

RIGHT OF LIGHT CONSULTING Chartered Surveyors

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Daylight and Sunlight Study 40 Bedford Square, London WC1

19th November 2009



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1 EXECUTIVE SUMMARY

1.1 Overview

- 1.1.1 Right of Light Consulting has been commissioned to undertake a daylight and sunlight study in connection with the proposed development at 40 Bedford Square, London WC1. The aim of the study is to check whether or not the proposed flats will achieve satisfactory levels of daylight.
- 1.1.2 The study is based on the numerical tests laid down in the Building Research Establishment (BRE) Digest 209 'Site Layout Planning for Daylight and Sunlight: a good practice guide' by P J Littlefair 1991.
- 1.1.3 Appendix 1 identifies the windows analysed in this study. The numerical test results (including all calculation workings) are provided in Appendix 2. The no sky line contour is presented in Appendix 3.
- 1.1.4 Right of Light Consulting confirms that the development design satisfies the requirements set out in BRE Digest 209 'Site Layout Planning for Daylight and Sunlight'.

2 INFORMATION SOURCE

2.1 Documents Considered

2.1.1 This report is based on the following drawings:

O'Reilly Architecture

| DWG.NO.240-100-07-E | Location Plans | Rev – |
|---------------------|----------------------------------|-------|
| DWG.NO.240-100-01-E | Existing Lower Ground Floor Plan | Rev A |
| DWG.NO.240-100-02-E | Existing Ground Floor Plan | Rev A |
| DWG.NO.240-100-03-E | Existing First Floor Plan | Rev A |
| DWG.NO.240-100-04-E | Existing Second Floor Plan | Rev A |
| DWG.NO.240-100-05-E | Existing Third Floor Plan | Rev A |
| DWG.NO.240-100-06-E | Existing Roof Plan | Rev A |
| DWG.NO.240-300-01-E | Existing Section A-A | Rev – |
| DWG.NO.240-200-02-E | Existing Side Elevation | Rev – |
| DWG.NO.240-200-01-E | Existing Front & Rear Elevation | Rev A |
| DWG.NO.240-100-08-P | Proposed Location Plan | Rev – |
| DWG.NO.240-100-01-P | Proposed Lower Ground Floor Plan | Rev D |
| DWG.NO.240-100-02-P | Proposed Ground Floor Plan | Rev C |
| DWG.NO.240-100-03-P | Proposed First Floor Plan | Rev C |
| DWG.NO.240-100-04-P | Proposed Second Floor Plan | Rev C |
| DWG.NO.240-100-05-P | Proposed Third Floor Plan | Rev C |
| DWG.NO.240-100-06-P | Proposed Roof Plan | Rev C |
| DWG.NO.240-300-01-P | Existing Section A-A | Rev C |
| DWG.NO.240-200-02-P | Existing Side Elevation | Rev B |
| DWG.NO.240-200-01-P | Existing Front & Rear Elevation | Rev B |
| | | |

3 METHODOLOGY OF THE STUDY

3.1 BRE Digest 209 : Site Layout Planning for Daylight and Sunlight

- 3.1.1 The study is based on the numerical tests laid down in the Building Research Establishment (BRE) Digest 209 'Site Layout Planning for Daylight and Sunlight: a good practice guide' by P J Littlefair 1991.
- 3.1.2 The standards set out in the BRE guide are intended to be used flexibly. In instances where there is a special requirement for daylight or sunlight, higher levels may be deemed necessary. In other situations, such as with urban developments, lower daylight and sunlight levels may be unavoidable. The following statement is quoted directly from the BRE guide:
- 3.1.3 "The guide is intended for building designers and their clients, consultants and planning officials. The advice given is not mandatory and this document should not be considered as an instrument of planning policy. Its aim is to help rather than constrain the developer. Although it gives numerical guidelines, these should be interpreted flexibly because natural lighting is only one of the many factors in site layout design."

3.2 Interior Daylighting

3.2.1 The interior daylighting recommendations set out in BRE 209 are based on British Standard BS 8206 Part 2 and the Chartered Institute of Building Services Engineers Applications Manual on window design. Collectively, the guides set out three main criteria for interior daylighting. These are summarised as follows:

3.2.2 Test 1 Average Daylight Factor (df)

The Average Daylight Factor can be calculated using the following formula:

$$df = \frac{T Aw \theta}{A (1-R^2)} \%$$

Where

 $\begin{array}{ll} \mathsf{T} & \text{is the diffuse visible transmittance of the glazing} \\ \mathsf{Aw} & \text{is the net glazed area of the window } (m^2) \\ \mathsf{A} & \text{is the total area of the room surfaces } (m^2) \\ \mathsf{R} & \text{is their average reflectance} \\ \Theta & \text{is the angle of visible sky in degrees} \end{array}$

The Average Daylight factor test is applied to habitable rooms. A kitchen is generally deemed to be a habitable room if it is large enough to accommodate a dining area. If the kitchen is small or if the property has a separate dining area then the accepted practice is to treat the kitchen as a non habitable room.

The guide recommends an Average Daylight Factor of 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary lighting is provided. There are additional minimum recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

3.2.3 Test 2 Room Depth

If a daylit room is lit by windows in one wall only, the depth of the room L should not exceed the limiting value given by:

$$\frac{L}{W} + \frac{L}{H} \leq \frac{2}{1-R_{b}}$$

Where

W is the room width

H is the window-head height above floor level

 R_b is the average reflectance of the surfaces in the rear half of the room

3.2.4 Test 3 Position of the no sky line

If a significant area of the working plane lies beyond the no sky line (i.e. it receives no direct skylight), then the distribution of daylight in the room will look poor and supplementary electric lighting will be required.

The no sky line assessment is not applicable where a room derives its daylight solely from a light well or atrium. In these situations the room relies on borrowed light instead of direct skylight.

3.3 Sunlight to Windows

3.3.1 The BRE guide recommends that where possible each dwelling should have at least one main living room window that faces within 90 degrees of due south. However, the guide acknowledges that this is not always possible when it comes to flats.

- 3.3.2 The BRE sunlight tests should be applied to all main living rooms and conservatories which have a window which faces within 90 degrees of due south. The guide states that sunlight is viewed as less important in kitchens and bedrooms. In non-domestic buildings, any spaces which are deemed to have a specific requirement for sunlight should be checked.
- 3.3.3 The BRE guide recommends that main living room windows should receive 25% of the total annual probable sunlight hours, including 5% of the annual probable sunlight hours during the winter months between 21st September and 21st March.

3.4 Overshadowing to Gardens and Open Spaces

- 3.4.1 The availability of sunlight should be checked for all open spaces where sunlight is required. This would normally include:
 - Gardens, usually the main back garden of a house, and allotments
 - Parks and playing fields
 - Children's playgrounds
 - Outdoor swimming pools and paddling pools
 - Sitting out areas, such as those between non-domestic buildings and in public squares
- 3.4.2 The BRE guide recommends that for an open space to appear adequately lit throughout the year, no more than 40% and preferably no more than 25% of its area should be prevented from receiving any sunlight at all on 21st March.

4 RESULTS OF THE STUDY

4.1 Window Reference Points

4.1.1 Refer to Appendix 1 for a drawing which identifies the positions of the windows analysed in this study.

4.2 Numerical Results and No Sky Line Contours

4.2.1 The numerical test results including all calculation workings are provided in Appendix2. The no sky line contour for the basement bedroom is presented in Appendix 3.

4.3 Interior Daylighting

4.3.1 The analysed rooms pass the BRE Average Daylight Factor target. The results of the Average Daylight Factor test are summarised below:

| Window (Primary use) | Target | Actual |
|-----------------------------------|--------|--------|
| Windows 1 & 2 (Living) | 1.5% | 2.7% |
| Windows 3 to 5 (Kitchen) | 2.0% | 3.5% |
| Windows 6 to 8 (Living) | 1.5% | 1.5% |
| Windows 9 & 10 (Bedroom) | 1.0% | 1.0% |
| Windows 11 to 14 (Living/Kitchen) | 2.0% | 2.7% |
| Windows 15 & 16 (Bedroom) | 1.0% | 2.2% |
| Windows 17 & 18 (Dining) | 1.5% | 4.2% |
| Windows 19 to 22 (Kitchen) | 2.0% | 3.9% |
| Windows 23 & 24 (Living) | 1.5% | 2.6% |
| Windows 25 & 26 (Bedroom) | 1.0% | 3.1% |
| Window 27 (Bedroom) | 1.0% | 2.0% |

- 4.3.2 The analysed rooms pass the room depth test (see detailed workings in Appendix 2).
- 4.3.3 The no sky line contour is presented in Appendix 3.

4.4 Sunlight to Windows

4.4.1 Living rooms which face within 90 degrees of due south have been tested for direct sunlight. The results are presented in Appendix 2. Not all windows receive ideal levels of direct sunlight. However, the BRE guide acknowledges that it is not always possible for every dwelling to be well situated to receive direct sunlight.

4.5 Conclusion

4.5.1 Right of Light Consulting confirms that the development design satisfies the requirements set out in BRE Digest 209 'Site Layout Planning for Daylight and Sunlight'.

5 CLARIFICATIONS

5.1 General

- 5.1.1 Right of Light Consulting accepts no liability to third parties.
- 5.1.2 External areas will have been inspected from best vantage points or a standard twelve-foot surveyor's ladder. We shall have undertaken the survey following the guidelines of the RICS publication "Surveying Safely".
- 5.1.3 Where limited access is available, reasonable assumptions will have been made.
- 5.1.4 Right of Light Consulting have endeavoured to include in the report those matters, which they have knowledge of or of which they have been made aware, that might adversely affect the validity of the opinion given.
- 5.1.5 Right of Light Consulting has indicated the sources of all information used in the report.
- 5.1.6 Right of Light Consulting will notify those instructing them immediately and confirm in writing if for any reason the report requires any correction or qualification.
- 5.1.7 Right of Light Consulting confirms that they have not entered into any arrangement where the amount or payment of fees is in any way dependent on the outcome of a planning decision.
- 5.1.8 Right of Light Consulting confirm that they have used their best endeavours to ensure that the facts stated in this report are correct and that the opinions expressed represent a true and complete professional opinion.

5.2 Project Specific

5.2.1 None

APPENDICES

APPENDIX 1

WINDOW KEY



APPENDIX 2

DAYLIGHT AND SUNLIGHT CALCULATIONS

| square, London WC1 | Average Daylight Factor Results |
|--------------------|---|
| d Square, Lo | 2 - Average |
| 40 Bedfor | Appendix |

Actual ADF

1.3% 1.4% **2.7%** 0.9% 1.3% **3.5%**

| Boom / Window Beference | Target ADF based on r | room use | Ave | erage Dayl | light Facto | or Coeffici∈ | nts |
|-------------------------|-----------------------|----------|------|------------|-------------|--------------|------|
| | Primary Room Use | ADF | Т | Aw | A | Я | θ |
| Lower Ground Floor | | | | | | | |
| Window 1 | | | 0.65 | 2.21 | 128.12 | 0.73 | 52.7 |
| Window 2 | | | 0.65 | 2.26 | 128.12 | 0.73 | 57.1 |
| Total ADF for room | Living | 1.5% | | | | | |
| Window 3 | | | 0.65 | 0.83 | 52.99 | 0.78 | 36.1 |
| Window 4 (Roof Light) | | | 0.65 | 0.50 | 52.99 | 0.78 | 87.0 |
| Window 5 (Roof Light) | | | 0.65 | 0.50 | 52.99 | 0.78 | 85.5 |
| Total ADF for room | Kitchen | 2.0% | | | | | |
| Window 6 | | | 0.65 | 1.66 | 117.99 | 0.73 | 19.3 |
| Window 7 | | | 0.65 | 1.86 | 117.99 | 0.73 | 32.7 |
| Window 8 | | | 0.65 | 1.63 | 117.99 | 0.73 | 18.6 |
| Total ADF for room | Living | 1.5% | | | | | |
| Window 9 | | | 0.65 | 1.68 | 93.01 | 0.74 | 13.7 |
| Window 10 | | | 0.65 | 1.68 | 93.01 | 0.74 | 22.5 |
| Total ADF for room | Bedroom | 1.0% | | | | | |
| Window 11 | | | 0.65 | 1.68 | 135.69 | 0.73 | 27.5 |
| Window 12 | | | 0.65 | 1.68 | 135.69 | 0.73 | 22.5 |
| Window 13 | | | 0.65 | 2.60 | 135.69 | 0.73 | 38.6 |
| Window 14 | | | 0.65 | 1.76 | 135.69 | 0.73 | 45.6 |
| Total ADF for room | Living/Kitchen | 2.0% | | | | | |
| | | | | | | | |

0.4% 0.7% 0.4% **1.5%** 0.4% 0.6% **1.0%** 0.5% 0.4% 1.0% 0.8% **2.7%**

| ire, London WC1 | <pre>srage Daylight Factor Results</pre> |
|-----------------|--|
| rd Square, Lor | x 2 - Average D |
| 40 Bedfo | Appendix |

| Doom / Window Doforonoo | Target ADF based on ro | om use | Ave | erage Day | light Facto | or Coefficie | ents | Actual |
|-------------------------|------------------------|--------|------|-----------|-------------|--------------|------|------------|
| | Primary Room Use | ADF | T | Aw | A | Я | θ | ADF |
| | | | | | | | | |
| Window 15 | | | 0.65 | 1.76 | 77.39 | 0.75 | 44.6 | 1.5% |
| Window 16 | | | 0.65 | 0.76 | 77.39 | 0.75 | 50.1 | 0.7% |
| Total ADF for room | Bedroom | 1.0% | | | | | | 2.2% |
| Ground Floor | | | | | | | | |
| Window 17 | | | 0.65 | 3.12 | 172.29 | 0.74 | 81.0 | 2.1% |
| Window 18 | | | 0.65 | 3.19 | 172.29 | 0.74 | 79.8 | 2.1% |
| Total ADF for room | Dining | 1.5% | | | | | | 4.2% |
| Window 19 | | | 0.65 | 2.55 | 175.81 | 0.74 | 53.8 | 1.1% |
| Window 20 | | | 0.65 | 2.71 | 175.81 | 0.74 | 51.0 | 1.1% |
| Window 21 | | | 0.65 | 3.03 | 175.81 | 0.74 | 45.1 | 1.1% |
| Window 22 | | | 0.65 | 2.67 | 175.81 | 0.74 | 27.6 | 0.6% |
| Total ADF for room | Kitchen | 2.0% | | | | | | 3.9% |
| Window 23 | | | 0.65 | 2.50 | 85.85 | 0.75 | 27.5 | 1.2% |
| Window 24 | | | 0.65 | 2.50 | 85.85 | 0.75 | 32.9 | 1.4% |
| Total ADF for room | Living | 1.5% | | | | | | 2.6% |
| Window 25 | | | 0.65 | 2.50 | 84.31 | 0.75 | 39.9 | 1.8% |
| Window 26 | | | 0.65 | 1.44 | 84.31 | 0.75 | 51.2 | 1.3% |
| Total ADF for room | Bedroom | 1.0% | | | | | | 3.1% |
| Window 27 | | | 0.65 | 1.85 | 77.57 | 0.76 | 53.4 | 2.0% |
| Total ADF for room | Bedroom | 1.0% | | | | | | 2.0% |
| | | | | | | | | |

40 Bedford Square, London WC1 Appendix 2 - Room Depth Calculation

| | Rc | om Depth | n Coefficie | nts |
|--------------------|-----|----------|-------------|------|
| KOOLI | _ | Ň | т | Rb |
| Lower Ground Floor | | | | |
| Windows 1 & 2 | 6.0 | 4.9 | 2.4 | 0.73 |
| Windows 3 to 5 | 1.6 | 4.9 | 2.4 | 0.78 |
| Windows 6 to 8 | 6.4 | 5.3 | 2.4 | 0.73 |
| Windows 9 & 10 | 5.4 | 4.1 | 2.4 | 0.74 |
| Windows 11 to 14 | 4.6 | 6.4 | 2.4 | 0.73 |
| Windows 15 & 16 | 4.6 | 3.0 | 2.4 | 0.75 |
| Ground Floor | | | | |
| Windows 17 & 18 | 7.0 | 5.5 | 2.4 | 0.74 |
| Windows 19 to 20 | 8.0 | 5.2 | 2.4 | 0.74 |
| Windows 21 & 24 | 4.6 | 3.9 | 2.4 | 0.75 |
| Windows 25 & 26 | 5.6 | 2.9 | 2.4 | 0.75 |
| Window 27 | 3.8 | 4.4 | 2.4 | 0.76 |
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| lculation | 2/1-Rb | 7.52 | 8.96 | 7.46 | 7.83 | 7.32 | 8.05 | 7.73 | 7.63 | 8.00 | 8.09 | 8.32 | |
|-----------|-----------|------|------|------|------|------|------|------|------|------|------|------|--|
| epth Ca | VI | VI | VI | VI | VI | VI | VI | VI | VI | VI | VI | VI | |
| Room De | L/W + L/H | 3.72 | 0.99 | 3.87 | 3.57 | 2.64 | 3.45 | 4.19 | 4.87 | 3.10 | 4.26 | 2.45 | |

40 Bedford Square, London WC1 Appendix 2 - Sunlight to Windows

| Room | Annual Proba |
|--------------------|--------------|
| | Total |
| | |
| Lower Ground Floor | |
| Window 6 - Living | %0 |
| Window 7 - Living | %0 |
| Window 8 - Living | 1% |
| Window 13 - Living | 15% |
| Window 14 - Living | 17% |
| Lower Ground Floor | |
| Window 19 - Living | 25% |
| Window 20 - Living | 38% |
| Window 21 - Living | 27% |
| Window 22 - Living | 11% |
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| Annual Probable | e Sunliaht Hours |
|-----------------|------------------|
| Total | During winter |
| | |
| %0 | %0 |
| %0 | %0 |
| 1% | %0 |
| 15% | 1% |
| 17% | 1% |
| | |
| 25% | 2% |
| 38% | 6% |
| 27% | 3% |
| 11% | %0 |
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APPENDIX 3

NO SKY LINE CONTOURS

