Interior Daylight Analysis
Sidcup Library

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Contents:

Executive Summary
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Overview

An analysis of the daylight conditions of the Sidcup Library development has been carried out.

The daylighting analysis has been calculated and assessed according to the BRE guidance "Site layout planning for daylight and sunlight – A guide to good practice" (second edition).

The daylighting analysis shows that:

- 89.9% of the rooms meet the ADF requirement.
- 96.6% of the rooms can receive direct light from the sky.
- 76.4% of the rooms meet the room depth criterion.

Please note that the BRE report is a guide for good practice and not an assessment of "Pass" and "Fail". Therefore, the failure to meet the recommended values for the ADF and no-sky line area do not indicate that the development is unsuitable.

Introduction
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Introduction

An analysis of the daylight conditions of the Sidcup Library development has been carried out. The proposal is to demolish the existing building to develop a four–storey building consisting of 32 new residential units

The daylighting analysis has been calculated and assessed according to the BRE guidance “Site layout planning for daylight and sunlight – A guide to good practice” (second edition). The calculations are based on plans of the proposed development provided by Stitch Architects, issued in September 2021.

BRE Guidelines
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Average Daylight Factor (ADF)

ADF is the average illuminance on the working plane in a room, divided by the illuminance on an unobstructed horizontal surface outdoors. For dwellings the following ADF are recommended:

- Kitchen 2%
- Living room 1.5%
- Bedroom 1%

The ADF is calculated by the following formula:

$$ADF = \frac{TMA_w\Theta}{A(1-R^2)}$$

Where:

- T, is the diffuse visible transmittance of the glazing
- M, is a maintenance factor, allowing for the effects of dirt
- A_w, is the net glazed area of the window (m^2)
- A, is the total area of the room surfaces: ceiling, floor, walls and windows (m^2)
- R, is their average reflectance
- Θ, is the angle of visible sky in degrees.

Position of No-Sky Line (NSL)

More than 80% of the working plane is recommended to receive direct light from the sky.

Room depth

The room depth recommendation applies to rooms lit by windows on one wall only. In this case the depth of the room L should not exceed the limiting value given by:

$$\frac{L}{W} + \frac{L}{H} < \frac{2}{1-R_b}$$

Where:

- W, is the room width
- H, is the window head height above floor level
- R_b, is the average reflectance of surfaces in the rear half of the room (away from the window).

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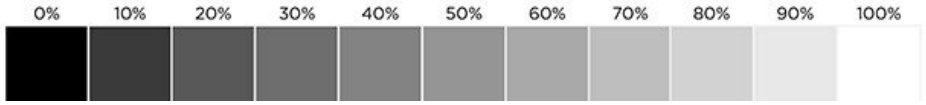
Basis for calculations

The daylight conditions of the residential units have been calculated using a daylight simulation software as opposed to the standard ADF formula due to the complex nature of the room layouts. The simulation software will provide more accurate results when compared to the simple standard ADF formula, as it takes into account further parameters such as the room layout (shape) and ambient bounces.

The following values have been used for the daylight calculations:

- Area weighted reflectance of the room surface (ceiling, floor walls and windows) of 0.5*
- Correction factor for dirt of 1, which corresponds to vertical glazing that can be cleaned easily
- Glass transmission factor of 0.65 (double glazing with low emissivity coating)
- Working Plane of 0.85m above the floor

*0.5 surface reflectance refers to a grey colour (see image below). Painting the wall and ceiling surface white can achieve an average reflectance of more than 0.5.



Assessed areas

The scheme consists of 32 residential units in total. As recommended by the BRE, the daylight conditions of the kitchen, living room, dining room and bedroom will be analysed in all units.

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Interior daylight results

The ADF, NSL and room depth results are shown in Appendix B. Illustrations of the ADF and NSL are presented in Appendix A.

- Most rooms meet the ADF criteria except 9 rooms (out of 89 rooms). Living room/Kitchen Rooms 7, 11, 24, 48, 52 and 71 have an ADF equal or above 1.5%, which is the threshold for living rooms and therefore the levels of Daylight should be acceptable.
- Most rooms meet the NSL criteria. 3 rooms cannot meet the NSL criterion, however, all the failing rooms are very close to the recommended value. Moreover, 2 of the failing rooms meet the other two daylight criteria and are bedrooms. which are not considered primary living spaces. The BRE guidance emphasises on the priority of meeting daylight levels in living areas over other habitable spaces. Also, they are more likely to be use during overnight period.
- 21 rooms out of 89 fail to meet the room depth criteria. 14 of the failing rooms meet the other two daylight criteria.

Conclusions
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Conclusions

The daylighting analysis shows that:

- 89.9% of the rooms meet the ADF requirement. However, living room/Kitchen Rooms 7, 11 24, 48, 52 and 71 have an ADF equal or above 1.5%, which is the threshold for living rooms and therefore the levels of Daylight should be acceptable.
- 96.6% of the rooms can receive direct light from the sky. All the failing rooms are very close to the recommended value. Moreover, 2 of the failing rooms meet the other two daylight criteria and are bedrooms. which are not considered primary living spaces. The BRE guidance emphasises on the priority of meeting daylight levels in living areas over other habitable spaces. Also, they are more likely to be use during overnight period.
- 76.4% of the rooms meet the room depth criterion. 14 of the failing rooms meet the other two daylight criteria.

Please note that the BRE report is a guide for good practice and not an assessment of “Pass” and “Fail”. Therefore, the failure to meet the recommended values for the ADF and no-sky line area do not indicate that the development is unsuitable.

Appendix A
Interior Daylight Analysis
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Illustrations

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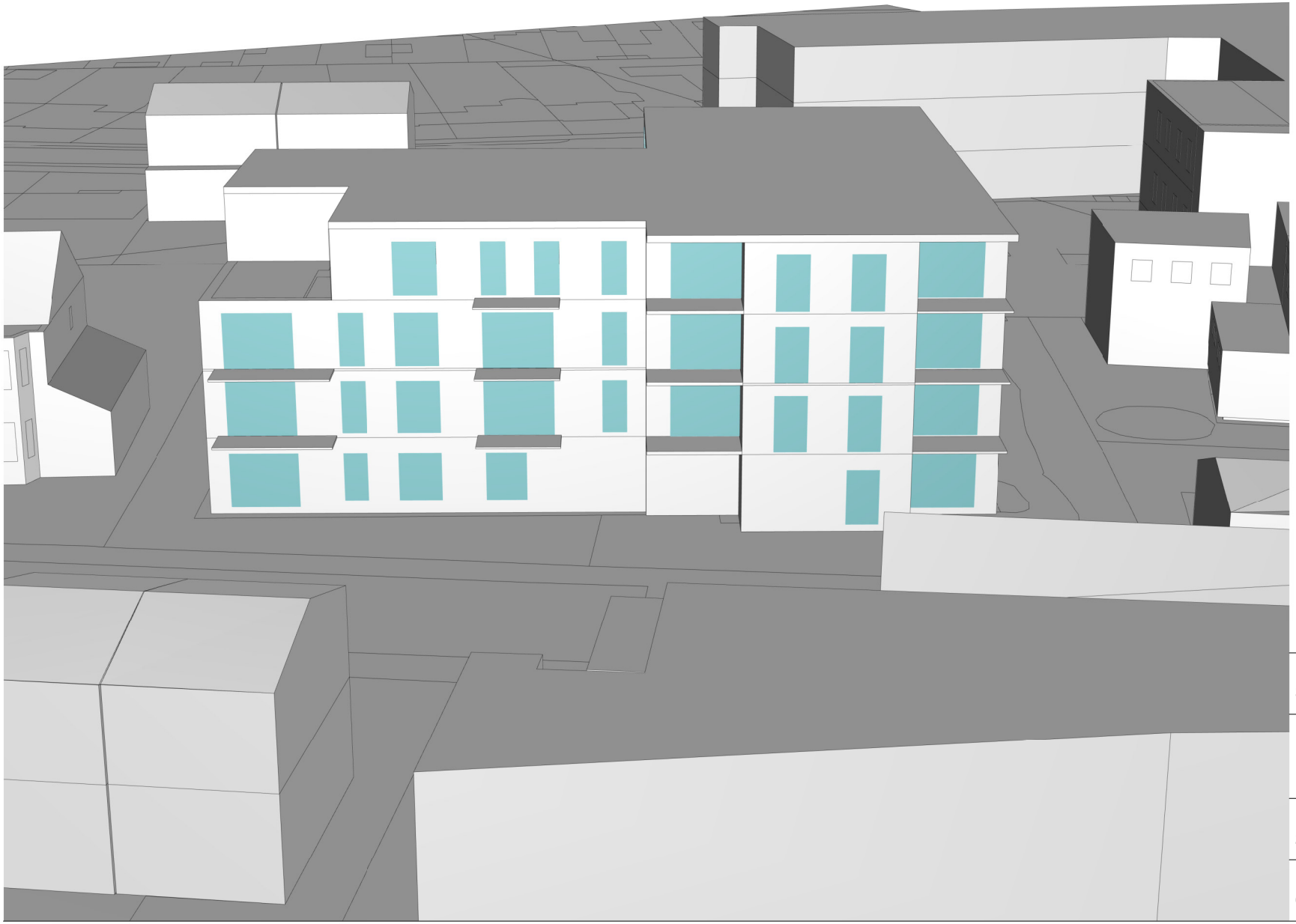
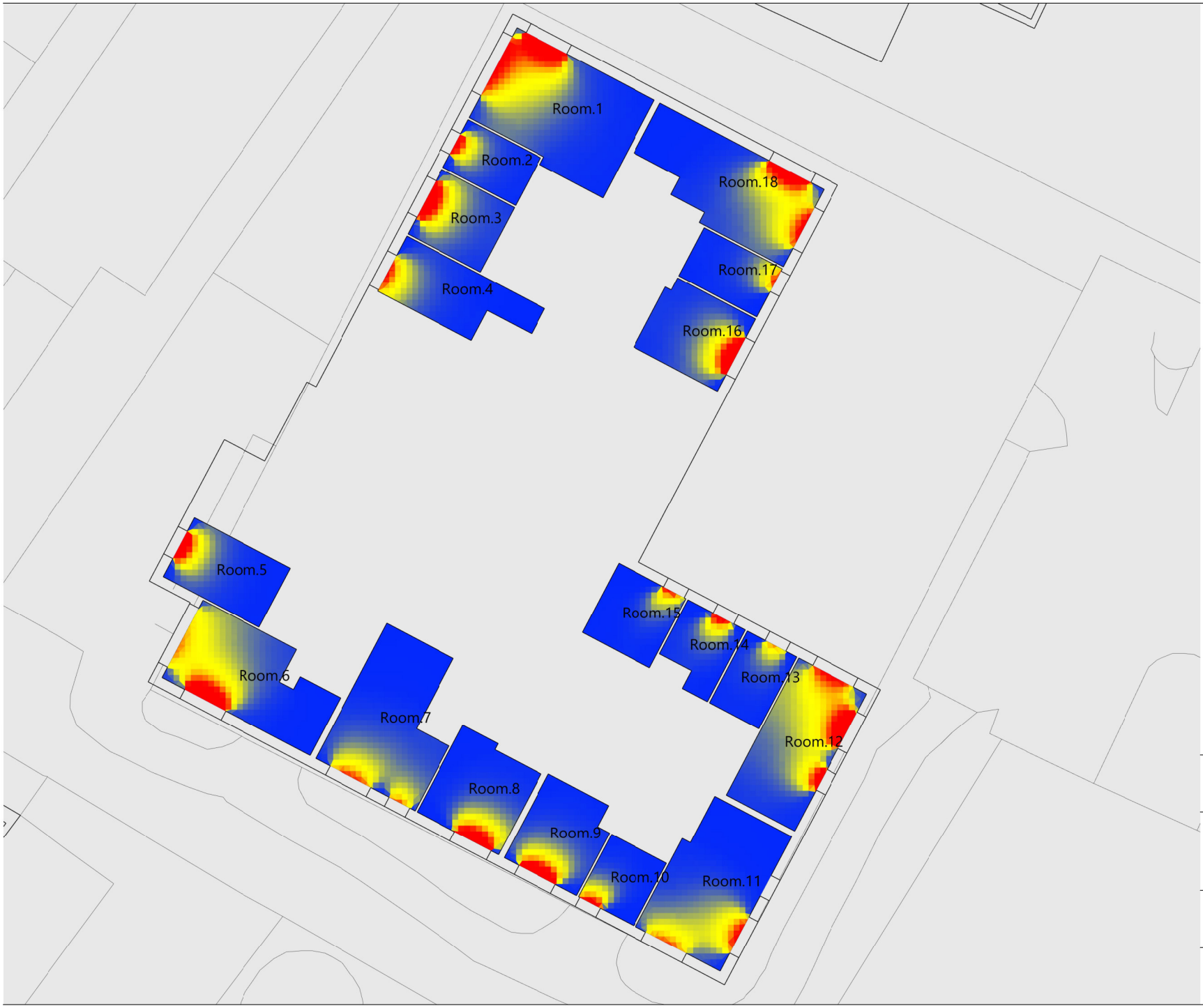


Project Name:
Sidcup Library

Drawing Name
Proposed development

Date:
21/10/2021

Drawing Number:
6207_A_01



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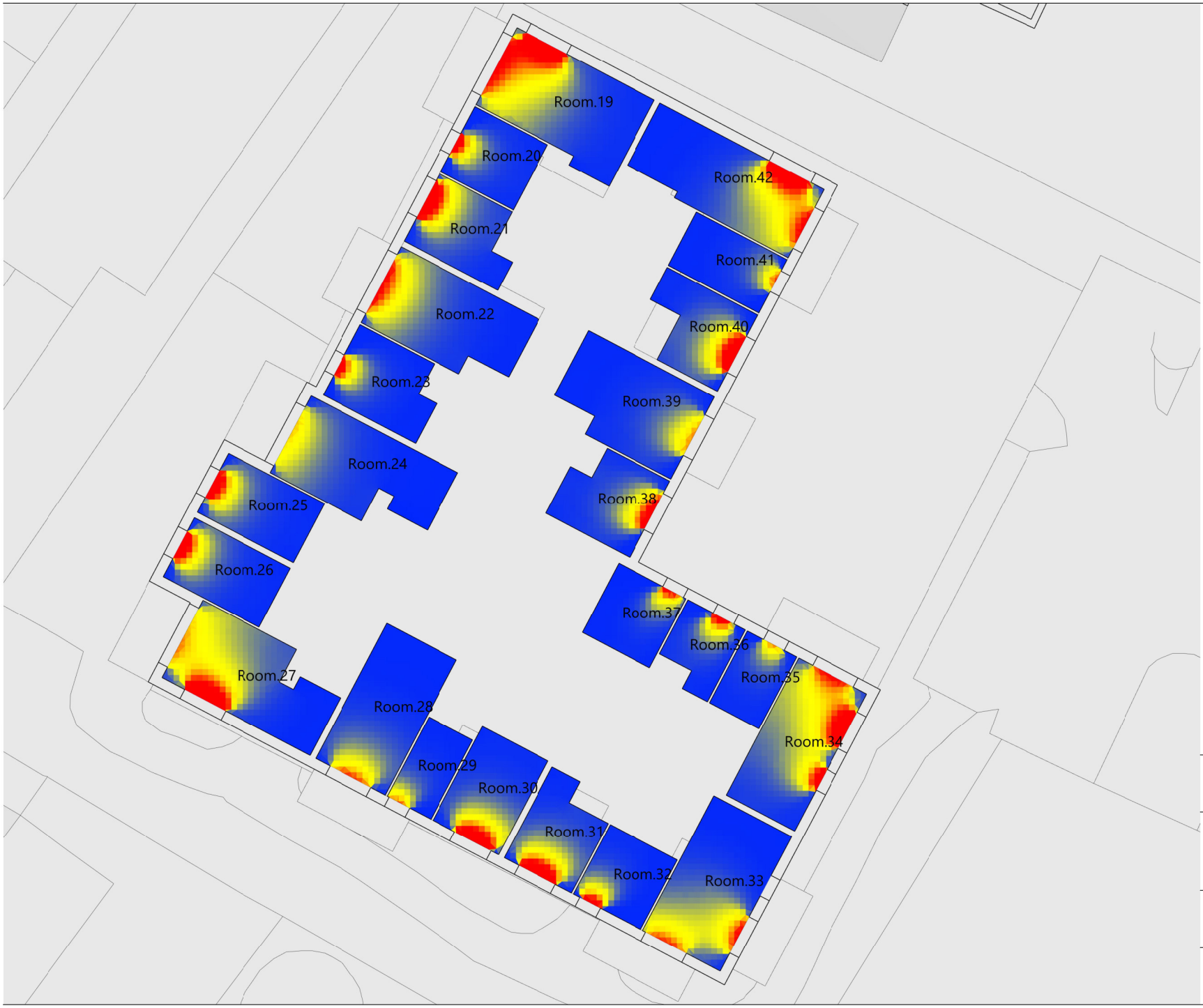
Project Name:
Sidcup Library

Drawing Name
ADF – Ground Floor

Date:
21/10/2021

Drawing Number:
6207_B_01



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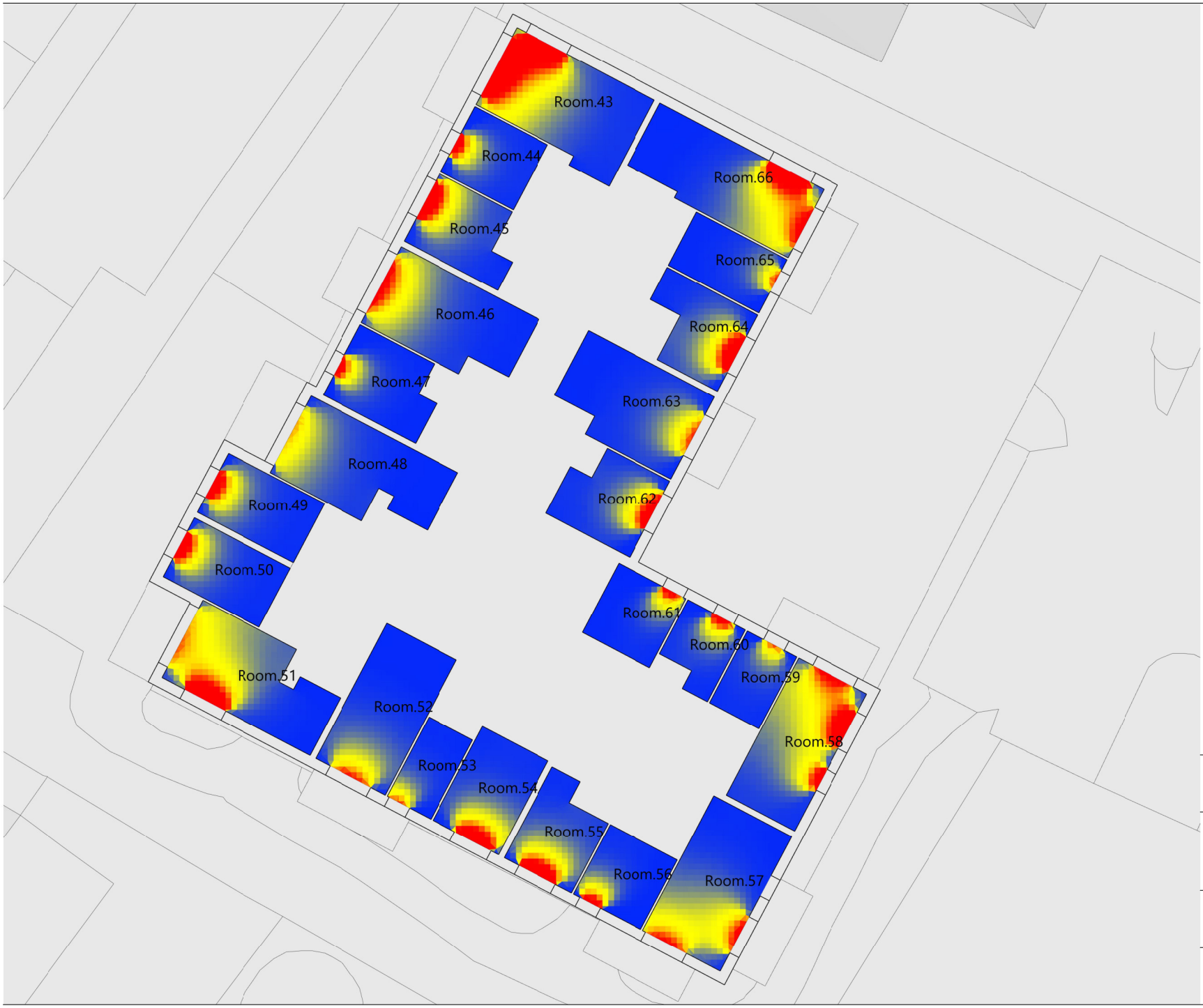
Project Name:
Sidcup Library

Drawing Name
ADF – First Floor

Date:
21/10/2021

Drawing Number:
6207_B_02



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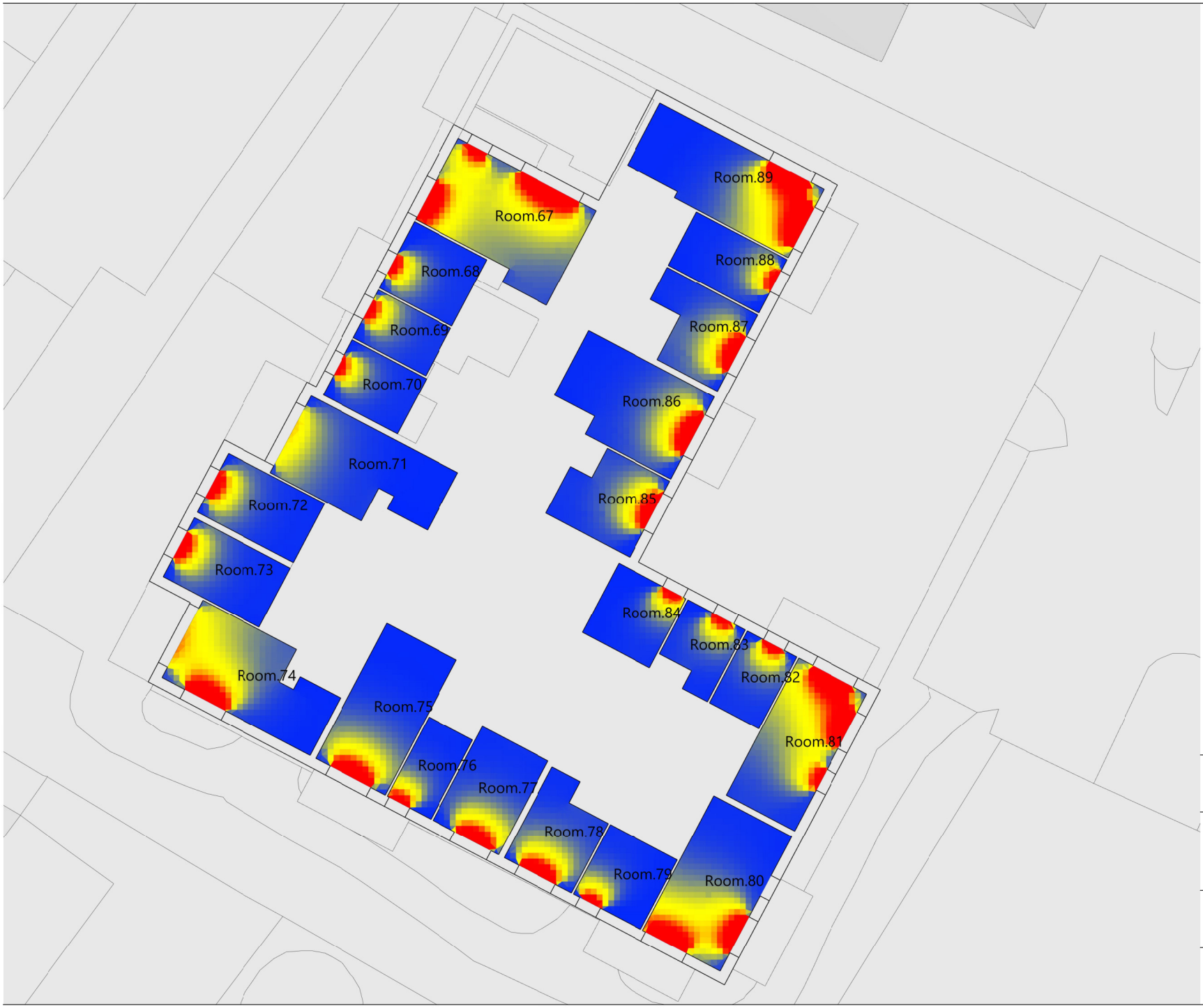
Project Name:
Sidcup Library

Drawing Name
ADF – Second Floor

Date:
21/10/2021

Drawing Number:
6207_B_03



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ADF
10.00<
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
<0.00

Project Name:
Sidcup Library

Drawing Name
ADF – Third Floor

Date:
21/10/2021

Drawing Number:
6207_B_04

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Area with sky view

Area without sky view

Project Name:
Sidcup Library

Drawing Name
NSL – Ground floor

Date:
21/10/2021

Drawing Number:
6207_C_01

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Area with sky view

Area without sky view

Project Name:
Sidcup Library

Drawing Name
NSL – First Floor

Date:
21/10/2021

Drawing Number:
6207_C_02

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Area with sky view

Area without sky view

Project Name:
Sidcup Library

Drawing Name
NSL – Second Floor

Date:
21/10/2021

Drawing Number:
6207_C_03

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Area with sky view

Area without sky view

Project Name:
Sidcup Library

Drawing Name
NSL – Third Floor

Date:
21/10/2021

Drawing Number:
6207_C_04

Appendix B
Interior Daylight Analysis
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Results

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Appendix B - Results

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Unit	Room	Use	Required ADF (%)	Calculated ADF (%)	Compliance	NSL (%)	Compliance	Room depth - Maximum room depth	Compliance
Unit 1	Room1	Kitchen/Living	2	2.91	Pass	98.00	Pass	8.16>6.56	Fail
	Room2	Bedroom	1	1.96	Pass	93.00	Pass	4.3<5.4	Pass
	Room3	Bedroom	1	3.18	Pass	95.70	Pass	4.69<5.74	Pass
	Room4	Bedroom	1	1.5	Pass	87.80	Pass	4.6<6.53	Fail
Unit 2	Room5	Bedroom	1	1.93	Pass	87.20	Pass	5.59<5.85	Pass
	Room6	Kitchen/Living	2	3.02	Pass	80.00	Pass	7.84>6.43	Pass
Unit 3	Room7	Kitchen/Living	2	1.54	Fail	85.90	Pass	6.07<6.7	Fail
	Room8	Bedroom	1	2.03	Pass	79.40	Fail	5.71<6.07	Pass
Unit 4	Room9	Bedroom	1	2.3	Pass	87.90	Pass	4.64<6.04	Pass
	Room10	Bedroom	1	1.54	Pass	86.30	Pass	4.05<5.46	Pass
	Room11	Kitchen/Living	2	1.86	Fail	65.20	Fail	6.87>6.61	Pass
Unit 5	Room12	Kitchen/Living	2	3.98	Pass	98.50	Pass	6.18<6.59	Pass
	Room13	Bedroom	1	1.34	Pass	91.10	Pass	3.83<5.64	Pass
	Room14	Bedroom	1	1.72	Pass	78.60	Fail	3.78<5.72	Pass
	Room15	Bedroom	1	1.15	Pass	82.20	Pass	4.57<5.77	Pass
Unit 6	Room16	Bedroom	1	2.63	Pass	93.30	Pass	4.99<6.04	Pass
	Room17	Bedroom	1	1.38	Pass	91.30	Pass	4.54<5.47	Pass
	Room18	Kitchen/Living	2	2.55	Pass	97.70	Pass	8.37>6.5	Fail
Unit 7	Room19	Kitchen/Living	2	4.56	Pass	99.60	Pass	7.85>6.46	Fail
	Room20	Bedroom	1	1.74	Pass	88.10	Pass	4.7<5.75	Pass
	Room21	Bedroom	1	2.93	Pass	96.50	Pass	4.77<5.96	Pass
Unit 8	Room22	Kitchen/Living	2	2.22	Pass	99.30	Pass	7.82>6.15	Fail
	Room23	Bedroom	1	1.35	Pass	87.90	Pass	5.01<6	Pass
Unit 9	Room24	Kitchen/Living	2	1.52	Fail	93.40	Pass	8.26>6.21	Fail
	Room25	Bedroom	1	2.08	Pass	95.30	Pass	5.59<5.85	Pass
Unit 10	Room26	Bedroom	1	2.07	Pass	95.20	Pass	5.59<5.85	Pass
	Room27	Kitchen/Living	2	3.36	Pass	100.00	Pass	7.84>6.43	Pass
Unit 11	Room28	Kitchen/Living	2	1.42	Fail	97.50	Pass	7.57>6.27	Fail
	Room29	Bedroom	1	1.34	Pass	92.90	Pass	3.76<5.73	Pass
	Room30	Bedroom	1	2.47	Pass	96.00	Pass	5.07<6.13	Pass
Unit 12	Room31	Bedroom	1	2.83	Pass	96.20	Pass	4.58<6.1	Pass
	Room32	Bedroom	1	1.44	Pass	84.30	Pass	4.58<5.78	Pass
	Room33	Kitchen/Living	2	2.17	Pass	98.30	Pass	6.55<6.61	Pass
Unit 13	Room34	Kitchen/Living	2	4.13	Pass	98.80	Pass	6.18<6.59	Pass
	Room35	Bedroom	1	1.43	Pass	91.90	Pass	3.83<5.64	Pass
	Room36	Bedroom	1	1.92	Pass	88.80	Pass	3.78<5.72	Pass
	Room37	Bedroom	1	1.32	Pass	82.20	Pass	4.57<5.77	Pass
Unit 14	Room38	Bedroom	1	2.28	Pass	86.80	Pass	5.46<5.85	Pass
	Room39	Kitchen/Living	2	1.38	Fail	93.80	Pass	7.05>6.37	Fail
Unit 15	Room40	Bedroom	1	2.87	Pass	92.80	Pass	4.72<6.07	Pass
	Room41	Bedroom	1	1.2	Pass	93.60	Pass	5.21<5.7	Pass
	Room42	Kitchen/Living	2	2.89	Pass	99.40	Pass	8.65>6.42	Fail
Unit 16	Room43	Kitchen/Living	2	4.65	Pass	99.60	Pass	7.85>6.46	Fail
	Room44	Bedroom	1	1.78	Pass	88.10	Pass	4.7<5.75	Pass
	Room45	Bedroom	1	2.97	Pass	96.50	Pass	4.77<5.96	Pass
Unit 17	Room46	Kitchen/Living	2	2.26	Pass	99.30	Pass	7.82>6.15	Fail
	Room47	Bedroom	1	1.38	Pass	87.90	Pass	5.01<6	Pass
Unit 18	Room48	Kitchen/Living	2	1.55	Fail	93.40	Pass	8.26>6.21	Fail
	Room49	Bedroom	1	2.12	Pass	95.30	Pass	5.59<5.85	Pass
Unit 19	Room50	Bedroom	1	2.12	Pass	95.20	Pass	5.59<5.85	Pass
	Room51	Kitchen/Living	2	3.44	Pass	100.00	Pass	7.84>6.43	Pass
Unit 20	Room52	Kitchen/Living	2	1.5	Fail	97.50	Pass	7.57>6.27	Fail
	Room53	Bedroom	1	1.37	Pass	92.90	Pass	3.76<5.73	Pass
	Room54	Bedroom	1	2.55	Pass	96.00	Pass	5.07<6.13	Pass
Unit 21	Room55	Bedroom	1	2.94	Pass	96.20	Pass	4.58<6.1	Pass
	Room56	Bedroom	1	1.52	Pass	84.30	Pass	4.58<5.78	Pass
	Room57	Kitchen/Living	2	2.47	Pass	98.70	Pass	6.55<6.61	Pass
Unit 22	Room58	Kitchen/Living	2	4.19	Pass	98.80	Pass	6.18<6.59	Pass
	Room59	Bedroom	1	1.44	Pass	91.90	Pass	3.83<5.64	Pass
	Room60	Bedroom	1	1.93	Pass	88.80	Pass	3.78<5.72	Pass
	Room61	Bedroom	1	1.31	Pass	82.20	Pass	4.57<5.77	Pass
Unit 23	Room62	Bedroom	1	2.28	Pass	86.80	Pass	5.46<5.85	Pass
	Room63	Kitchen/Living	2	1.41	Fail	93.90	Pass	7.05>6.37	Fail
Unit 24	Room64	Bedroom	1	2.9	Pass	92.80	Pass	4.72<6.07	Pass
	Room65	Bedroom	1	1.23	Pass	93.60	Pass	5.21<5.7	Pass
	Room66	Kitchen/Living	2	3.04	Pass	99.40	Pass	8.65>6.42	Fail
Unit 25	Room67	Kitchen/Living	2	4.91	Pass	99.10	Pass	7.95>6.53	Fail
	Room68	Bedroom	1	1.79	Pass	87.70	Pass	4.73<5.77	Pass
	Room69	Bedroom	1	2.28	Pass	91.10	Pass	4.3<5.4	Pass
	Room70	Bedroom	1	1.86	Pass	90.80	Pass	4.16<5.75	Pass
Unit 26	Room71	Kitchen/Living	2	1.5	Fail	93.40	Pass	8.26>6.21	Fail
	Room72	Bedroom	1	2.1	Pass	95.30	Pass	5.59<5.85	Pass

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Appendix B - Results

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Unit	Room	Use	Required ADF (%)	Calculated ADF (%)	Compliance	NSL (%)	Compliance	Room depth - Maximum room depth	Compliance
Unit 27	Room73	Bedroom	1	2.1	Pass	95.20	Pass	5.59<5.85	Pass
	Room74	Kitchen/Living	2	3.34	Pass	100.00	Pass	7.84>6.43	Pass
Unit 28	Room75	Kitchen/Living	2	2.24	Pass	97.50	Pass	7.57>6.27	Fail
	Room76	Bedroom	1	2.06	Pass	92.80	Pass	3.76<5.73	Pass
	Room77	Bedroom	1	2.59	Pass	96.00	Pass	5.07<6.13	Pass
Unit 29	Room78	Bedroom	1	2.96	Pass	96.20	Pass	4.58<6.1	Pass
	Room79	Bedroom	1	1.63	Pass	84.40	Pass	4.58<5.78	Pass
	Room80	Kitchen/Living	2	3.67	Pass	98.80	Pass	6.55<6.61	Pass
Unit 30	Room81	Kitchen/Living	2	4.89	Pass	99.30	Pass	6.18<6.59	Pass
	Room82	Bedroom	1	2.2	Pass	91.90	Pass	3.83<5.64	Pass
	Room83	Bedroom	1	2.08	Pass	89.10	Pass	3.78<5.72	Pass
	Room84	Bedroom	1	1.51	Pass	82.30	Pass	4.57<5.77	Pass
Unit 31	Room85	Bedroom	1	2.69	Pass	93.20	Pass	5.46<5.85	Pass
	Room86	Kitchen/Living	2	2.35	Pass	96.70	Pass	7.05>6.37	Fail
Unit 32	Room87	Bedroom	1	2.99	Pass	94.30	Pass	4.72<6.07	Pass
	Room88	Bedroom	1	1.78	Pass	93.60	Pass	5.21<5.7	Pass
	Room89	Kitchen/Living	2	3.7	Pass	99.50	Pass	8.65>6.42	Fail
			Total number of rooms		89		89		89
			Pass		80	Pass	86	Pass	68
					89.9%		96.6%		76.4%
			Fail		9	Fail	3	Fail	21
					10.1%		3.4%		23.6%