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DAYLIGHT AND SUNLIGHT ASSESSMENT

20/04/2015

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Kings Mews

DAYLIGHT AND SUNLIGHT ASSESSMENT

20/04/2015

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Executive Summary

WSP has been appointed by G&T Kings Mews Ltd to undertake a Daylight and Sunlight assessment to support the planning application of the proposed development at 10/11 King's Mews located in Bloomsbury, in the London Borough of Camden. The proposed development consists of two terraced 3-bedroom residential units arranged on four storeys including a lower ground floor level.

The purpose of this study is to determine the level of daylight within the proposed development for comparison with recommended standards.

The assessment has been undertaken following the guidance given in the BRE's Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice. In addition to the BS 8206-2:2008 has also been used for guidance in this assessment. These are the most complete set of criteria for the assessment of daylight effects both for new and existing buildings.

The results of the internal daylight assessment show that in 8 of the 10 rooms tested, the daylight levels are greater than the minimum recommended standards. This is on the basis that in these 8 rooms the ADF is 1% or higher in bedrooms, and 2% or higher for Kitchen/Living rooms. The results show 2 rooms where the ADF is lower than the minimum recommended values. These rooms are the kitchen/Living areas located at the lower ground floor level where daylight is more restricted. It is worth adding that despite the constraints imposed by a lower level, the ADF within these two rooms is still within the level acceptable for living rooms (1.5%). The results of the daylight assessment indicated that the ADF levels in the rest of the rooms of the scheme are well within the minimum recommended standards.

It is also worth mentioning that the proposed design reflects a good level of attention paid towards improving access to natural light where possible, with adequate fenestration in most areas including roof-lights where access to light is constrained.

The BRE guide recommends that for new buildings, access to sunlight is measured on the windows to habitable rooms, facing within 90° of due south. However it is important to note that due to the orientation of the building there are no south facing windows and the level of sunlight will always be limited in refurbishment sites such as this one. The windows tested east and west facing windows at each level which will only have access to direct sunlight either in the morning (east facing) or afternoon (west facing) limiting the overall number of sunlight hours. However as indicated above, the proposed development reflects a level of design which has taken access to natural light as feasible as possible within the constraints of the site.

An assessment of the massing of the scheme in relation to the surroundings properties indicate that the based on the massing of the consented scheme on the site, the change in massing of the proposed development does not represent any adverse impacts to the level of daylight and sunlight to the surrounding adjacent properties.

In summary, the proposed design shows a high proportion of rooms and windows to be within the recommended daylight and sunlight standards. The study identified two rooms to be outside the criteria although it is also important to put this in the context of a refurbishment in an urban area with the inherited constraints regarding the internal layouts, window to floor ratios and room depth which are the key factors in the design of daylight in buildings.

1. Introduction

1.1. WSP has been appointed by G&T Kings Mews Ltd. to undertake a Daylight and Sunlight assessment to support the planning application of the proposed development at 10/11 King's Mews located in Bloomsbury, in the London Borough of Camden. The proposed development consists of two terraced 3-bedroom residential units arranged on four storeys including a lower ground floor level.

1.2. The purpose of this study is to determine the level of daylight within the proposed development for comparison with recommended standards.

1.3. A 3D model has been developed for the purpose of the daylight and sunlight assessment. This model has been based on the drawings provided by Coffey Architects and includes all the windows and rooms within the proposed scheme and also the surrounding adjacent buildings to account for external obstruction to light.

Figure 1 Site Location

2. Methodology & Criteria

2.1. The assessment has been undertaken following the guidance given in the BRE's Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice also known as the 'BRE Guide'[1]. These guidelines were first published in 1991, and superseded the document Sunlight and Daylight Planning Criteria and Design of Buildings. The second and latest edition of the BRE Guide was released in 2011.

2.2. The BRE Guide gives criteria and methods for calculating daylight and sunlight both for the proposed development and the impact on existing surrounding windows. The level of daylight and sunlight availability within the proposed development has been measured by the parameters discussed below.

[1] Littlefair, (2011); *Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice*, Building Research Establishment.

Angle of Visible Sky (Ø)

2.3. The visible sky angle (Ø) gives the availability of daylight to a window and is measured from the top of the obstruction to the top of the window. For an unobstructed window Ø is 90°. If the Visible Sky Angle VSA is greater than 65° conventional window design usually give reasonable results. If the VSA is between 45 and 65° then larger windows and shallow plan internal layouts would be needed to provide adequate daylight. For VSA between 25 and 45° it is very difficult to provide adequate daylight unless large windows are used. Situations where the VSA is lower than 25° no adequate daylight is possible even with a fully glazed wall

Vertical Sky Component

2.4. When the obstruction is not continuous, the visible sky angle (Ø) is complex to calculate and the Vertical Sky Component (VSC) may be used instead. The calculation of VSC usually requires specialist computer software. The VSC measures the amount of sky that can be viewed from the centre of a window accounting for all external obstructions, (with 40% being the maximum value for an unobstructed window). The minimum recommended figure for VSC is 27% or greater to maintain good levels of daylight. For existing surrounding windows if the 27% VSC is lower, then a comparison of existing and proposed VSC levels with the new development in place is calculated.

Average Daylight Factor

2.5. The VSC described above provides an indication of the potential for daylight entering the space, however, it does not quantify the actual daylight levels inside the rooms. Should windows fail to comply with the VSC values, further detailed studies are performed using the Average Daylight Factor (ADF) calculations to assess if compliance with the minimum values recommended in the BS8206 is achieved and whether mitigation measures are still required.

2.6. The CIBSE Guide LG10 (Ref 16.10) defines the Average Daylight Factor as:

"…the measure of the amount of skylight in a room. If the room is not too deep or obstructed, an average daylight factor of 5% or more will ensure that an interior looks substantially daylit, except early in the morning, late in the afternoon or on exceptionally dull days. An average daylight factor below 2% generally makes a room look dull; electric lighting is likely to be in frequent use"

2.7. The BS8206-02 (BSI, 1992) sets out the following guidelines for the ADF:

- If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided.

2.8. In dwellings, the following minimum ADF values should be achieved as per the BS 8206-02 (BSI, 1992):

- 1% in bedrooms,
- 1.5% in living rooms, and
- 2% in kitchens.

2.9. The ADF calculations have been based on room layouts derived from drawings provided by Coffey Architects and glazing characteristics from the National Calculation Methodology (NCM) modelling guide (Ref 4). The following assumptions were taken for the calculation of the ADF calculations:

- Glass transmittance: 0.71;
- External dirt factor: 0.9;
- Internal dirt factor: 0.9;
- Frame factor: 0.85;
- Reflectance of floor: 15%;

- Reflectance of walls: 60%; and
- Reflectance of ceiling: 75%.

2.10. For floor to ceiling windows a factor has been applied for the portion of window below the working plane height of 850 mm, in line with the BRE guidelines.

Sunlight

2.11. Access to sunlight is measured on the windows to habitable rooms, facing within 90° of due south. The Probable Sunlight Hours (PSH) calculation method measures the proportion of the window assessed that is sunlit for a period of time. In new developments, each dwelling should have at least one main living room within 90° of due south to receive a reasonable amount of sunlight. The BRE Guide recommends that the PSH is calculated for the whole year, and for the winter months (21 September to 21 March).

2.12. If the window reference point can receive more than 25% of annual PSH, including at least 5% of annual probable sunlight hours during winter months between 21 September and 21 March, then the room should still receive enough sunlight.

Sensitive Receptors

2.13. For the daylight calculations, sensitive receptors are described as windows to habitable rooms where the occupants have a reasonable expectation of natural light. As the BRE Guide states:

> *'The guidelines given here are intended for use in adjoining dwellings where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed. The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices.'*

3d Modelling

2.14. The daylight and sunlight impact calculations have been undertaken using the specialist software Ecotect 2011 by AutoDesk in which a three dimensional model comprising the Proposed Development and the surrounding properties was created based on models and drawings provided by Coffey Architects. The existing building within the Site was also modelled along with the surrounding properties

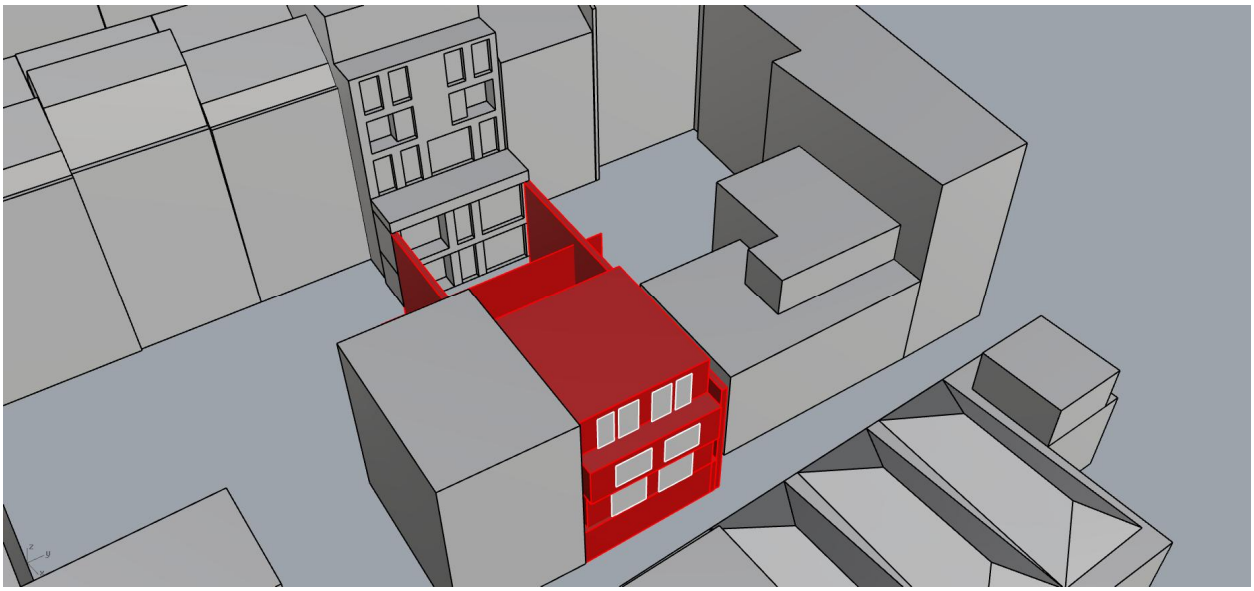

Figure 2 Aerial view of the model used for the daylight analyses

3. Assessment of Daylight and Sunlight within the Proposed Development

3.1. The results of the internal daylight and sunlight assessment are detailed in Appendices 1 and 2, and summarised in Tables 1 and 2 below.

3.2. The daylight assessment included the calculation of VSCs for each window to measure the level of obstruction and the potential available daylight at the window, and based on the internal rooms' characteristics, the Average Daylight Factor (ADF) was calculated for each room.

Table 1: Summary of Daylight (ADF) Results within the Proposed Development

Building	Total receptors Tested for ADF (rooms)	Above	Below
10-11 King's Mews	10	8	2

Daylight results

3.3. The results of the internal daylight assessment show that in 8 of the 10 rooms tested, the daylight levels are greater than the minimum recommended standards. This is on the basis that in these 8 rooms the ADF is 1% or higher in bedrooms, and 2% or higher for Kitchen/Living rooms. The results show 2 rooms where the ADF is lower than the minimum recommended values. These rooms are the kitchen/Living areas located at the lower ground floor level where daylight is more restricted. It is worth adding that despite the constraints imposed by a lower level, the ADF within these two rooms is still within the level acceptable for living rooms (1.5%). The results of the daylight assessment indicated that the ADF levels in the rest of the rooms of the scheme are well within the minimum recommended standards.

3.4. It is also worth mentioning that the proposed design reflects a good level of attention paid towards improving access to natural light where possible, with adequate fenestration in most areas including roof-lights where access to light is constrained.

Sunlight results

3.5. The BRE guide recommends that for new buildings, access to sunlight is measured on the windows to habitable rooms, facing within 90° of due south. Sunlight calculations have been carried out in line with the BRE recommendations and the results are included in Appendix 2. However it is important to note that due to the orientation of the building there are no south facing windows and the level of sunlight will always be limited in refurbishment sites such as this one. The windows tested east and west facing windows at each level which will only have access to direct sunlight either in the morning (east facing) or afternoon (west facing) limiting the overall number of sunlight hours. However as indicated above, the proposed development reflects a level of design which has taken access to natural light as feasible as possible within the constraints of the site.

Existing Surrounding windows

3.6. An assessment of the massing of the scheme in relation to the surroundings properties indicate that the based on the massing of the consented scheme on the site, the change in massing of the proposed development does not represent any adverse impacts to the level of daylight and sunlight to the surrounding adjacent properties.

4. Conclusions

4.1. This report presents the results of the Daylight and Sunlight assessment carried out to support the planning application of the proposed development at at 10/11 King's Mews located in Bloomsbury, in the London Borough of Camden. The purpose of this study is to determine the level of daylight within the proposed development for comparison with recommended standards.

4.2. The assessment has been undertaken following the guidance given in the BRE's Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice. In addition to the BS 8206-2:2008 has also been used for guidance in this assessment. These are the most complete set of criteria for the assessment of daylight effects both for new and existing buildings.

4.3. The results of the internal daylight assessment show that in 8 of the 10 rooms tested, the daylight levels are greater than the minimum recommended standards. This is on the basis that in these 8 rooms the ADF is 1% or higher in bedrooms, and 2% or higher for Kitchen/Living rooms. The results show 2 rooms where the ADF is lower than the minimum recommended values. These rooms are the kitchen/Living areas located at the lower ground floor level where daylight is more restricted. It is worth adding that despite the constraints imposed by a lower level, the ADF within these two rooms is still within the level acceptable for living rooms (1.5%). The results of the daylight assessment indicated that the ADF levels in the rest of the rooms of the scheme are well within the minimum recommended standards.

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4.6. An assessment of the massing of the scheme in relation to the surroundings properties indicate that the based on the massing of the consented scheme on the site, the change in massing of the proposed development does not represent any adverse impacts to the level of daylight and sunlight to the surrounding adjacent properties.

4.7. In summary, the proposed design shows a high proportion of rooms and windows to be within the recommended daylight and sunlight standards. The study identified two rooms to be outside the criteria although it is also important to put this in the context of a refurbishment in an urban area with the inherited constraints regarding the internal layouts, window to floor ratios and room depth which are the key factors in the design of daylight in buildings.

5. Limitations and Assumptions

5.1. All calculations have been based on best practice guidance and on drawing or models of the proposed development provided by the architects. Where required, estimations have been made with regards to the height and massing of surrounding properties, based on available satellite photographs and mapping.

6. Glossary

ADF – Average Daylight Factor – It is the ratio of the average indoor illuminance on a working plane to the outdoor illuminance.

VSC – Vertical Sky Component - A measure of the percentage of skylight incident at a point on a vertical plane in relation to the unobstructed skylight incident on the horizontal plane.

APSH – Annual Probable Sunlight Hours – The total no. of sunlight hours in a year falling on a window or a vertical surface expressed as a percentage of total no. of unobstructed sunlight hours.

WPSH – Winter Probable Sunlight Hours - The total no. of sunlight hours falling on a window or a vertical surface between 21st September and 21st March expressed as a percentage of total no. of unobstructed sunlight hour.

CIE – Commission Internationale De L'Eclairage – It is an authority which has developed a number of standard sky distributions (e.g. overcast, uniform) based on very specific mathematical formula.

Ø – Angle of visible sky – It is the angle subtended in the vertical plane normal to the window by sky visible from centre of the window.

References

1. Littlefair, P.J. (1995) *Site Layout and Planning for Daylight and Sunlight: a guide to good practice*. BRE Construction Research Communications, Garston, UK. 2011 edition.

2. British Standards Institution (2008). *British Standard 8206-02: Code of practice for daylighting*. BSI, London.

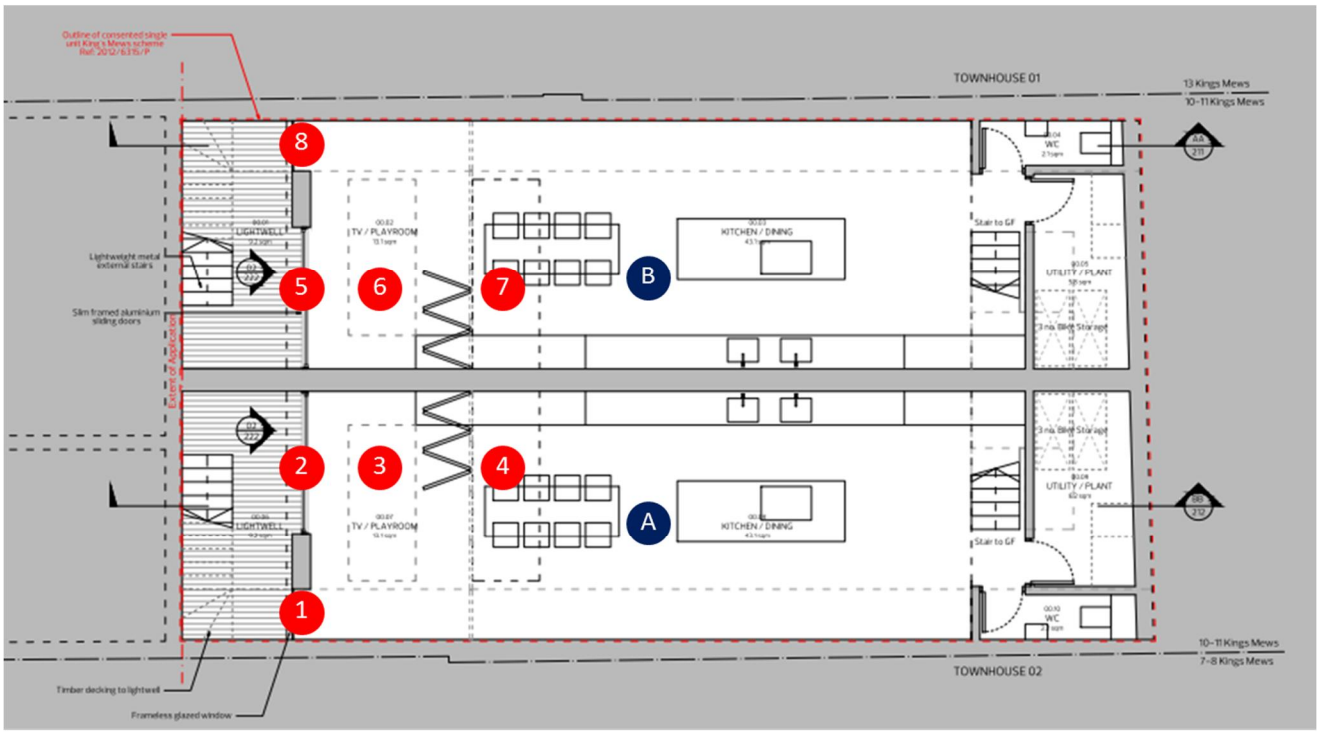
3. The Chartered Institution of Building Services Engineers London (1999). *CIBSE Guide 'A'.* Yale Press ltd. London

4. National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England) 2013 Edition

Appendix 1

DAYLIGHT ANALYSIS RESULTS WITHIN THE PROPOSED DEVELOPMENT

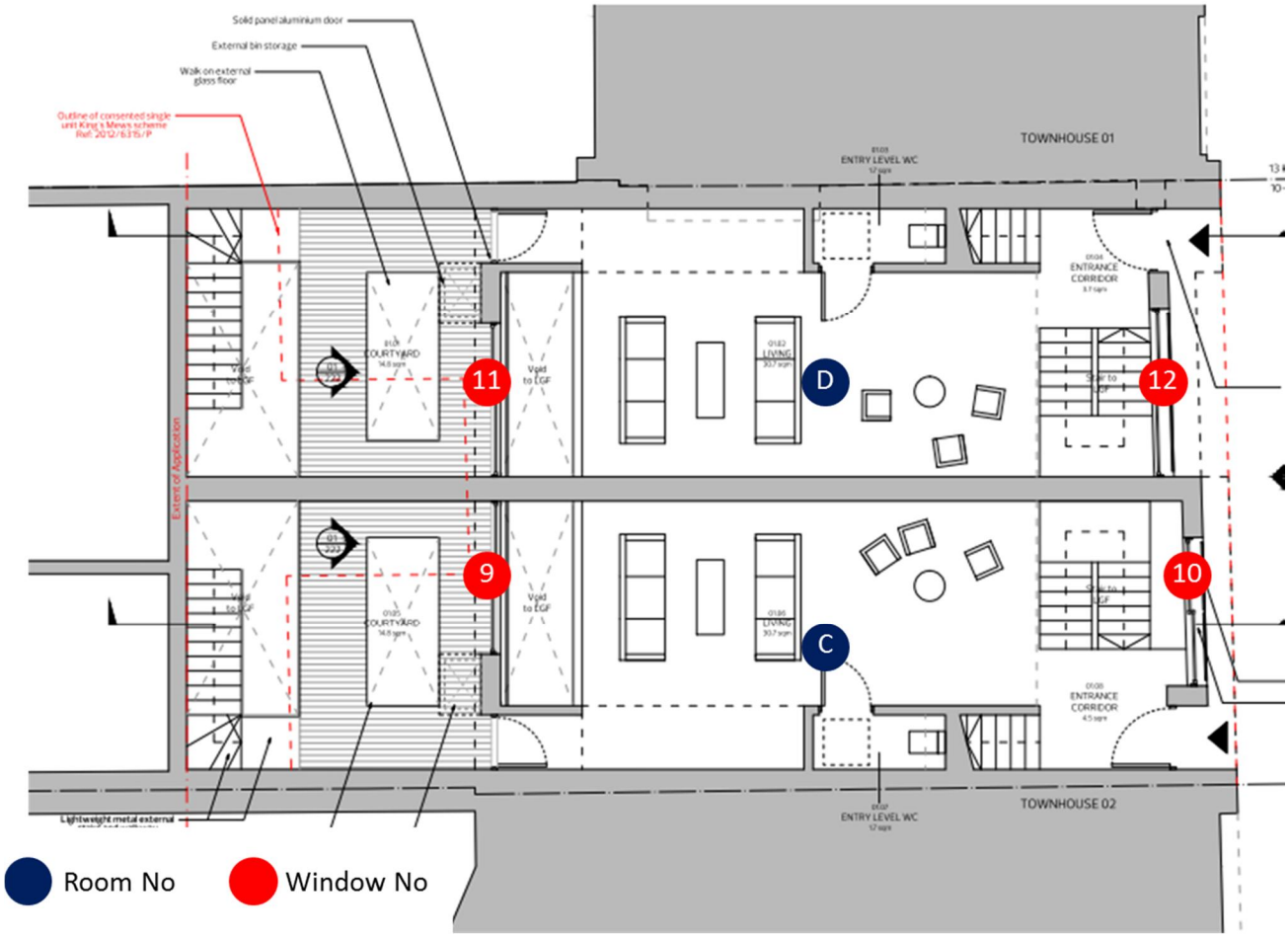
Lower ground floor



Room No Window No

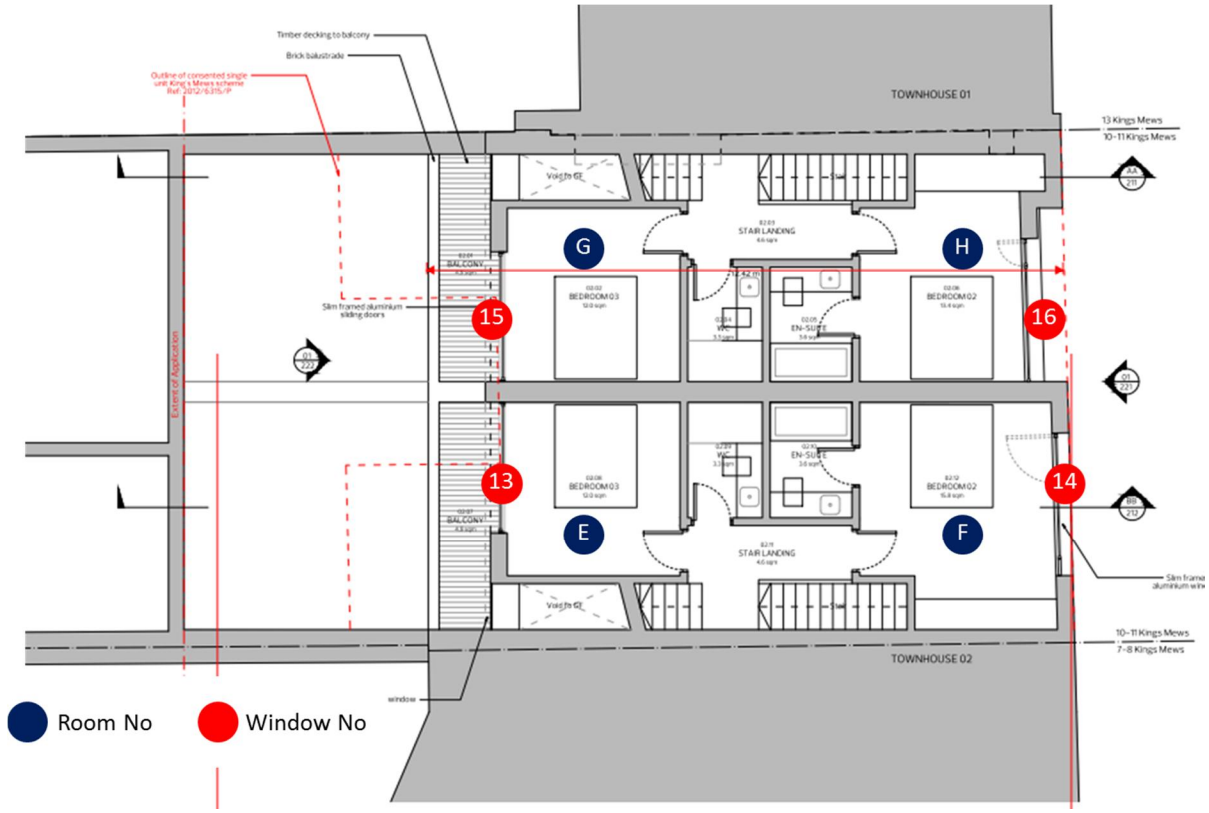
Room	Window	Upper/Lower	VSC	ADF per window	ADF for Room	ADF Target	BRE Criteria (VSC or ADF)
A	1	L	1.00	0.05	1.53	2.0	FAIL
		U	1.00				
	2	L	**1.00**	0.13			
		U	1.00				
	3	U	35.34	0.83			
	4	U	15.60	0.52			
B	5	L	1.00	0.06	1.55	2.0	FAIL
		U	1.00				
	6	L	**1.00**	0.15			
		U	1.00				
	7	U	35.34	0.83			
	8	U	15.60	0.52			

Ground floor



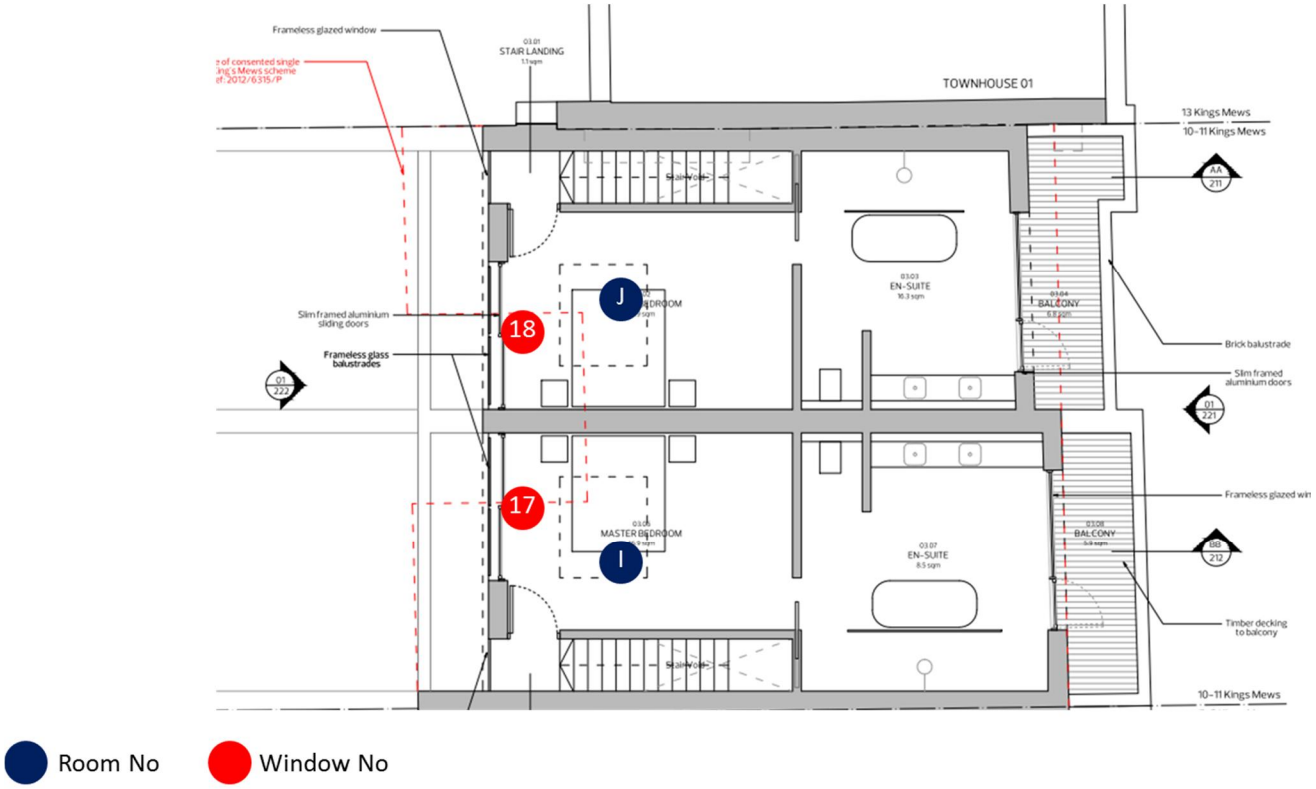
Room	Window	Upper/Lower	VSC	ADF per window	ADF for Room	ADF Target	BRE Criteria (VSC or ADF)
C	9	L	12.20	0.70	1.52	1.5	PASS
		U	12.20				
	10	L	**16.20**	0.82			
		U	16.20				
D	11	L	12.00	0.70	1.52	1.5	PASS
		U	12.00				
	12	L	**16.30**	0.82			
		U	16.30				

First Floor



Room	Window	Upper/Lower	VSC	ADF per window	ADF for Room	ADF Target	BRE Criteria (VSC or ADF)
E	13	L	18.00	2.15	2.15	1.0	PASS
		U	18.00				
F	14	L	**26.60**	1.42	1.42	1.0	PASS
		U	26.60				
G	15	L	19.10	2.23	2.23	1.0	PASS
		U	19.10				
H	16	L	27.00	1.44	1.44	1.0	PASS
		U	27.00				

Second Floor



Room	Window	Upper/Lower	VSC	ADF per window	ADF for Room	ADF Target	BRE Criteria (VSC or ADF)
I	17	L	22.40	1.92	1.92	1.0	PASS
		U	22.40				
J	18	L	**23.60**	1.99	1.99	1.0	PASS
		U	23.60				

Appendix 2

SUNLIGHT ANALYSIS RESULTS WITHIN THE PROPOSED DEVELOPMENT

Annual Sunlight Assessment

BRE recommended criteria for Annual Probable Sunlight Hours				
PSH ≥ 25% all year				
Receptor			APSH Calcu-lations	Compliance Crite-ria
Location	Receptor No.	Sensitivity	(%)	
10-11 King's Mews	1	Low	0.0%	Below
	2	Low	0.0%	Below
	3	Low	0.3%	Below
	5	Low	0.8%	Below
	6	Low	12.7%	Below
	8	Low	0.8%	Below
	9	high	6.7%	Below
	10	High	14.4%	Below
	11	High	13.1%	Below
	12	High	14.9%	Below
	13	Low	10.3%	Below
	14	Low	31.0%	Above
	15	Low	17.0%	Below
	16	Low	30.9%	Above
	17	Low	19.3%	Below
	18	Low	23.7%	Below

Winter Sunlight Assessment

BRE recommended criteria for Annual Probable Sunlight Hours				
WPSH ≥ 5 winter period				
Receptor			WPSH Calcula-tions	Compliance Criteria
Location	Receptor No.	Sensitivity	(%)	
10-11 King's Mews	1	Low	0.0%	Below
	2	Low	0.0%	Below
	3	Low	0.0%	Below
	5	Low	0.0%	Below
	6	Low	0.0%	Below
	8	Low	0.0%	Below
	9	high	0.0%	Below
	10	High	4.7%	Below
	11	High	0.8%	Below
	12	High	5.3%	Above
	13	Low	0.6%	Below
	14	Low	9.4%	Above
	15	Low	3.3%	Below
	16	Low	9.6%	Above
	17	Low	2.1%	Below
	18	Low	8.1%	Above