Appendix C

7A High Street Wanstead
London UK E11 2AA
T +44(0)20 8530 7632
W www.divineideas.co.uk
E info@divineideas.co.uk

Internal Daylight Sunlight Calculations Assessment

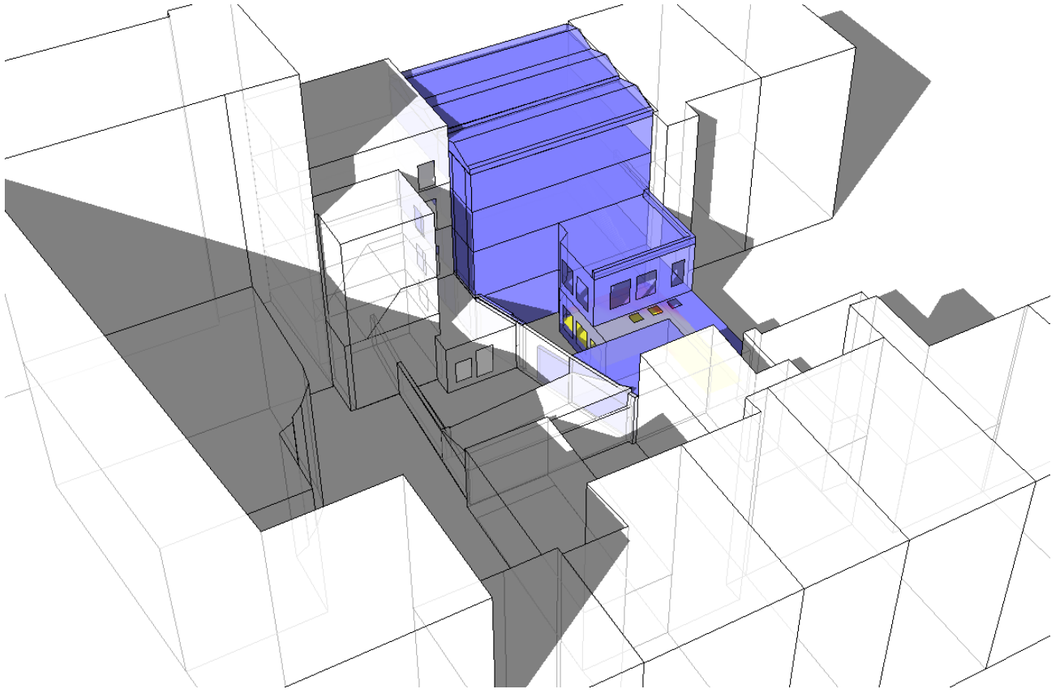
61 Swinton St, London WC1X 9NT

Project No: 395
Issue Date: 13TH May 2015

NRG CONSULTING

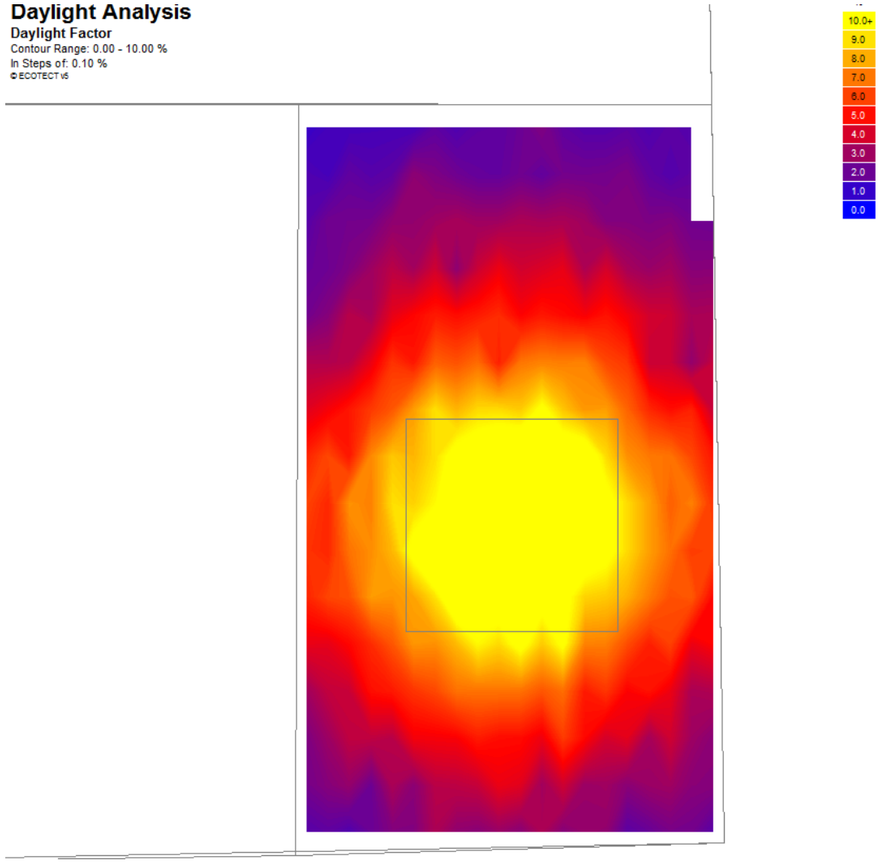
Architect:	Divine Ideas Architects
Project Title:	61 Swinton Rd, WC1X 9NT
Report:	Internal Daylight Sunlight Calculations Assessment
First Issue Dated:	13th May 2015
Author:	Samia Duran
Reviewer:	Xavier Valladares
Authorized:	Ryan Thrower
Type:	For planning
Revisions:	**Date:**
-	-

FIGURE 01 – 3D VIEW OF THE DEVELOPMENT ´AS PROPOSED´



0 INDEX

FIGURE 02 - GRAPHIC REPRESENTATION OF AN AVERAGE DF CALCULATION



1 EXECUTIVE SUMMARY

The assessment undertaken in this report demonstrates that the self-contained flats and hotel guest rooms at 61 Swinton St achieve good levels of daylight with all rooms meeting or exceeding the values set by British Standard BS8206:Pt2 and Site Layout Planning for Daylight and Sunlight, A guide to good practice, by P J Littlefair, BRE 2011.

Internal Daylight and Sunlight assessments were performed taking in consideration the approved scheme at 65 Swinton Rd.

Non-domestic buildings where occupants have a reasonable expectation of daylight for example schools, hospitals, hotels and hostels should also follow BRE Guidelines. Therefore, hotel guest rooms have been included in the assessment.

The criteria to comply with both standards is:

- 1.0% average Daylight Factor for bedrooms,
- 1.5% average Daylight Factor for living - dining rooms and studies,
- 2.0 % average Daylight Factor for kitchens

  AND

- View of the Sky criteria for all kitchens, dining rooms, living rooms (80% or more).

Based on a detailed Internal Daylight Calculations 100% of the rooms comply with the average Daylight Factor of 2% for Kitchens, 1.5% for Dining Living and 1% for Bedrooms.

Based on detailed Internal Daylight Calculations 100% of the rooms comply with the View of the Sky 80% of the working plane at kitchens, living-dining rooms, studies and bedrooms.

Therefore, 100% of the development 'as proposed' complies with Internal Daylight Conditions as per the British Standard British Standard BS8206:Pt2 and Site Layout Planning for Daylight and Sunlight, A guide to good practice, by P J Littlefair, BRE 2011.

Regarding Internal Sunlight conditions, BRE guidelines recommend that all living areas should receive at least 392 Annual Probable Sunlight Hours (APSH) and 75 Winter Probable Sunlight Hours (WPSH). If the living room does not comply then the other habitable rooms should be analyzed.

All Dining Living Kitchen rooms in the proposed development meet or exceed the sunlight hours set by the BRE guidelines.

The Dining Living Kitchen on Ground Floor and Dining Living Kitchen on 1st floor receive between 210 to 627 WPSH and 493 to 1703 APSH. **Therefore the proposed extension also complies with the BRE guidelines for APSH & WPSH in living areas.**

By virtue of its design, the development is currently assessed against the criteria as follows:

TABLE 01 – INTERNAL DAYLIGHT CALCULATIONS RESULTS SUMMARY – RESIDENTIAL UNITS

UNIT	FLOOR LEVEL	GF-01 LIVING DINING KICTHEN DF COMPLIANCE	GF-01 LIVING DINING KICTHEN VS COMPLIANCE	GF-02 BEDROOM DF COMPLIANCE	GF-02 BEDROOM VS COMPLIANCE	GF-03 MASTER BEDROOM DF COMPLIANCE	GF-03 MASTER BEDROOM VS COMPLIANCE	1STF-04 LIVING DINING KITCHEN DF COMPLIANCE	1STF-04 LIVING DINING KITCHEN VS COMPLIANCE	1STF-05 BEDROOM DF COMPLIANCE	1STF-05 BEDROOM VS COMPLIANCE
61 SWINTON ST	GF	YES	YES	YES	YES	YES	YES	YES	YES		
	1STF									YES	YES

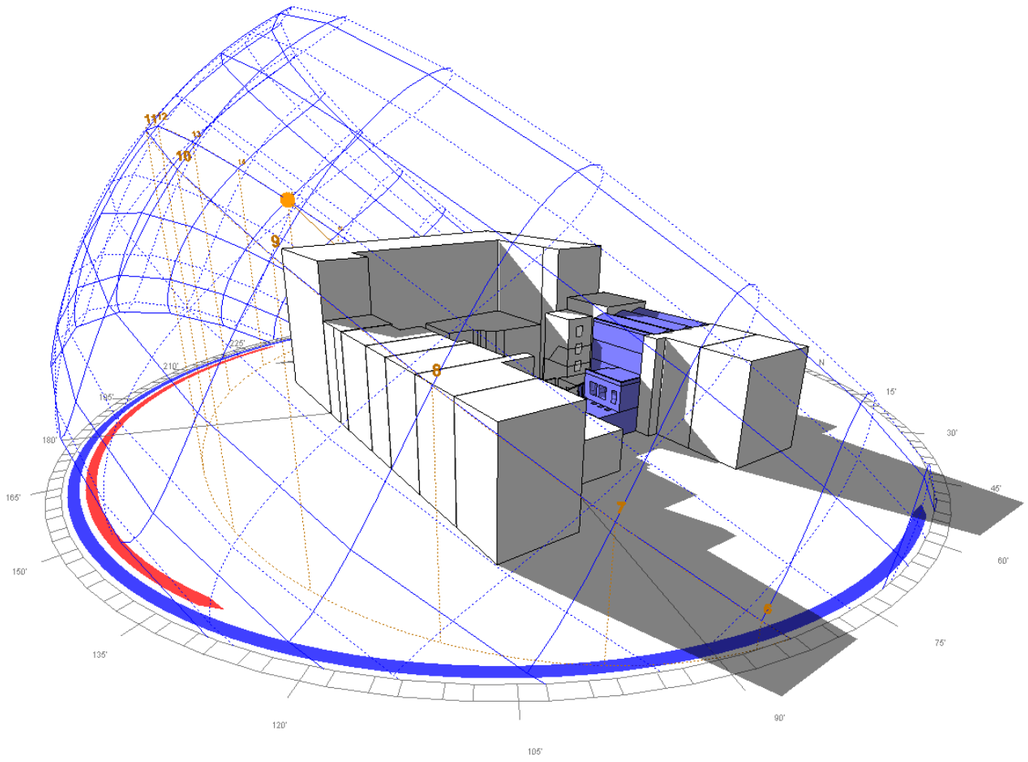
TABLE 02 – INTERNAL DAYLIGHT CALCULATIONS RESULTS SUMMARY – HOTEL

UNIT	FLOOR LEVEL	1STF-06 GUEST BEDROOM 1 DF COMPLIANCE	1STF-06 GUEST BEDROOM 1 VS COMPLIANCE	1STF-07 GUEST BEDROOM 2 DF COMPLIANCE	1STF-07 GUEST BEDROOM 2 VS COMPLIANCE	2ND-08 GUEST BEDROOM 3 DF COMPLIANCE	2ND-08 GUEST BEDROOM 3 VS COMPLIANCE	2ND-09 GUEST BEDROOM 4 DF COMPLIANCE	2ND-09 GUEST BEDROOM 4 VS COMPLIANCE	2ND-10 GUEST BEDROOM 5 DF COMPLIANCE	2ND-10 GUEST BEDROOM 5 VS COMPLIANCE
61 SWINTON ST	1STF	YES	YES	YES	YES						
	2NDF					YES	YES	YES	YES	YES	YES

UNIT	FLOOR LEVEL	2ND-11 GUEST BEDROOM 6 DF COMPLIANCE	2ND-11 GUEST BEDROOM 6 VS COMPLIANCE
61 SWINTON ST	**1STF**		
	2NDF	**YES**	**YES**

*Based on a detailed Internal Daylight Calculations 100% rooms comply with the average Daylight Factor of 2% for Kitchens, 1.5% for Dining Living and 1% for Bedrooms.
**Based on detailed Internal Daylight Calculations 100% rooms comply with the View of the Sky 80% of the working plane at kitchens, living-dining rooms, studies and bedrooms.

FIGURE 03 – ANNUAL SUN PATH WITH MASSING OF THE DEVELOPMENT ´AS PROPOSED´ - PERSPECTIVE VIEW



2 INTRODUCTION

This document was commissioned on behalf of Divine Ideas Architects.

In order to assess Internal Daylight and Sunlight Issues according to British Standard BS 8206:Pt2, a detailed study and calculations on the proposed development have been carried out.

This report details average Daylight Factor (DF), View of the Sky (VOS) and Sunlight calculations for the following areas within the proposed development:

TABLE 03 – INTERNAL DAYLIGHT-SUNLIGHT ASSESSED ROOMS

FLOOR	AREAS EXAMINED
GF	Living Room Dining Room Kitchen, Bedroom
1STF	Living Room Dining Room Kitchen, Bedroom, Guest Bedroom 1, Guest Bedroom 2
2NDF	Guest Bedroom3, Guest Bedroom 4, Guest Bedroom 5, Guest Bedroom 6

TABLE 04 – SUMMARY CRITERIA FROM BRE REPORT TO ASSESS THE IMPACT OF THE PROPOSED DEVELOPMENTS

PARAMETER	BRE REPORT REFERENCE	CRITERIA	ACCEPTABILITY CRITERIA
Daylight	Section 2.2	Any part of the new building measured in a vertical section perpendicular to a main window wall subtends an angle of less than 25° to the horizontal.	Any part of the new building measured in a vertical section perpendicular to a main window wall subtends an angle of less than 25° to the horizontal.
		Vertical Sky Component (VSC)	Reduction from existing not more than 20% its former value if VSC is lower than 27%.

3 ASSESSMENT CRITERIA ON DAYLIGHT

When assessing the effects of proposed building projects on the potential to cause issues relating to light, it is important to recognize the distinction between daylight and sunlight. Daylight is the combination of all direct and indirect sunlight during the daytime, whereas sunlight comprises only the direct elements of sunlight. On a cloudy or overcast day diffused daylight still shines through windows, even when sunlight is absent.

Care should also be taken when the development is situated to the south of existing buildings, as in the northern hemisphere the majority of the sunlight comes from the south. In the UK (and other northern hemisphere countries) south- facing facades will, in general, receive most sunlight, while north facing facades will receive sunlight few hours during summer months, specifically early mornings and late evenings. The Sunlight Assessment has been carried out in a separate report.

3.1 BRITISH STANDARD BS 8206 PT 2- INTERNALLY

The British Standard BS 8206 Part 2, states in section 5.6 the minimum values of average daylight factor values in dwellings.

Even if a predominantly day lit appearance is not achievable in a dwelling, it is recommended that the average daylight factor should be at least the relevant value as given in Table 04.

3.2 AVERAGE DAYLIGHT FACTOR

"If a predominantly daylit appearance is required, then df should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings, of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These last are minimum values of Average Daylight Factor, and should be attained even if a predominantly daylit appearance is not required."

This method of assessment takes into account the total glazed area to the room, the transmittance quality of the glazing proposed, the total area of the room surfaces including ceilings and floors, and the internal average reflectance for the room being assessed. The method also takes into account the Vertical Sky Component and the quantum of reflected light off external surfaces.

TABLE 05 - MINIMUM RECOMMENDED AVERAGE DAYLIGHT FACTORS

ROOM TYPE	MINIMUM DF REQUIRED %
BEDROOMS	1
LIVING ROOMS	1.5
KITCHENS	2
Where one room serves more than one purpose, the minimum Average Daylight Factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%.	

Daylight factor calculations have been carried out for the above site in the above rooms using the average daylight factor formula and specifications:

$$DF = \frac{MW\theta T}{A(1-R^2)}$$

The following values and specifications have been used for the calculations:

- M is the correction factor for dirt, 1 for vertical windows, 0.7 for horizontal skylights, 0.8 for skylights in sloping roof
- W is the area of the glazing. This is applied as a generic frame type, measured from each structural opening:
- The frame factor coefficient of 0.70 for windows with timber or composite frames
- θ is the angle of visible sky, taken from the center of each window to the top of the nearest obstruction
- T is the light transmittance value for glazing, a default value of 0.65 for standard double glazing with low emissivity coating,
- A is the total area of all room surfaces
- R is the average reflectance of the room surfaces. The following values have been used as stated in the British Standard BS 8206 Pt2. Refer to Appendix A for further details on finishes and colors to achieve the recommended Reflectance Values in Table 05.

3.3 VIEW OF THE SKY / NO SKY LINE CRITERIA

This assessment is a test to establish where within the proposed room the sky will be visible through the windows, taking into account external obstructions. The assessment is undertaken at working plane height (850mm above floor level).

Appendix C of the BRE guide: Interior Daylighting Recommendations states that if a significant area of the working plane lies beyond the no skyline (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. To guarantee satisfactory daylight uniformity, this area is more precisely quantified in the BS 8206 Part2 2008 as 20%.

To work out the area where the working plan in each room receives direct light from the sky, we determine the no - skyline using the methodology shown in Figure 09.

FIGURE 04 – AT THE NO SKY LINE, THE LAST VISIBLE PATCH OF SKY ABOVE THE OBSTRUCTION WILL JUST DISAPPEAR WHEN THE WINDOW HEAD IS SIGHTED THROUGH A POINT AT WORKING PLANE HEIGHT

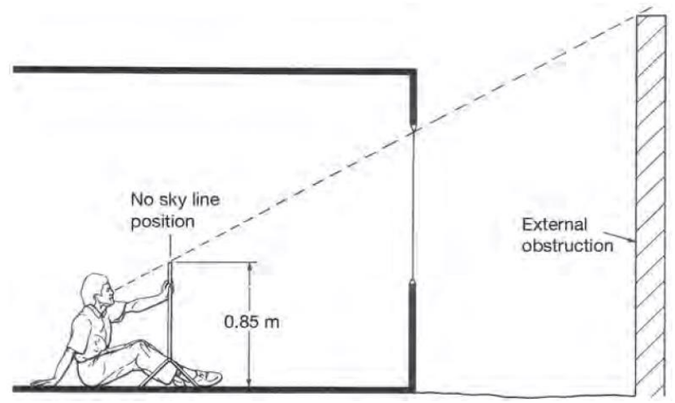


FIGURE 05 – A MIRROR CAN BE USED TO SIGHT THE NO SKY LINE POSITION

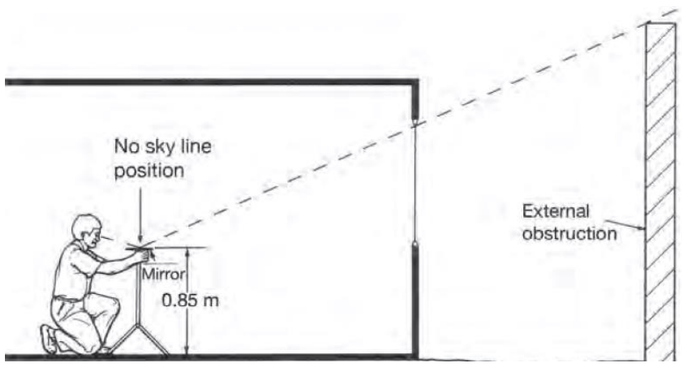


TABLE 06 – AVERAGE REFLECTANCE VALUES FOR ROOM SURFACES

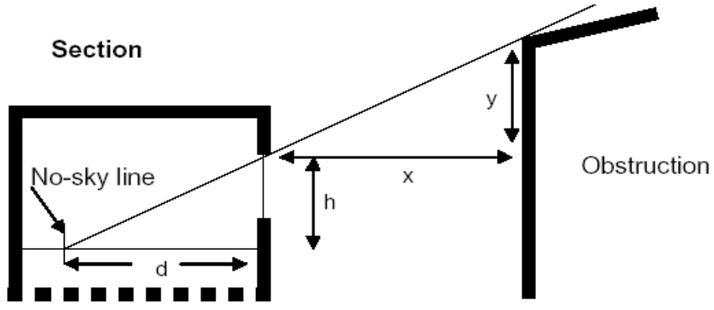
SPACE	WALL FINISHES	R VALUE	FLOOR FINISHES	R VALUE	CEILING FINISHES	R VALUE
Living Dining Kitchen	Default value as per BS8206 PT: 2	0.65*	Default value as per BS8206 PT: 2	0.3	White 00E55	0.85
Bedrooms	Default value as per BS8206 PT: 2	0.65*	Default value as per BS8206 PT: 2	0.3	White 00E55	0.85
Guest Bedrooms	Default value as per BS8206 PT: 2	0.65*	Default value as per BS8206 PT: 2	0.3	White 00E55	0.85

3.4 SUMMARY DAYLIGHTING CRITERIA

The Average Daylight Factor gives a more detailed assessment of the daylight within a room and takes into account the highest number of factors in establishing a quantitative output. However, the conclusion of Appendix C of the BRE guides: Interior Daylighting Recommendations states that the criteria need to be satisfied if the whole of the room is to look adequately daylit. Even if the amount of daylight in a room (given by the Average Daylight Factor) is sufficient, the overall daylight appearance will be impaired if its distribution is poor.

In most urban areas it is important to recognize that the distribution of daylight within a room may be difficult to achieve, given the built up nature of the environment. Consequently, most local authorities seek to ensure that there is sufficient daylight within the room as determined by the Average Daylight Factor calculation. However, the additional recommendations of the BRE and British Standard for residential accommodation, set out above, ought not to be overlooked.

FIGURE 06 - VIEW OF THE SKY FORMULA DIAGRAM



3.5 RELEVANT INFORMATION FOR ASSESSING DAYLIGHT

The Daylight in Urban Areas Design Guide (Energy Saving Trust CE257, 2007) provides a key recommendation with regards to Daylight levels in urban areas:

“If ‘theta’ (Visible sky angle) is greater than 65 º conventional window designs will usually give reasonable results.

If ‘theta’ is between 45º and 65ºspecial measures such as larger windows and changes to room layout are usually needed to provide adequate daylight.

If ‘theta’ is between 25º and 45º it is very difficult to provide adequate daylight unless very large windows are used.

If ‘theta’ is less than 25º it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed.”

Figure 07 shows the typical sections drawn from window center between the nearest obstruction and the window head.

FIGURE 07 THETA - ANGLE OF VISIBLE SKY

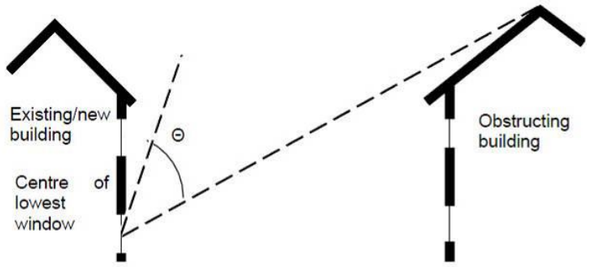
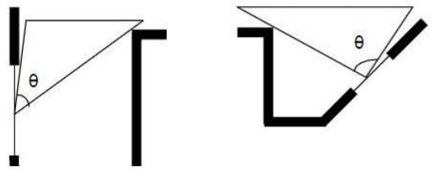


Figure 2 Section in plane perpendicular to the main face of the building



4 ASSESSMENT CRITERIA ON SUNLIGHT

For interiors, access to sunlight can be quantified. BS 8206- Part 2 recommends that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours (APSH) including in the winter months between 21 September and 21 March at least 5% APSH. Here ´probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

The centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in winter months between 21 September and 21 March.

FIGURE 08 – CAREFUL DESIGN EXAMPLE MEANS THAT FOUR OF THE FIVE FLATS SHOWN HAVE A SOUTH-FACING LIVING ROOM

FIGURE 09 - AERIAL VIEW OF THE SITE AS EXISTING

5 DATA

All of the information has been taken directly from digital files provided by the Design Team. The height of the obstructions has been taken from survey data.

Following the guidance stated in BS8206:Pt2, each window has taken into account their specific angle of visible sky.

FIGURE 10 - LOCATION OF THE THETHA VALUE USED IN THE SPREADSHEETS FOR THE AVERAGE DAYLIGHT FACTOR

DAYLIGHT FACTORS		DF Formula = (M x W x Theta x T) / (A x (1 - (RxR)))						Total DF % 2.67	NB - ACCEPTABLE DF%ages = Kitchen 2%, Living Room / Dining Room / Study 1.5%, Bedroom 1%													
UNIT	SPACE	M	W	Th	T	A	R															
Flat Type AG-1	Kitchen Living Dining Room	1.0	4.2	45	0.77	85.9	0.60		A	L	H	W	Total A	R	%	Total R weighted	W	L	H	CF	total
W = total glazed area of windows or rooflights									Walls	18.27	2.55		46.59	0.67	100%	0.67	win 1	2.41	2.10	0.70	3.53
													0.00		0%	0.00	win 2	0.91	1.10	0.70	0.70
A = total area of all the room surfaces (ceiling, floors, walls and windows)													0.00		0%	0.00	win 3				0.00
R = area-weighted average reflectance of the room surfaces													0.00		0%	0.00	win 4				0.00
M = a correction factor for dirt													0.00		0%	0.00	win 5				0.00
T = glass transmission factor													0.00		0%	0.00	win 6				0.00
Th (Theta) = angle of visible sky allowing for adjacent buildings (65 default but should be checked)									**SUBTotal Walls**				**46.59**	0.67	100%	0.67					
									R weighted					0.67							
									floor	1.00		19.65	19.65	0.35		6.8775					0.00
									ceiling	1.00		19.65	19.65	0.81		15.9165					0.00
									Total Glass				**4.23**	0.10		0.4235					
									Total Walls - Glass				**42.35**	**0.67**		28.3769					
									TOTAL A ROOM SURF			**A =**	**85.9**			**51.6**			**W =**		**4.2**

INSTRUCTIONS - Complete yellow or orange-shaded boxes, using dimensions in metres, for all internal room surface areas. For rough guidance measure the room surface dimensions as if the room had no fixtures or fittings in it. Alter orange-shaded boxes if necessary, (BS8206 Part 2 may be used as a reference), according to the factors listed below :

M = 1.0 (vertical glazing that can be cleaned easily)
0.8 (sloping glazing)
0.7 (horizontal glazing)

CF= 0.9 (metal patent glazing)
0.8 (metal frame large pane)
0.7(wood frame large pane)
0.6 (wood frame "Georgian" pane)

T = 0.7 (double glazing)
0.6 (double glazing with low-emissivity coating)

Theta = 65° (vertical glazing)

R = 0.5 (typical value for light-coloured walls)

NOTES & ASSUMPTIONS

This is the same Daylighting ID Type as unit AG-5

6 AVERAGE DAYLIGHT FACTOR (DF) AND VIEW OF THE SKY (VS) CALCULATIONS RESULTS

Tables 07, 08 AND 09 below show the DF and VS results for the relevant habitable rooms. All rooms were assessed using the approved BRE formulas using advanced daylight calculations.

Room GF 01-Living Dining Kitchen, was also assessed using 3D Daylight Simulation software due to its complex geometrical obstructions caused by neighbours. For further details, please refer to Appendix A.

FIGURE 11 – GF WITH ASSESSED AREAS IN RED HATCH

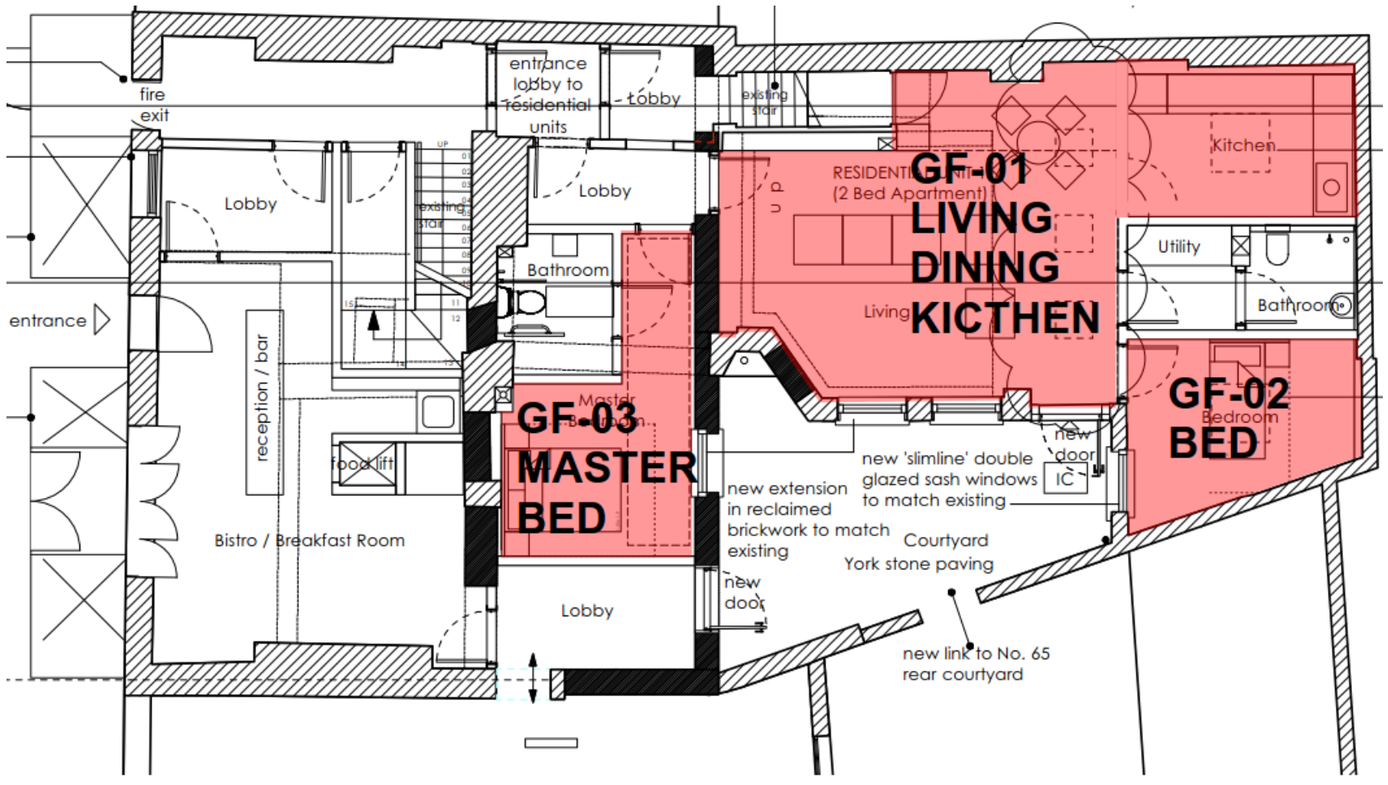
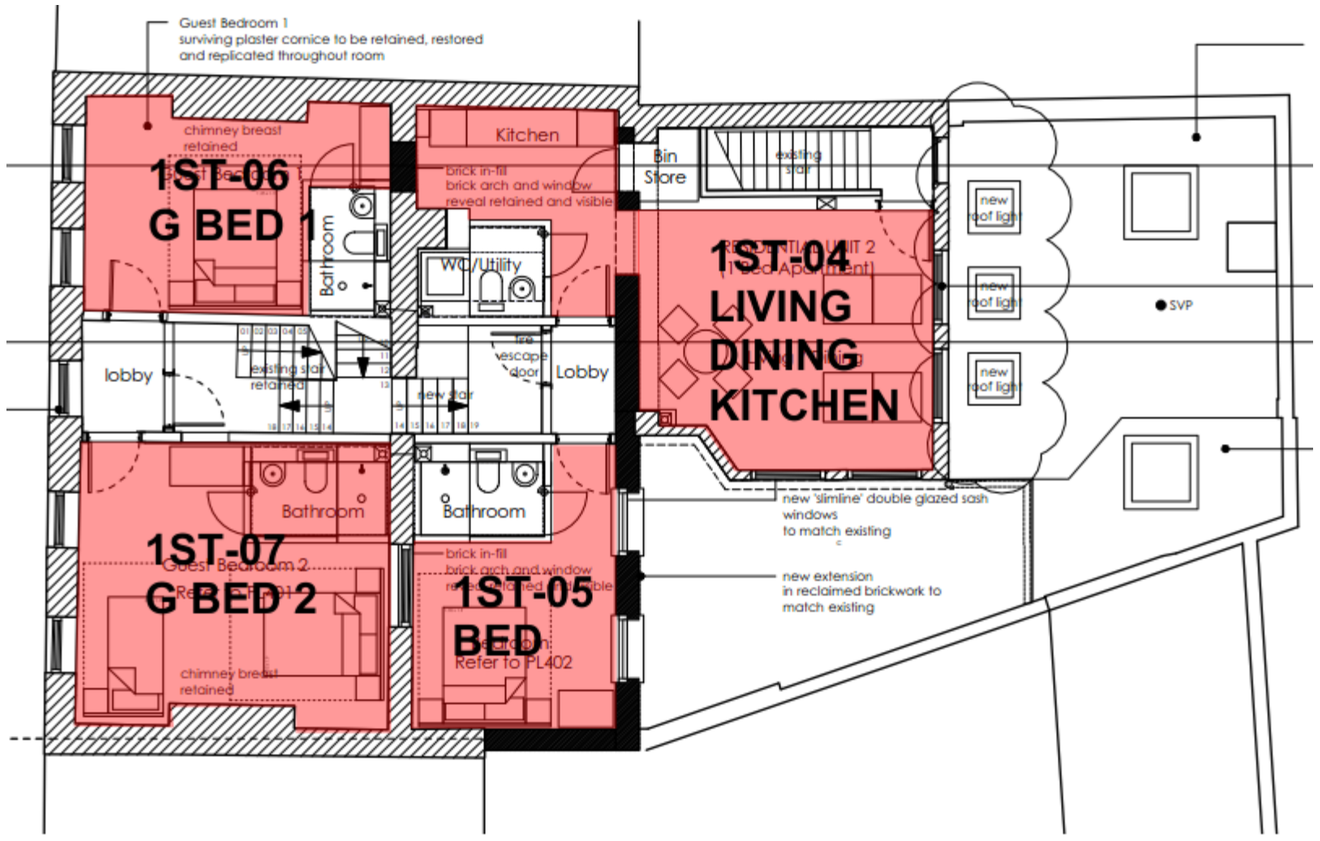


TABLE 07 – GROUND FLOOR – AVERAGE DAYLIGHT FACTOR AND VIEW OF THE SKY CALCULATIONS

Table 07 shows a summary of the results achieved by the proposed design.

UNIT TYPE	FLOOR	ROOM NAME	ROOM ID	SIMILAR ROOMS	AVERAGE DAYLIGHT FACTOR %	VIEW OF THE SKY %	COMPLIES WITH BS8206 PT2?	NOTES
61 Swinton St	GF	Living Dining Kitchen	GF01	-	5.32	100	YES	
		Bedroom	GF02	-	1.81	90	YES	
		Master Bedroom	GF03	-	3.31	100	YES	

FIGURE 12 – 1st FLOOR WITH ASSESSED AREAS IN RED HATCH



Front Windows
existing front windows to be overhauled, refurbished with 'slimline' type double glazing
existing moulded timber surrounds and paneled reveals to be refurbished
any missing parts or details to be reproduced following the existing historic example

TABLE 08 – 1ST FLOOR – AVERAGE DAYLIGHT FACTOR AND VIEW OF THE SKY CALCULATIONS

Table 08 shows a summary of the results achieved by the proposed design.

UNIT TYPE	FLOOR	ROOM NAME	ROOM ID	SIMILAR ROOMS	AVERAGE DAYLIGHT FACTOR %	VIEW OF THE SKY %	COMPLIES WITH BS8206 PT2?	NOTES
61 Swinton St	1ST Floor	Living Dining Kitchen	1ST04	-	2.90	86	YES	
		Bedroom	1ST05	-	3.52	100	YES	
		Guest Bedroom 1	1ST06	-	3.17	100	YES	
		Guest Bedroom 2	1ST07	-	2.58	100	YES	

FIGURE 13 – 2nd FLOOR WITH ASSESSED AREAS IN RED HATCH

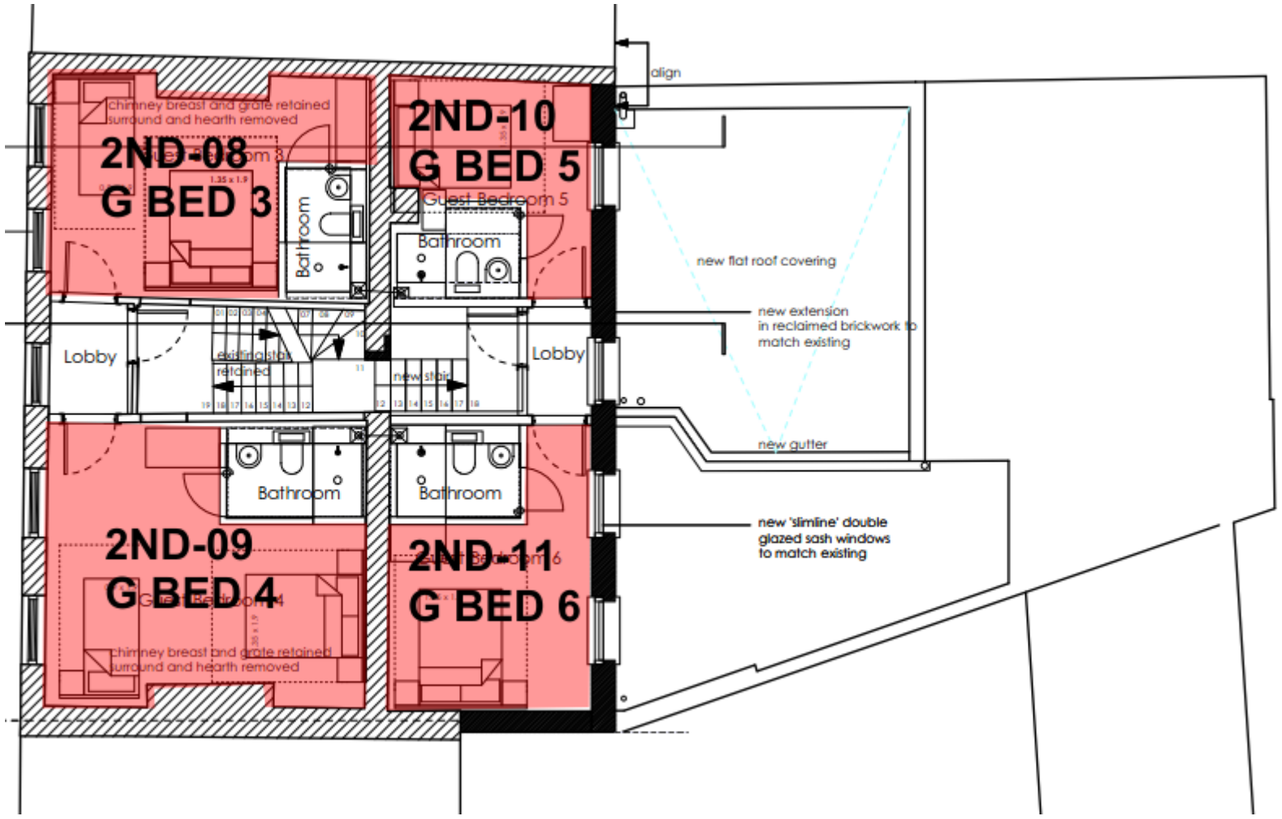
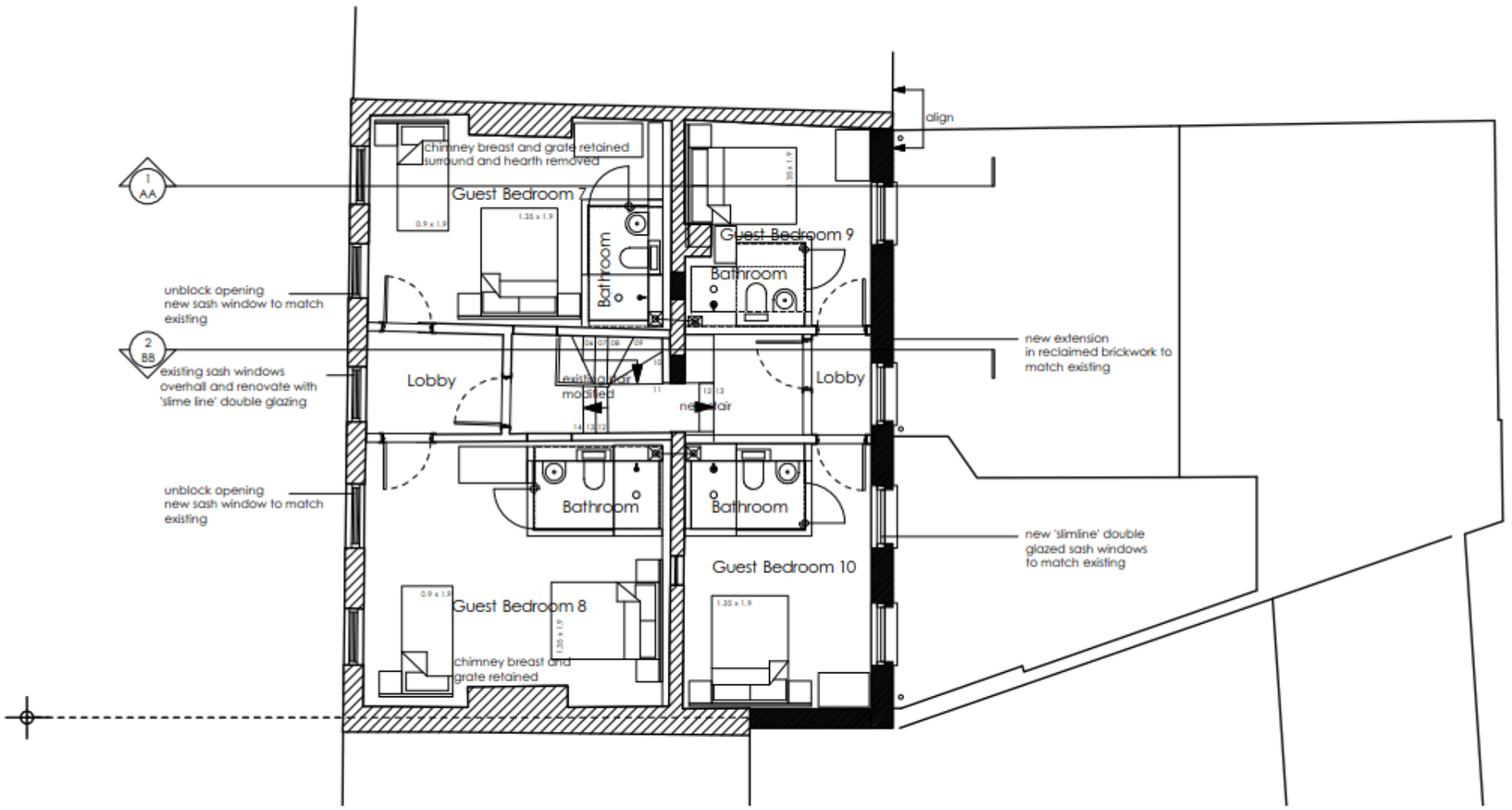


TABLE 09 – 2ND FLOOR – AVERAGE DAYLIGHT FACTOR AND VIEW OF THE SKY CALCULATIONS

Table 09 shows a summary of the results achieved by the proposed design.

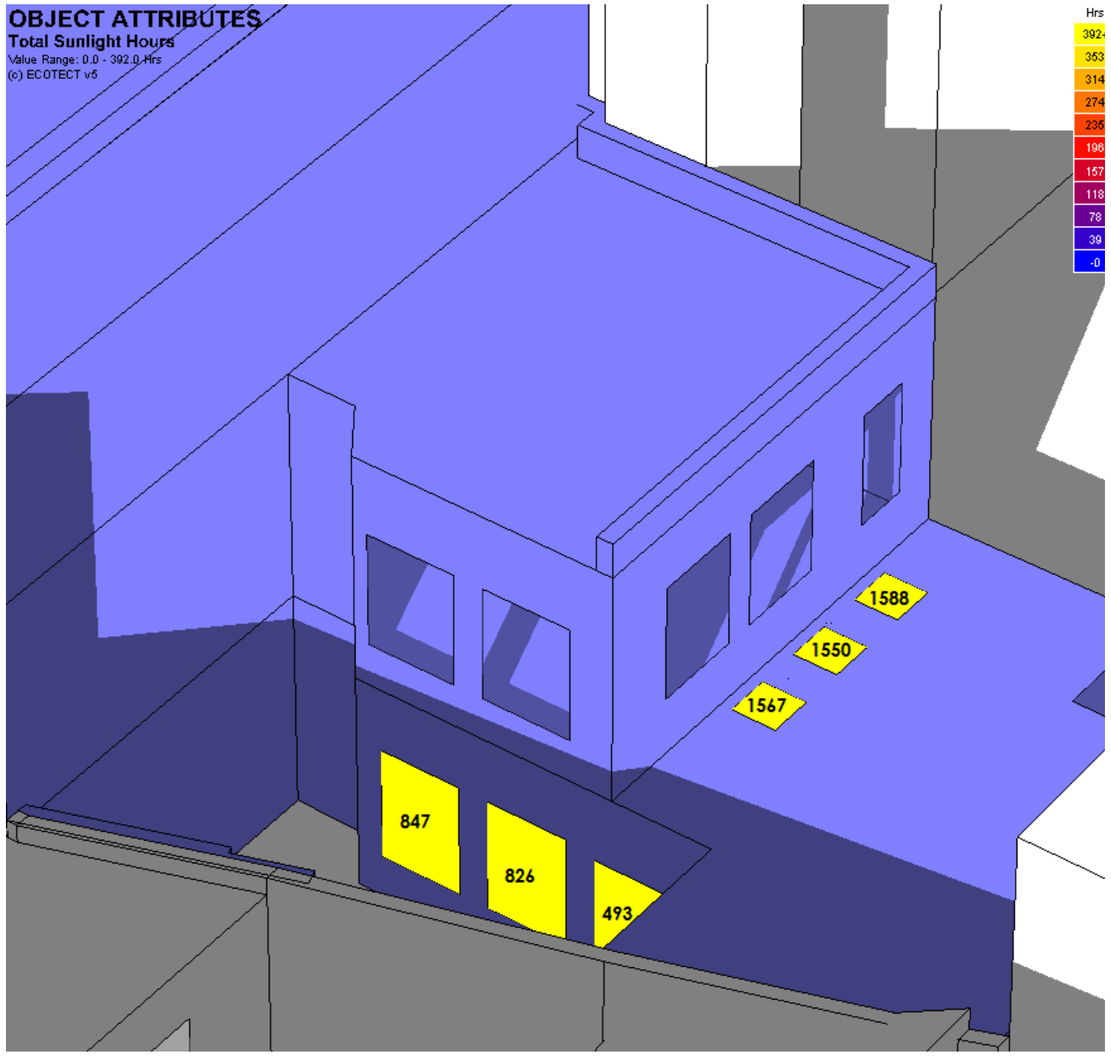
UNIT TYPE	FLOOR	ROOM NAME	ROOM ID	SIMILAR ROOMS	AVERAGE DAYLIGHT FACTOR %	VIEW OF THE SKY %	COMPLIES WITH BS8206 PT2?	NOTES
61 Swinton St	2ND Floor	Guest Bedroom 3	2ND08	Guest Bedroom 7	3.5	100	YES	
		Guest Bedroom 4	2ND09	Guest Bedroom 8	3.7	100	YES	
		Guest Bedroom 5	2ND10	Guest Bedroom 9	3.23	100	YES	
		Guest Bedroom 6	2ND11	Guest Bedroom 10	3	100	YES	

FIGURE 14 – 3rd FLOOR FOR REFERENCE



Front Windows
existing front windows to be overhauled, refurbished with 'slimline' type double glazing
existing moulded timber surrounds and paneled reveals to be refurbished
any missing parts or details to be reproduced following the existing historic example

FIGURE 15 - APSH TO WINDOWS – GF – 01 LIVING DINING KITCHEN



7 SUNLIGHT ASSESSMENT TO THE PROPOSED DEVELOPMENT RESULTS

BRE guidelines recommend that all living areas should receive at least 392 APSH and 75 WPSH. If the living room does not comply then the other habitable rooms should be analyzed.

Figures 14 to 17 show that the living dining kitchen on GF and the living dining kitchen on 1st floor will maintain acceptable levels of sunlight exceeding the criteria set by BRE Guidelines. These will receive more than 392 APSH and 75 WPSH which demonstrates compliance.

The Dining Living Kitchen on Ground Floor and Dining Living Kitchen on 1st floor receive between 210 to 627 WPSH and 493 to 1703 APSH. **Therefore the proposed extension also complies with the BRE guidelines for APSH & WPSH in living areas.**

FIGURE 16 - WPSH TO WINDOWS – GF – 01 LIVING DINING KITCHEN

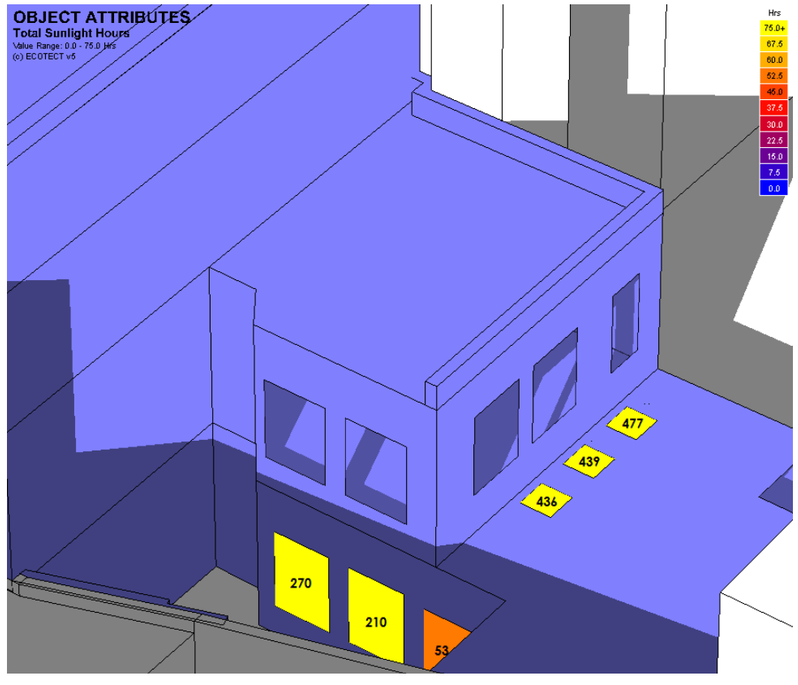


FIGURE 17 - APSH TO WINDOWS – 1STF – 06 LIVING DINING KITCHEN

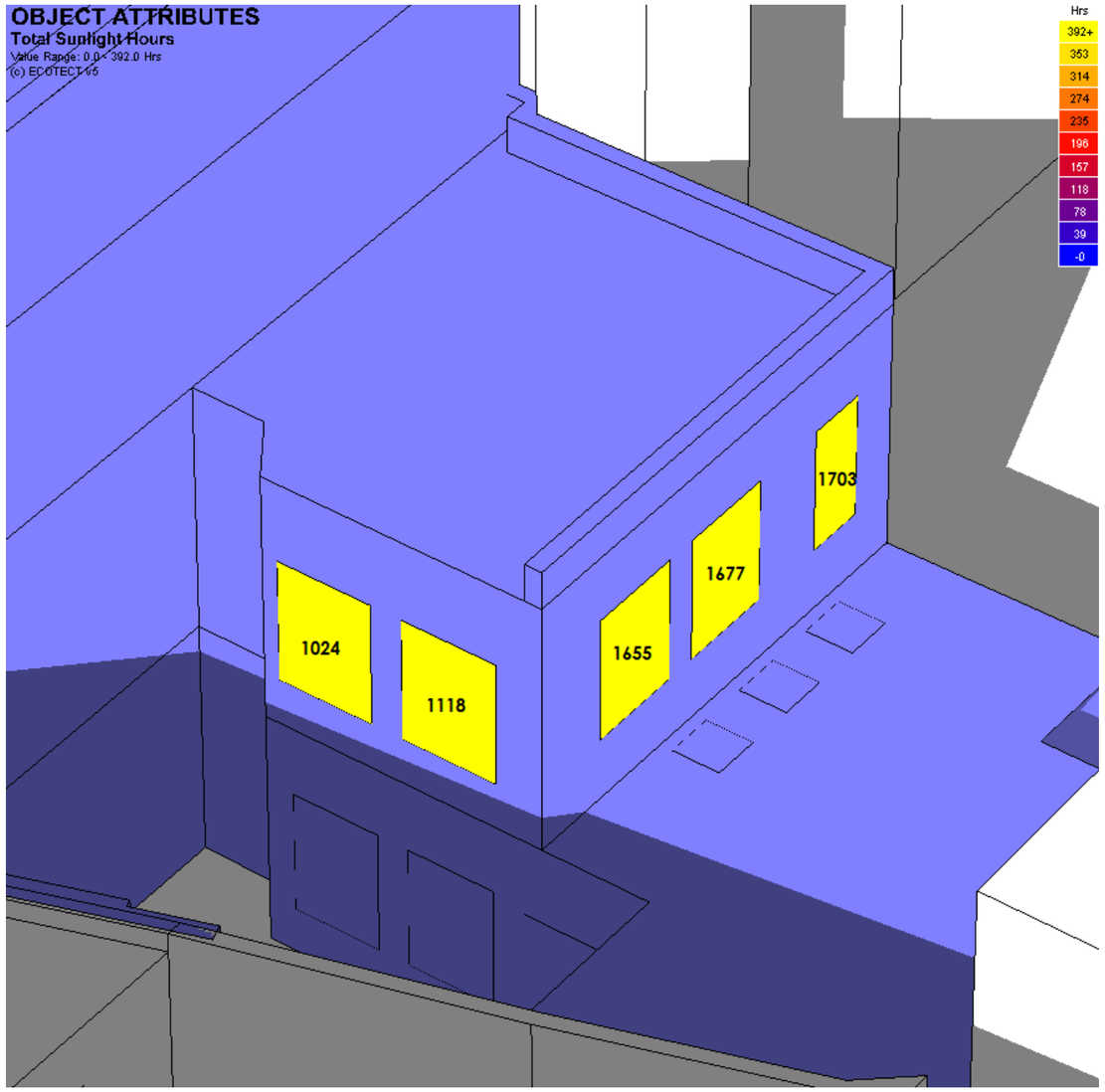


FIGURE 18 - WPSH TO WINDOWS – 1STF - 06 LIVING DINING KITCHEN

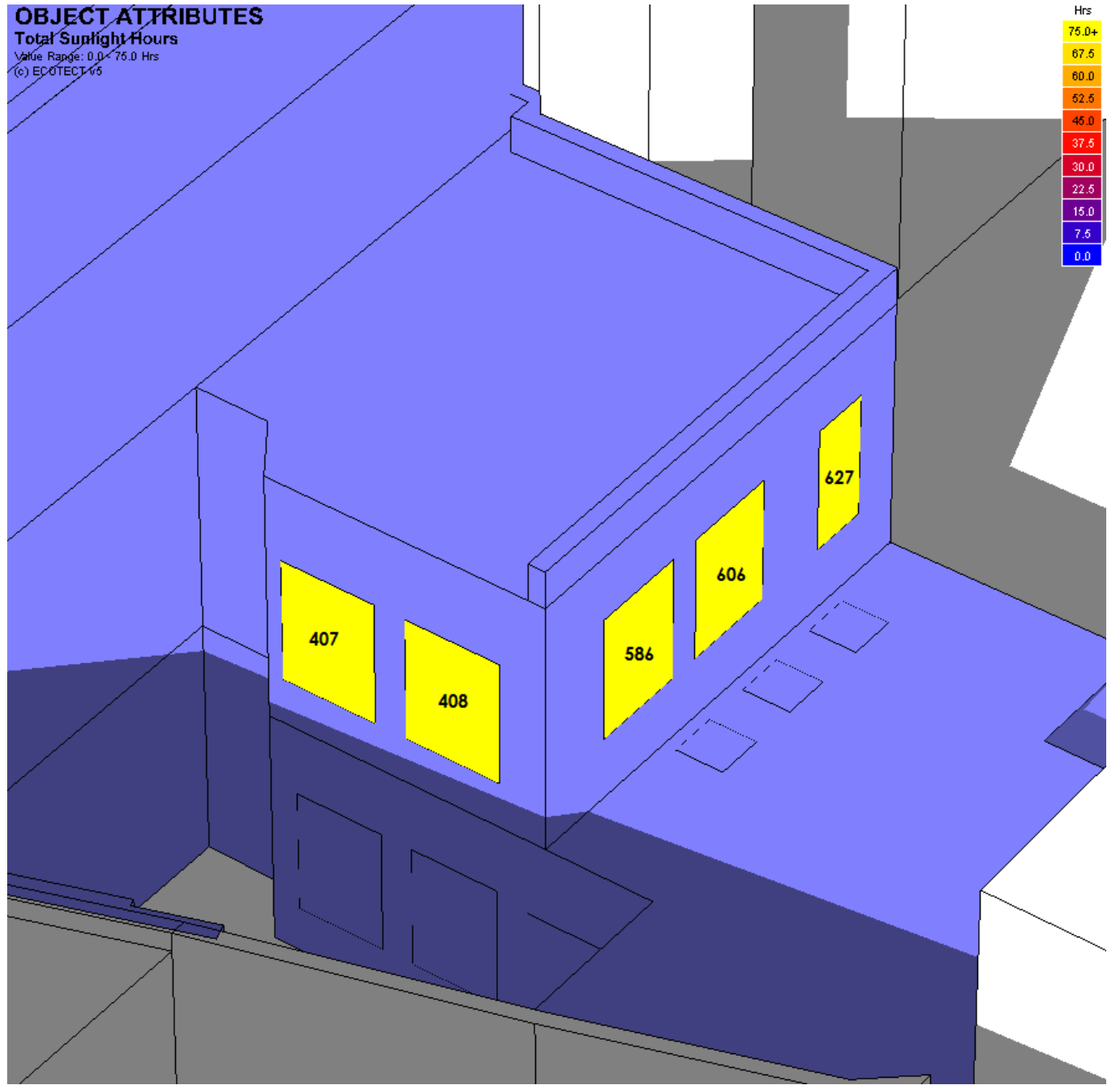
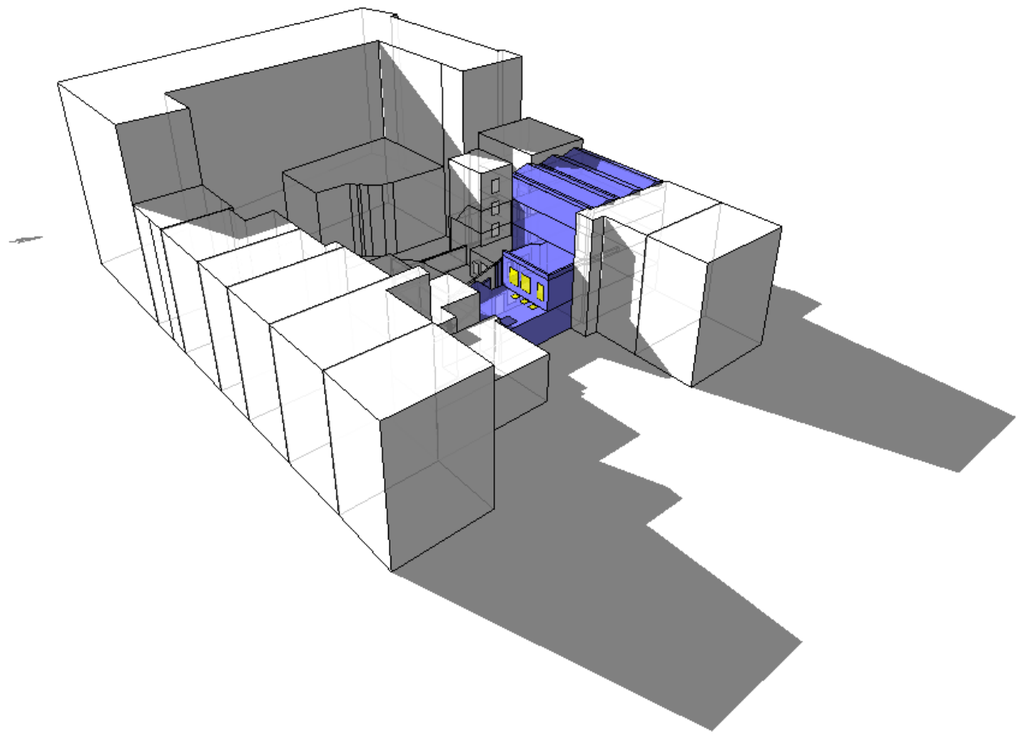


TABLE 10 – APSH & WPSH LIVING DINING KITCHEN AT GROUND FLOOR AND LIVING DINING KITCHEN AT 1ST FLOOR – PROPOSED DEVELOPMENT

FLOOR	ROOM	APSH	WPSH	COMPLIES WITH BRE GUIDELINES?
GF	DI LI KI	847	270	YES
		826	210	
		493	53	
		1567	436	
		1550	439	
		1588	477	
1STF	DI LI KI	1024	407	YES
		1118	408	
		1655	586	
		1677	606	
		1703	627	

FIGURE 19 – 3D VIEW OF THE PROPOSED DEVELOPMENT AT 61 SWINTON RD



8 CONCLUSION

The assessment undertaken in this report demonstrates that the self-contained flats and hotel guest rooms at 61 Swinton St achieve good levels of daylight with all rooms meeting or exceeding the values set by British Standard BS8206:Pt2 and Site Layout Planning for Daylight and Sunlight, A guide to good practice, by P J Littlefair, BRE 2011.

Based on a detailed Internal Daylight Calculations 100% rooms comply with the average Daylight Factor of 2% for Kitchens, 1.5% for Dining Living and 1% for Bedrooms.

Based on detailed Internal Daylight Calculations 100% rooms comply with the View of the Sky 80% of the working plane at kitchens, living-dining rooms, studies and bedrooms.

Therefore, 100% of the development 'as proposed' complies with Internal Daylight Conditions as per the British Standard British Standard BS8206:Pt2 and Site Layout Planning for Daylight and Sunlight, A guide to good practice, by P J Littlefair, BRE 2011.

Regarding Internal Sunlight conditions, BRE guidelines recommend that all living areas should receive at least 392 Annual Probable Sunlight Hours (APSH) and 75 Winter Probable Sunlight Hours (WPSH). If the living room does not comply then the other habitable rooms should be analyzed.

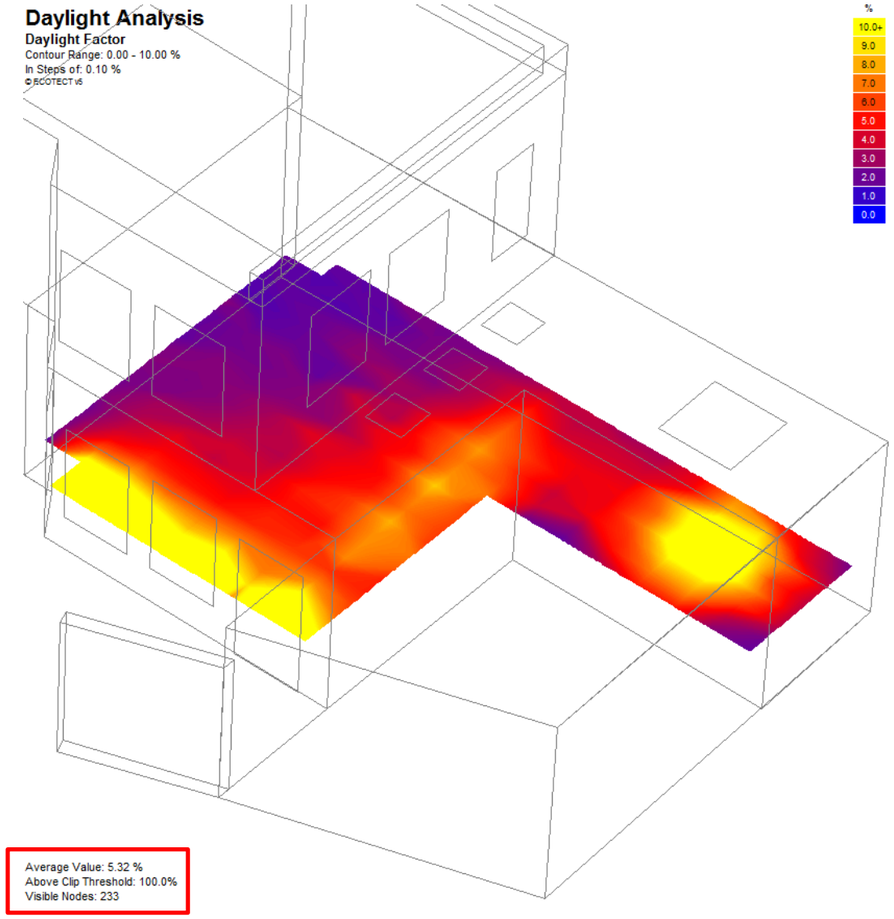
All Dining Living Kitchen rooms in the proposed development meet or exceed the sunlight hours set by the BRE guidelines.

The Dining Living Kitchen on Ground Floor and Dining Living Kitchen on 1st floor receive between 210 to 627 WPSH and 493 to 1703 APSH. **Therefore the proposed extension also complies with the BRE guidelines for APSH & WPSH in living areas.**

APPENDIX A – AVERAGE DAYLIGHT FACTOR (DF) AND VIEW OF THE SKY (VS) CALCULATIONS RESULTS

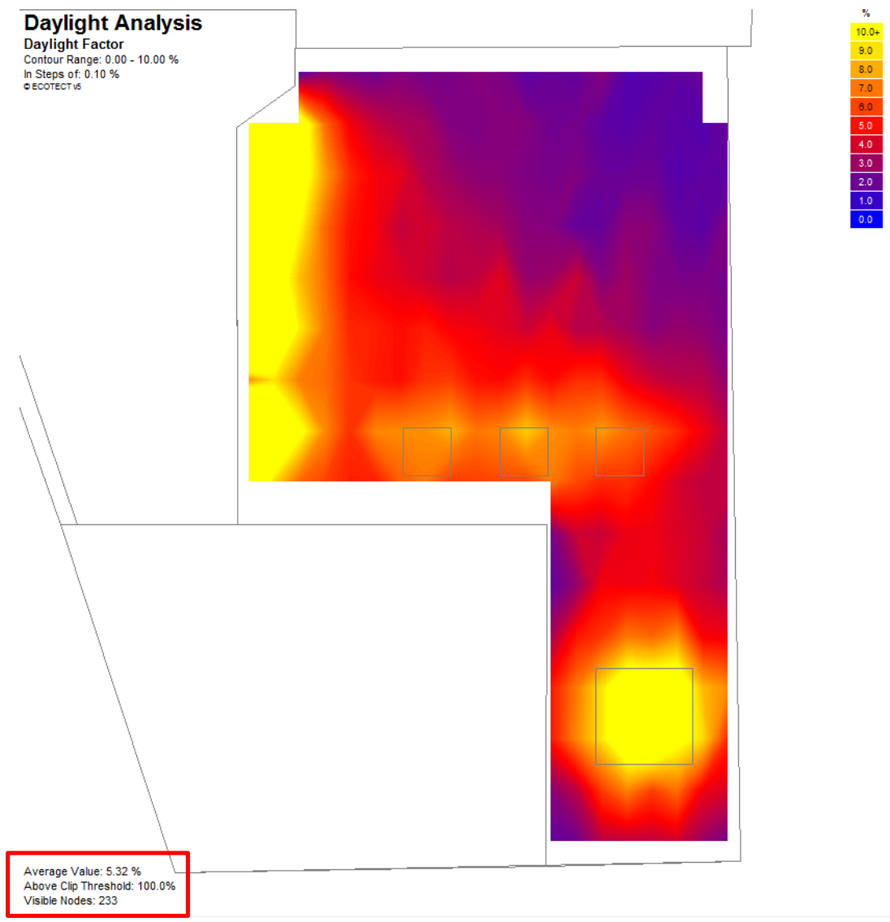
GF-01 LIVING DINING KITCHEN RESULTS

DF – PERSPECTIVE



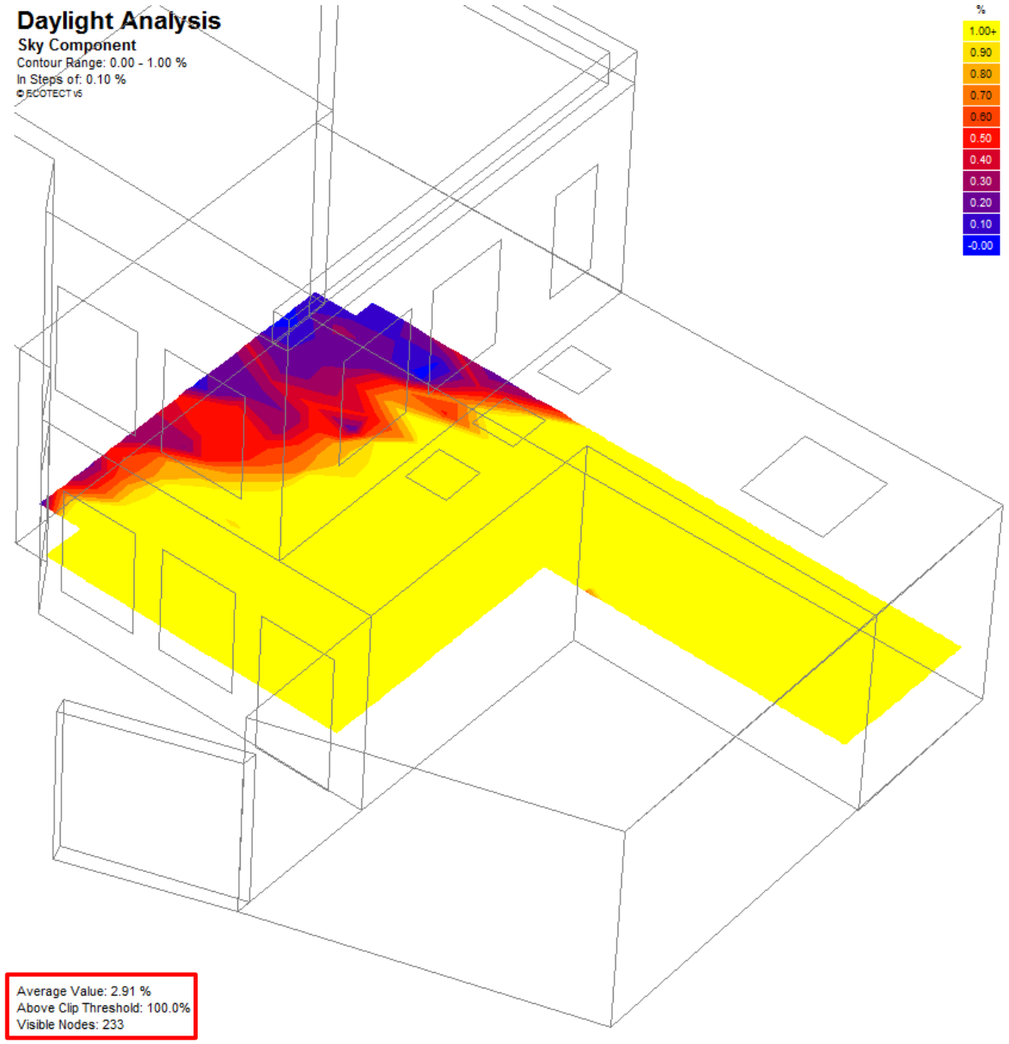
GF-01 LIVING DINING KITCHEN RESULTS

DF – PLAN



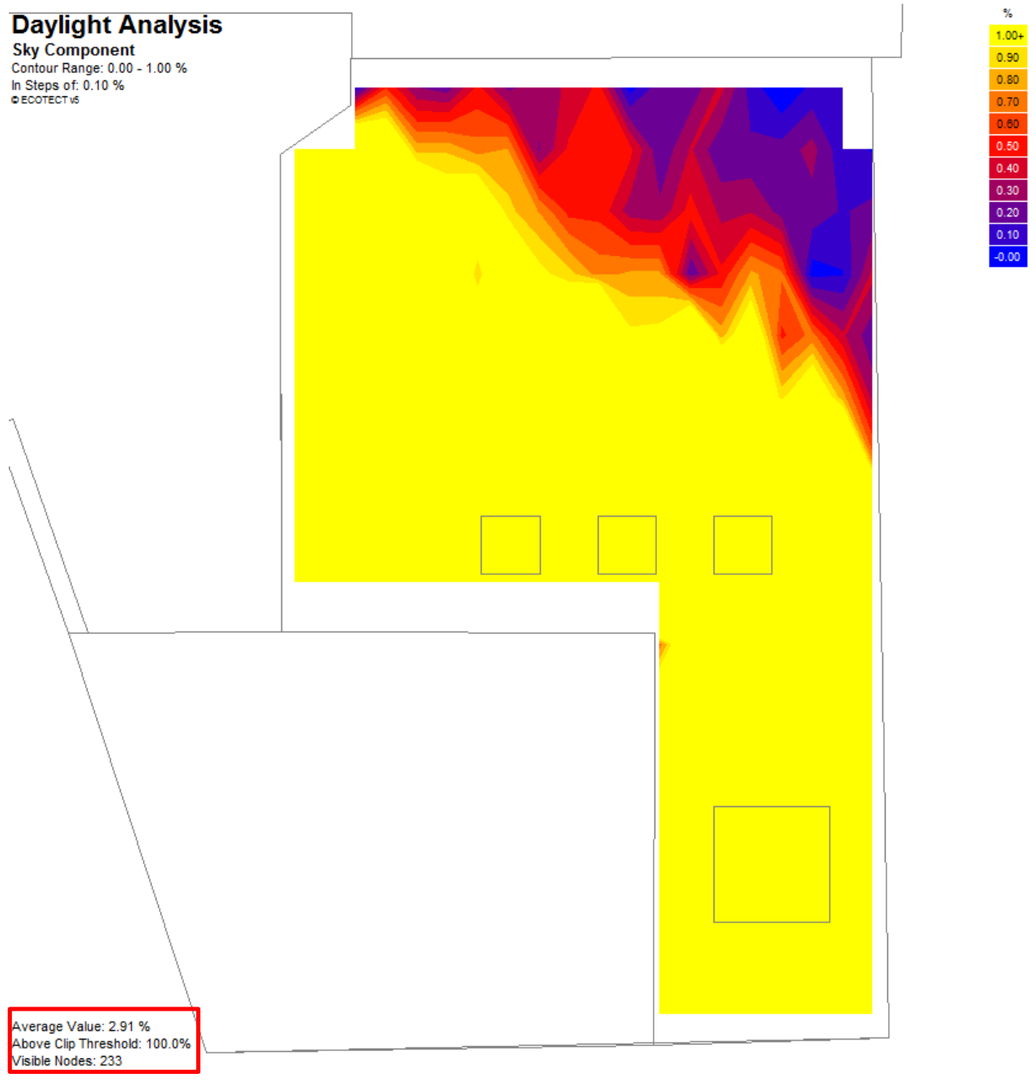
GF-01 LIVING DINING KITCHEN RESULTS

VS – PERSPECTIVE



GF-01 LIVING DINING KITCHEN RESULTS

VS - PLAN



APPENDIX B - REFLECTANCES OF COMMON MATERIALS - SOURCE CIBSE GUIDE

MATERIAL	REFLECTANCE (R)	MATERIAL	REFLECTANCE (R)
Windows		**Floors and furniture**	
Glass	0.1	Paper, white	0.8
Ceilings		Cement screed; PVC tiles, cream; carpet: light grey, middle buff	0.45
White emulsion paint on plain plaster surface	0.8	Timber, beech, birch, maple	0.35
White emulsion paint on acoustic title	0.7	Timber, oak; PVC tiles, brown and cream marbled; carpet, turquoise, sage green	0.25
White emulsion paint on no-fines concrete	0.6	Timber, iroko, keruing, medium oak; tiles, cork, polished	0.2
White emulsion paint on wool slab	0.5	Quarry tiles, red, heather brown; carpet (dark low maintenance); PVC tiles, dark brown; timber, dark oak	0.1
Walls		**Paint colours (with BS 4800 colour code)**	
White emulsion paint on plain plaster surface; tiles, white glazed	0.8	White 00E55	0.85
Brick, white gault	0.7	Pale cream 10C31	0.81
Plaster, pink	0.65	Light grey 00A01	0.68
White asbestos cement; brick, concrete, light grey; Portland cement, smooth	0.4	Strong yellow 10E53	0.64
Stainless steel	0.35	Mid grey 00A05	0.45
Brick, fletton	0.3	Strong green 14E53	0.22
Concrete, light grey; Portland cement, rough; brick, London stock; timber paneling, light oak, mahogany, gaboon	0.25	Strong red 04E53	0.18
Timber paneling, teak, afromosia, medium oak; brick, concrete, dark grey	0.2	Strong blue 18E53	0.15
Brick, blue engineering	0.15	Dark grey 10A11	0.14
Chalkboard, painted black	0.05	Dark red/purple 02C39	0.1

A.1.1 REFLECTANCES

The reflectance of a building material in use is affected by weathering, dirt and moisture. The overall reflectance of a surface is also affected by its shape: a deeply corrugated surface reflects less light than a smooth surface of the same material. Glossy surfaces have a slightly higher reflectance than matt materials of the same body colour, but the distribution of reflected light and the appearance of the surface is more significant than the change in total reflectance. Approximate reflectance values are given in Table A.1.

Table A.1. Approximate values of the reflectance of light

Material	Reflectance
Ground	
Snow (new)	0.8
Sand	0.3
Paving	0.2
Earth (dry)	0.2
Earth (moist)	0.1
Grass	0.1
Green Vegetation	0.1

APPENDIX B - REFLECTANCES OF COMMON MATERIALS - SOURCE BS 8206 PT 2

Material	Reflectance
Materials used internally	0.8
White paper	0.4
Stainless steel	0.4
Cement screed	0.4
Carpet (cream)	0.4
Wood (light veneers)	0.2
Wood (medium colours)	0.1
Wood (dark oak)	0.1
Quarry tiles	0.1
Window glass	

APPENDIX B - REFLECTANCES OF COMMON MATERIALS - SOURCE BS 8206 PT 2

A.1.1 REFLECTANCES

The reflectance of a building material in use is affected by weathering, dirt and moisture. The overall reflectance of a surface is also affected by its shape: a deeply corrugated surface reflects less light than a smooth surface of the same material. Glossy surfaces have a slightly higher reflectance than matt materials of the same body colour, but the distribution of reflected light and the appearance of the surface is more significant than the change in total reflectance. Approximate reflectance values are given in Table A.1.

Table A.1. Approximate values of the reflectance of light

Material	Reflectance
Other external materials	
Brickwork (white glazed)	0.7
Portland stone	0.6
Medium limestone	0.4
Concrete	0.4
Brickwork (London stock)	0.3
Brickwork (red)	0.2
Granite	0.2
Window glass	0.1
Tree foliage	0.1

APPENDIX B - REFLECTANCES OF COMMON MATERIALS - SOURCE BS 8206 PT 2

Table A.1. Approximate values of the reflectance of light *(continued)*

Material	Reflectance
Paint Colours (with BS 4800 colour Code)	
White 00E55	0.85
Pale cream 10C31	0.81
Light grey 00A01	0.68
Strong yellow 10E53	0.64
Mid-grey 00A05	0.45
Strong green 14E53	0.22
Strong red 04E53	0.18
Strong blue 18E53	0.15
Dark grey 10a11	0.14
Dark brown 08C89	0.10
Dark red-purple 02C39	0.10

References given are values for gloss paint. BS 4800 lists approximate Munsell references for paint colours for building purposes, and gives a useful method for deriving reflectances from Munsell references.

APPENDIX C – DAYLIGHT FACTOR CALCULATIONS AND VIEW OF THE SKY CALCULATION RESULTS – AVAILABLE UPON REQUEST