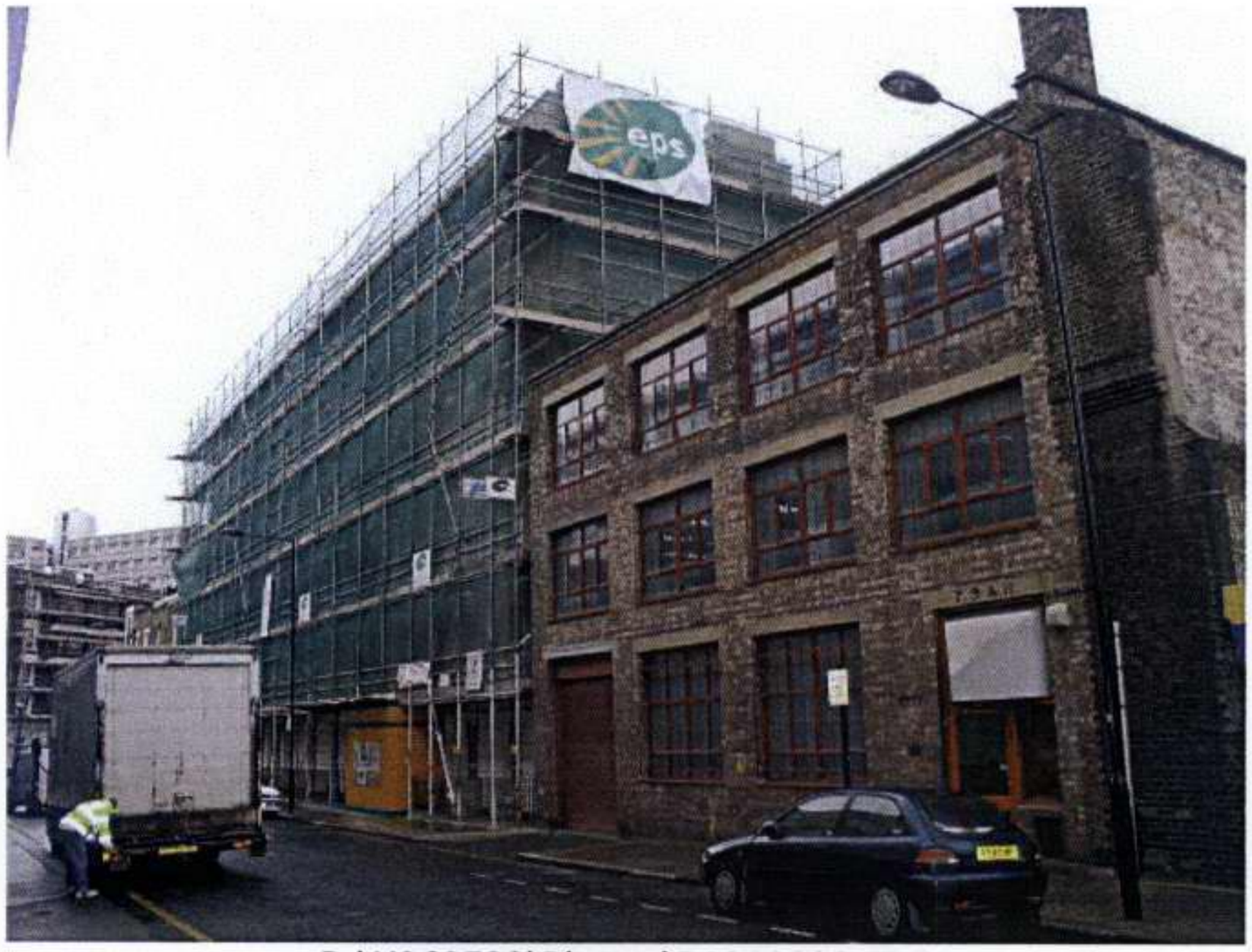

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