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5020 Daylight Reception Analysis

DAYLIGHT RECEPTION IN HABITABLE ROOMS WITHIN THE PROPOSED DEVELOPMENT

The Green Quarter

Proposed Strategic Housing Development

Cartrontroy,
Kilnafaddoge
Lissywollen and
Ardnaglug (townlands),
Athlone
Co. Westmeath

Avenir Homes Limited

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Contents

1 Introduction

1.1 Report purpose

This report gives information on the level of achieved daylight reception in habitable rooms within the proposed new development.

1.2 Instruction

DKPartnership (DKP) have been commissioned by Avenir Homes Limited to carry out the analysis and report for the proposed development at Cartrontroy, Kilnafaddoge, Lissywollen and Ardnaglug (townlands), Athlone, Co. Westmeath.

1.3 Development description

Avenir Homes Limited. intend to apply to An Bord Pleanála for permission for a strategic housing development at Cartrontroy, Kilnafaddoge, Lissywollen and Ardnaglug (townlands), Athlone, Co. Westmeath. The development will consist of:
The construction of a mixed use residential development of 122 no. residential units with ancillary creche, 46 no. student apartments consisting of 283 bed spaces, and all associated site development works. The proposed development makes provision for 60 no. dwelling houses comprising 38 no. 2-storey 3-bed townhouses, 7 no. 2-storey 4-bed townhouses, 7 no. 3-storey 4-bed townhouses, 6 no. 2 storey 4-bed semi-detached and 2 no. 2 storey 4-bed detached. The proposed development includes 62 no. apartments / duplexes to be provided as follows: Block R1 containing 38 no. apartments (16 no. 1 bed units and 22 no. 2 bed units) in a 3-6 storey building, and Block R2 containing 20 no. duplex units (10 no. 2 bed units and 10 no. 3 bed units) over 4 storeys with 4 no. apartments (4 no. 2 bed units) in one 5th storey feature area. The proposed student accommodation makes provision for 283 no. bed spaces in 3 no. blocks to be provided as follows: Block S1 containing 18 apartments with 117 bed spaces over 5-6 storeys, Block S2 containing 16 apartments with 107 bed spaces over 6-7 storeys, and Block S3 containing 12 apartments with 59 bed spaces over 4-5 storeys.

The proposed development will provide for two new vehicular accesses as well as pedestrian entrances onto Lissywollen Avenue east-west access road (as permitted under An Bord Pleanála Reference ABP-309513-21). Minor modifications to ABP-309513-21 are proposed to cater for these access points, alterations to cycle/pedestrian paths, the removal of a central island to facilitate the south-eastern entrance, and provision of bus stop infrastructure. Ancillary site works include public and communal open spaces, hard and soft landscaping, pedestrian / cycleways, car parking, cycle parking, bin storage, public lighting, solar panels, ESB substation and supporting distribution kiosks, and all other ancillary works above and below ground. The proposal includes pedestrian and cycle linkages onto the Old Rail Trail Greenway to the south and Blackberry Lane (L40061) to the west.

In addition to the above specified works within the red-line boundary, Westmeath County Council are facilitating some offsite works to support the project for which the applicant has confirmed written consent. These include:
Resurfacing Blackberry lane along the western extent of the site. A special development contribution has been agreed with the applicant for such purposes.
Facilitating works to complete connections to the Old Rail Trail Greenway, including
Completion of pedestrian/cycle path between Blocks R1 and S1 to the surfaced area of the greenway to the south, and;
Replacement of existing gated access between the greenway and Blackberry Lane (southwest of the site) with a revised arrangement with dedicated cycle/pedestrian access. Final works to be agreed with Westmeath County Council.

1.4 Policy and building regulation requirements

There are no particular building regulations in relation day light/shadow effect standards other than recommendations outlined or referred to in the CIBSE lighting guide 10, BS EN17037/EN17037 and the BRE document" Site layout planning for daylight and sun light".

2 Executive summary

2.1 Analysis conducted

This report details the achieved calculated daylight reception in habitable rooms within the new development and compares these for compliance with the recommendations of the relevant guidelines and standards.

2.2 Daylight reception and building orientation

Day light reception in habitable rooms within the proposed development under the BRE, CIBSE and BS EN17037/EN17037 is calculated using the area of the glazed element, the room depth/height ratio, the room light reflection capability and the amount of direct or blocked/partially blocked daylight it receives. i.e. building orientation is not relevant to day light reception or daylight reception calculations. In other words day light factor analysis is equal to all orientations. This note is for clarity as day light is often confused with sunlight or sunlight energy which is effected by orientation.

2.3 Guidelines and standards applied

For this report we applied the recommendations and guideline of the following;

- The Building Research Establishment (BRE) report, site layout planning for daylight and sunlight – a guide to good practice (referred to as the BRE Report).
- British European Standard BS EN17037/EN17037 Day lighting standards and contains guidance on the minimum recommended levels of interior day lighting.
- CIBSE guide 10 Day light and lighting for buildings.

2.4 Technical analysis

The amount of daylight received in a room is calculated and expressed as a daylight factor. This calculated daylight factor is then compared with the BRE recommended room daylight factor to ensure sufficient daylight reception. Calculations were conducted in accordance with the BRE guidelines to determine the average day light factor in a number of selected rooms within the new development. These selected rooms are generally in (daylight) challenging locations typically based at the lowest (ground floor) levels given that these would receive the least amount of day light. Once the ground floor rooms achieve compliance all other rooms at higher levels with similar room/window configurations and parameters will also achieve compliance as the vertical daylight impact angle will improve increasing the daylight reception typically 0.3%-0.5% per floor level (3m). The ADF daylight has been calculated to include for diffused daylight where the architects have indicated privacy screens / louvres effecting the reception by 2% to 12% pending the extend and location of the screens.

2.5 Daylight reception in rooms within the new development conclusion

The BRE report recommends as a methodology for assessing sufficient daylight reception in a habitable room, that the calculated average daylight factor (ADF) of a habitable room to be in excess of the BRE bench marks of a kitchen at 2%, a living room at 1.5%, a bedroom at 1% and a living room/bedroom at 1.5%. The calculation assessment was segregated according to building type, these are;
(a) Residential apartments, R1 and R2
(b) Residential housing
(c) Student housing, S1, S2 and S3

Calculation findings are as follows (see images throughout chapter 5 for receptor locations):

(a) Residential apartments – R1 and R2
From the calculation result table 5.1 we note;

- R1 Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- R1 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- R1 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor typically 0.3%-0.5% per floor level.

- R2 Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- R2 Level 01: All floors above the ground floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

(b) Residential housing
From the calculation result table 5.2 we note;
- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 01: All floors above the ground floor dwellings are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

(c) Student housing – S1, S2 and S3
From the calculation result table 5.3 we note;
- S1 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S1 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

- S2 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S2 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

- S3 Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S3 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S3 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

(Note on privacy screens/louvers: Receptors with screens have been incorporated into the ADF calculation and albeit a reduction in receiving daylight reception, these receptors still achieved an ADF in excess of the guidelines.)

Given the results and conclusions above we, DKP, deem the proposed project at Lissywollen to be in compliance with the recommendations in the BRE design guidelines 'site layout and planning for daylight and sunlight - a guide to good practice'.

2.6 Mitigation measures/actions
No mitigation measures anticipated.

3 Geographical overview

3.1 Project overview

Image 3.1 the (google maps) site map below indicates the location of the site approximately outlined.

Image 3.1 proposed development site area outline

4 Approach and methodology

4.1 General approach

This report covers the day light reception of habitable rooms within the new proposed development. The day light reception is expressed as the average day light factor (ADF) in the following rooms:
- Bed rooms within dwellings
- Living rooms/dining rooms
- Kitchens
- Any combination of the above

4.2 The nature and effects of day light and sun light

When assessing the effects of proposed building projects on the potential to cause issues relating to light, it is important to recognise the distinction between daylight and sunlight. Daylight is the combination of all direct and indirect sunlight during the daytime, whereas sunlight (for the purposes of this report) comprises only the direct elements of sunlight. For example, on a cloudy or overcast day diffused daylight still comes in through windows, even when sunlight is absent. Any development within a built-up area has the potential to alter the amount of daylight received by nearby residential properties.
Care should be taken when designing new buildings in built-up areas, especially when the proposed development is relatively tall or situated to the south of existing buildings, because in the northern hemisphere the majority of the sunlight comes from the south. In Ireland (and other northern hemisphere countries) south-facing facades will in general, receive the most sunlight, while the north facing facades will receive sunlight on only a handful of occasions, specifically early mornings and late evenings during the summer months. It is therefore important to ensure that new buildings to the south of any development do not cause over shadowing to existing dwellings and therefore reduce their capacity to receive sunlight.

4.3 Assessment criteria

National Policy/building regulations:
The government does not have an adopted policy on daylight, sunlight and the effects of overshadowing, and does not have targets, criteria or relevant planning guidance in the way it has for other environmental impacts such as noise, landscape or air quality. However, there are a number of guidance documents which are relevant when considering daylight, sunlight and overshadowing in dwellings:

- The Building Research Establishment (BRE) report, “Site layout planning for daylight and sunlight – a guide to good practice (referred to as the BRE Report).
  Although not Government guidance, this report is commonly referenced as the main guide in Ireland/UK in determining the minimum standards of daylight and sunlight and for determining the impact of a development.
- British European Standard BS EN17037 / EN17037 Day Lighting for buildings.
  BS EN17037/EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces some of the calculation procedures used in the BRE Report.
- CIBSE guide 10 Day light and lighting for buildings.
  CIBSE lighting guide 10, BS EN17037/EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces recommended day light levels for general buildings.

4.4 The BRE Report – “Site Layout and Planning for Daylight and Sunlight – A Guide to Good Practice”

The BRE report contains guidance on how to design developments whilst minimising the impacts on existing buildings from overshadowing and reduced levels of daylight and sunlight. The advice provided within the guide is not mandatory and should not be seen as an instrument of planning policy, its aim is to help rather than constrain the designer. Although it gives numerical guidance values these should be interpreted flexibly since natural lighting is one of many factors in site layout design. The guidance should be applied appropriately to developments to assist in gaining the best development possible without adverse impacts.

As well as advice the report contains a methodology to assess levels of daylight, sunlight and over shadowing and contains criteria to determine the potential impacts of a new development on surrounding buildings. Table 4.1 below details the BRE assessment criteria for daylight reception within the proposed development.

Analysis	Description	Acceptable parameters
Daylight reception criterion	Average daylight factor (ADF)	Habitable rooms to have ADF factors between 1% and 2% pending room type

Table 4.1

There are also recommendations with regards to minimum proposed glazed area in facades in relation to the available sky view component angle. BS EN17037/EN17037 gives guidance on the minimum glazed area with different virtual sky component angles to maintain sufficient daylight reception. Table 4.2 presents the minimum glazed areas fractions relative to the available sky view angle.

Room depth	VSC <=25°	VSC >=25° <=45°	VSC >=45° <=65°	VSC >=65°	Comments
1 to 8	20%	20% - 31%	31% - 35%	35% - 40%	
8 – 11	25%	25% - 40%	40% - 44%	44% - 50%	
11 – 14	30%	30% - 47%	47% - 53%	53% - 60%	
14 - 20	35%	35% - 54%	54% - 61%	61% - 70%	

Table 4.2

4.5 ADF or Average day light factor

The average day light assessment is the amount of day light received by the habitable rooms in the proposed development only. Whereas there are no standards applied for day light factors there are recommendations published in the CIBSE guides and BRE documents in relation to the percentage and minimum area of the room/area to conform to same. Table 4.4 below represents recommended minimum day light factors.

Habitable room types		Minimum day light factor	Minimum floor area cover
Multi-residential buildings	Kitchen	2%	75%
Multi-residential buildings	Living rooms, dining rooms,	1.50%	70%
Multi-residential buildings	Bedrooms	1%	50%

Table 4.3

4.6 ADF or Average Daylight Factor calculation method

The average daylight factor provides a useful technique for assessing the daylight potential of interior spaces under standard overcast conditions. The average daylight factor *df* is defined as;

$df = TAw\ q / [A\ (1-R^2)]\ \%$

where,
T is the diffuse visible transmittance of the glazing, including corrections for dirt on glass
Aw 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 of the ceiling, walls and floor surfaces
q is the angle of visible sky in degrees (VSC)

4.7 Project ADF calculation parameters

The following calculation parameters have been applied. For T (Em), the overall maintained light transmittance into the room we applied a conservative 0.66. Current triple glazed elements can now be supplied with light emittance in excess of 0.72 effecting/improving the final resultant ADF by a further 0.3% to 0.5%.

Glass light emittance	0.72
Glazing maintenance factor	8%
Maintained light emittance Em	0.66

For R (Rf), the average reflectance of the walls, ceiling and floor we have used an overall average figure 0.61 representing a dark floor, medium dark walls and a light ceiling. R can also be significantly improved by implementing lighter colours on the walls and floor effecting/improving the ADF by 0.5% to 0.7%.

Ceiling	0.8	95%	Light
Walls	0.6	80%	Medium dark
Floor	0.4	70%	Dark
Combined Rf	0.61		

For q, the vertical sky component angle we use the combined calculated vertical sky component over the full visual horizontal plane from the relevant window/room point. i.e. at each obstacle in the general 180° horizontal view plane the vertical sky component is measured and combined to form the overall resultant VSC. The illustration 4.1 below shows the room analysed to be effected by 3 different vertical sky component angles A, B and C on its horizontal plane. The resultant VSC is a calculated combination of all three VSC angles.

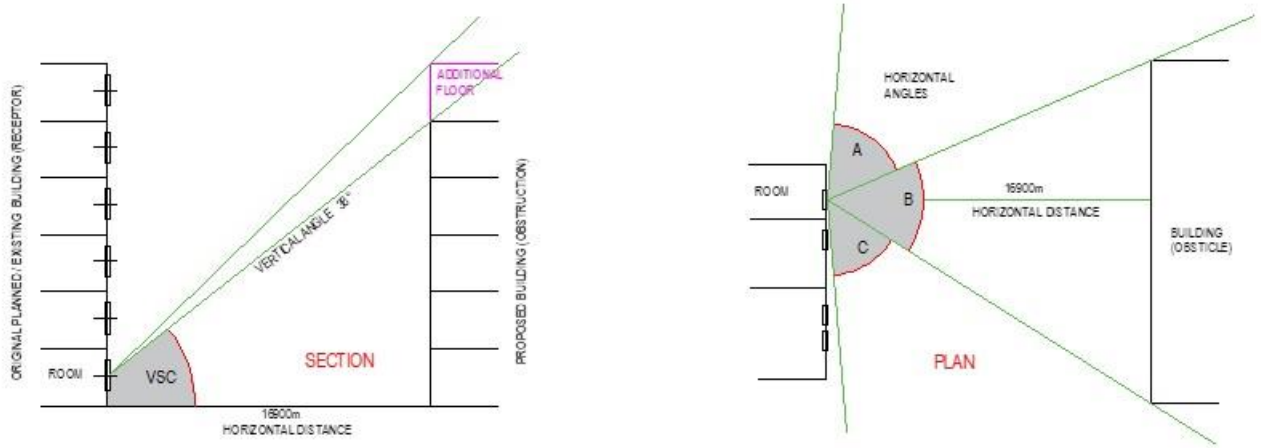

Image 4.1

5 Basis of receptor selection of habitable rooms within the development and Calculation results

5.1 Basis of receptor (room) selection

The daylight reception assessment has been targeted to rooms which are perceived to receive less day light i.e. ground floor rooms / rooms facing close-by large obstacles. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms. A combined total of 67 room locations have been selected on the basis that these locations are more daylight challenging.

5.2 Assessment approach and colour indicators

The tables below provide the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.
The assessment is segregated according to building type, these are;

(a) Residential apartments – R1 and R2
(b) Residential housing
(c) Student housing – S1, S2 and S3

The overall conclusion is presented at the end of the chapter.
Note: The ADF calculation results have been given the following colour code guide depending on its level of resulting compliance.

Compliance guide		
☑	0%	Over /equal to
☑	5%	Within
!!	10%	Within
x	10%	In excess of

5.3 (a) Residential apartments – receptors and ADF calculation results

Receptors: Image 5.1 to 5.3 indicate the locations of the rooms chosen from residential apartments R1 and R2 for the ADF analysis. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.

Image 5.1: Level 00 with selected rooms – R1 residential apartments

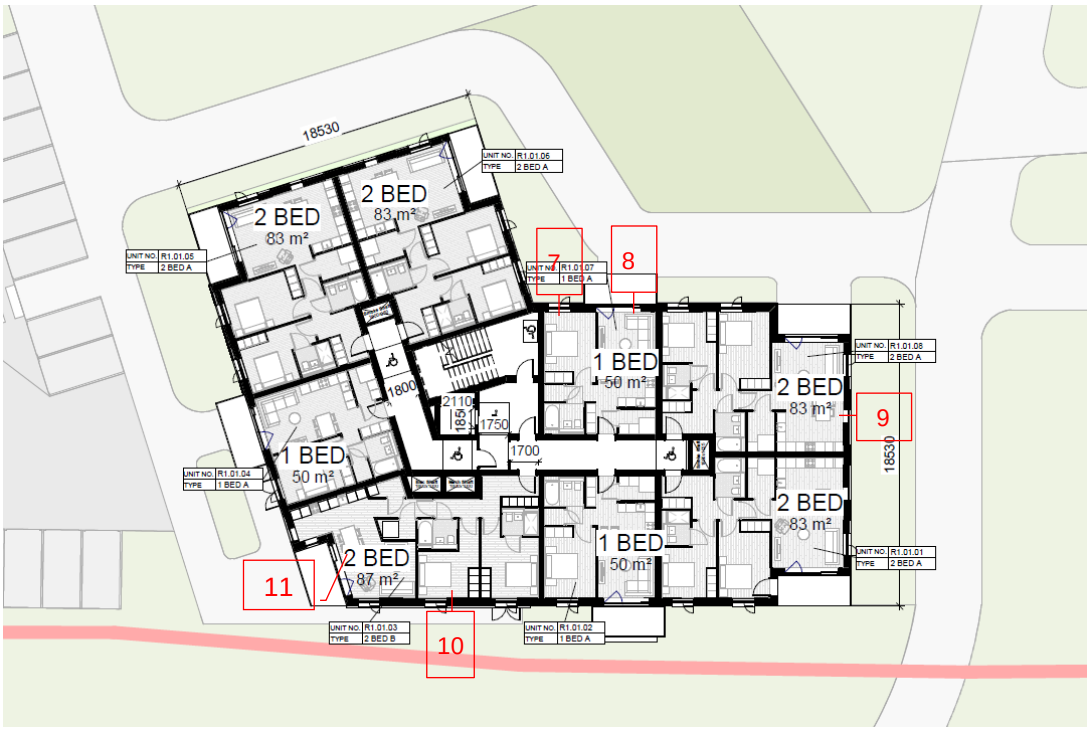

Image 5.2: Level 01 with selected rooms – R1 residential apartments

Image 5.3: Level 00 with selected rooms – R2 residential apartments

ADF calculation results:

The tables below provide the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

Receptor	Location	Unit ID	Receptor Level	Room / type	Hor Sec a Hor ∟°	Hor Sec a Vert ∟°	Hor Sec b Hor ∟°	Hor Sec b Vert ∟°	Hor Sec c Hor ∟°	Hor Sec c Vert ∟°	Hor Sec d Hor ∟°	Hor Sec d Vert ∟°	∑ Hor ∟	∑ VSC ∟	glass area m2	Room width m	Room depth m	Room height m	Room ADF %	BRE ADF %
1	R1		00	Bed room	30	8	49	16	72	12	29	7	180	33%	2.04	3.40	4.70	2.70	2.25	1.00
2	R1		00	Living - Kitchen	36	9	53	16	61	12	30	65	180	29%	4.59	4.40	6.70	2.70	2.83	2.00
3	R1		00	Living - Kitchen	36	25	43	13	53	24	48	65	180	24%	4.59	4.40	6.70	2.70	2.37	2.00
4	R1		00	Bed room	31	24	43	13	42	25	64	75	180	21%	2.04	3.40	4.70	2.70	1.45	1.00
5	R1		00	Living - Kitchen	23	11	42	26	36	40	79	8	180	30%	4.59	4.30	6.70	2.70	2.98	2.00
6	R1		00	Bed room	23	6	20	9	80	9	57	6	180	34%	2.04	3.10	4.70	2.70	2.51	1.00
7	R1		01	Bed room	47	51	49	11	65	22	19	9	180	27%	2.04	3.40	4.70	2.55	1.92	1.00
8	R1		01	Living - Kitchen	33	50	57	11	71	23	19	9	180	28%	3.40	3.50	6.50	2.55	2.54	2.00
9	R1		01	Living - Kitchen	35	73	48	9	72	25	25	10	180	26%	4.59	4.30	6.70	2.55	2.68	2.00
10	R1		01	Bed room	28	4	29	9	69	5	54	5	180	35%	1.53	3.40	4.70	2.55	1.88	1.00
11	R1		01	Living - Kitchen	28	72	31	9	77	8	44	5	180	31%	3.45	5.10	4.50	2.55	2.82	2.00
12	R2		00	Living - Kitchen	38	50	46	12	58	10	38	9	180	30%	4.25	3.80	9.80	2.70	2.19	2.00
13	R2		00	Living - Kitchen	23	18	40	9	68	11	49	13	180	33%	4.25	3.80	9.80	2.70	2.40	2.00
14	R2		00	Living - Kitchen	42	6	26	10	56	11	56	47	180	29%	4.25	3.80	9.80	2.70	2.12	2.00

Table 5.1:residential apartments R1 and R2 results

5.4 (b) Residential housing – receptors and ADF calculation results

Receptors: Image 5.4 indicate the locations of the rooms chosen from residential housing for the ADF analysis. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.

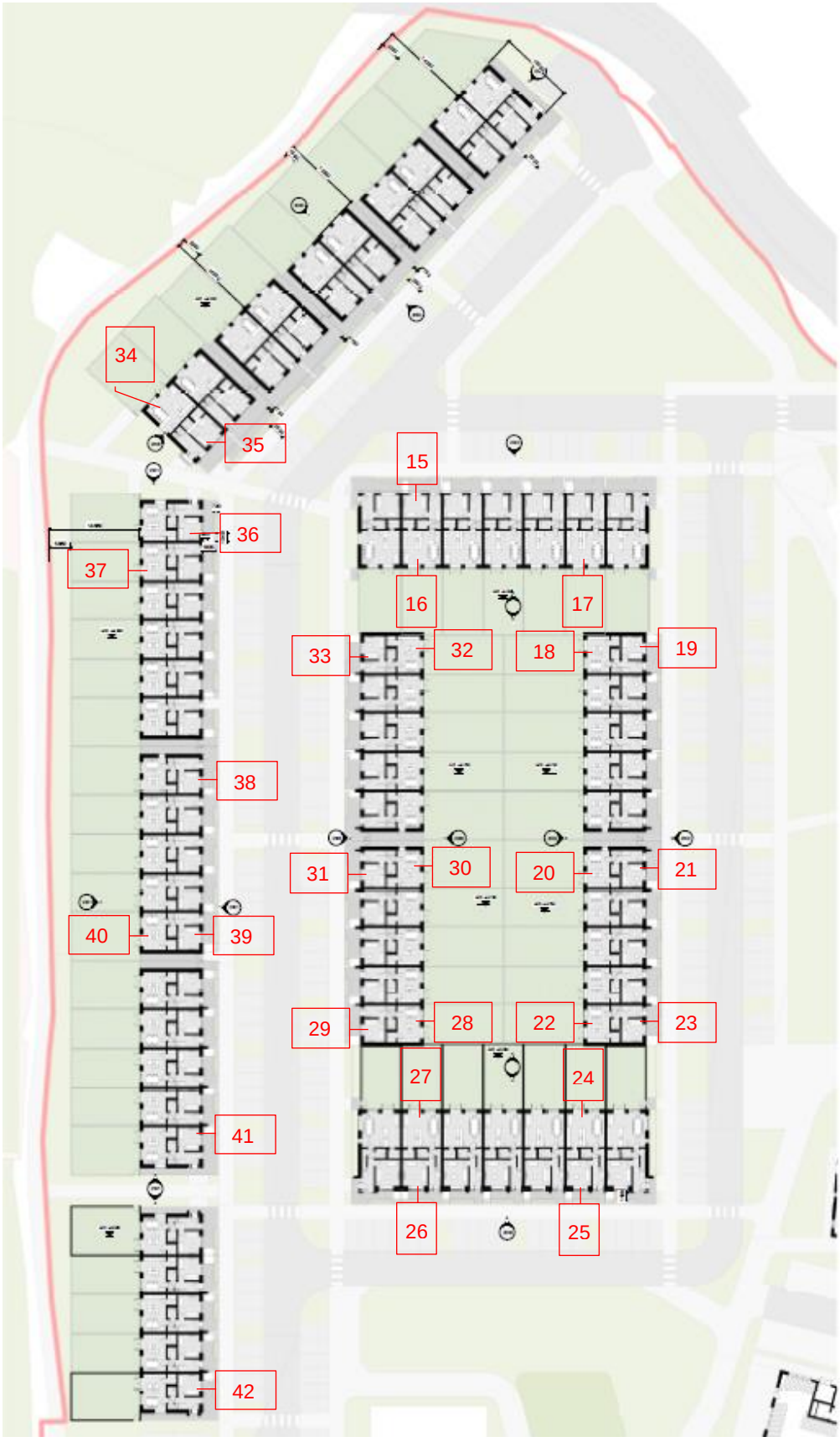

Image 5.4: Level 00 with selected rooms – residential housing

ADF calculation results:

The tables below provide the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

Receptor	Receptor				Hor Sec a		Hor Sec b		Hor Sec c		Hor Sec d		∑ Hor ∟	∑ VSC ∟	glass	Room			Room	BRE
	Location	Unit ID	Level	Room / type	Hor ∟°	Vert ∟°	Hor ∟°	Vert ∟°	Hor ∟°	Vert ∟°	Hor ∟°	Vert ∟°			area m2	width m	depth m	height m	ADF %	ADF %
15	res. house	00		Living	7	7	102	16	71	5			180	33%	2.72	4.00	3.80	2.50	3.29	1.50
16	res. house	00		Living - Kitchen	44	14	47	40	75	16	14	13	180	29%	4.25	6.20	5.40	2.50	2.50	2.00
17	res. house	00		Living - Kitchen	16	8	64	14	55	40	45	15	180	29%	4.25	6.20	5.40	2.50	2.50	2.00
18	res. house	00		Living - Kitchen	67	26	15	9	77	19	21	11	180	30%	4.25	5.80	3.70	2.50	3.53	2.00
19	res. house	00		Living	45	7	36	24	66	16	33	11	180	32%	2.72	3.70	3.40	2.50	3.61	1.50
20	res. house	00		Living - Kitchen	35	10	105	20	40	14			180	31%	4.25	5.80	3.70	2.50	3.68	2.00
21	res. house	00		Living	25	6	16	22	85	17	54	14	180	31%	2.72	3.70	3.40	2.50	3.58	1.50
22	res. house	00		Living - Kitchen	67	31	14	11	76	19	23	8	180	29%	4.25	5.80	3.70	2.50	3.44	2.00
23	res. house	00		Living	20	6	8	20	75	18	77	22	180	30%	2.72	3.70	3.40	2.50	3.42	1.50
24	res. house	00		Living - Kitchen	30	8	56	18	47	41	47	11	180	29%	4.25	6.20	5.40	2.50	2.54	2.00
25	res. house	00		Living	49	8	44	16	67	22	20	19	180	31%	2.72	4.00	3.80	2.50	3.08	1.50
26	res. house	00		Living	82	11	37	18	54	21	7	15	180	31%	2.72	4.00	3.80	2.50	3.11	1.50
27	res. house	00		Living - Kitchen	46	11	46	41	72	18	16	11	180	29%	4.25	6.20	5.40	2.50	2.50	2.00
28	res. house	00		Living - Kitchen	68	37	14	15	75	14	23	8	180	29%	4.25	5.80	3.70	2.50	3.42	2.00
29	res. house	00		Living	23	7	26	12	99	19	32	8	180	32%	2.72	3.70	3.40	2.50	3.60	1.50
30	res. house	00		Living - Kitchen	41	16	104	19	35	12			180	31%	4.25	5.80	3.70	2.50	3.67	2.00
31	res. house	00		Living	17	6	12	11	102	19	49	9	180	32%	2.72	3.70	3.40	2.50	3.60	1.50
32	res. house	00		Living - Kitchen	21	25	73	19	15	12	71	9	180	31%	4.25	5.80	3.70	2.50	3.76	2.00
33	res. house	00		Living	18	8	44	13	69	19	49	15	180	31%	2.72	3.70	3.40	2.50	3.56	1.50
34	res. house	00		Living - Kitchen	47	14	47	10	54	22	32	7	180	32%	4.25	6.20	5.40	2.50	2.77	2.00
35	res. house	00		Living	52	6	38	20	49	9	41	40	180	30%	2.72	4.00	3.80	2.50	3.03	1.50
36	res. house	00		Living	40	19	39	7	26	20	75	12	180	32%	2.72	3.70	3.40	2.50	3.65	1.50
37	res. house	00		Living - Kitchen	27	10	52	19	36	10	65	10	180	32%	4.25	5.80	3.70	2.50	3.89	2.00
38	res. house	00		Living	29	12	22	14	100	19	29	11	180	31%	2.72	3.70	3.40	2.50	3.53	1.50
39	res. house	00		Living	29	11	97	19	24	19	30	12	180	31%	2.72	3.70	3.40	2.50	3.51	1.50
40	res. house	00		Living - Kitchen	56	7	81	14	21	13	22	7	180	33%	4.25	5.80	3.70	2.50	3.98	2.00
41	res. house	00		Living	14	8	62	18	37	25	67	18	180	30%	2.72	3.70	3.40	2.50	3.41	1.50
42	res. house	00		Living	29	9	37	16	71	28	43	7	180	30%	2.72	3.70	3.40	2.50	3.46	1.50

Table 5.2:residential housing results

5.5 (c) Student housing – receptors and ADF calculation results

Receptors: Image 5.5 to 5.6 indicate the locations of the rooms chosen from the student housing S1, S2 and S3 for the ADF analysis. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.

Image 5.5: Level 00 with selected rooms – student housing S1, S2 and S3

Image 5.6: Level 01 with selected rooms – student housing S1, S2 and S3

ADF calculation results:

The tables below provide the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

Receptor	Location	Unit ID	Receptor Level	Room / type	Hor Sec a Hor ⌞°	Hor Sec a Vert ⌞°	Hor Sec b Hor ⌞°	Hor Sec b Vert ⌞°	Hor Sec c Hor ⌞°	Hor Sec c Vert ⌞°	Hor Sec d Hor ⌞°	Hor Sec d Vert ⌞°	∑ Hor ⌞	∑ VSC ⌞	glass area m2	Room width m	Room depth m	Room height m	Room ADF %	BRE ADF %
43	S3		00	Bed room	11	58	72	26	32	6	65	11	180	30%	1.70	2.60	4.00	2.70	2.27	1.00
44	S3		00	Living - Kitchen	15	58	29	6	44	38	92	9	180	30%	3.40	6.90	4.30	2.70	2.13	2.00
45	S3		00	Bed room	53	6	84	54	34	8	9	60	180	25%	1.70	2.60	4.00	2.70	1.87	1.00
46	S3		00	Bed room	17	13	42	33	45	43	76	9	180	28%	1.70	2.60	4.00	2.70	2.13	1.00
47	S3		00	Living - Kitchen	14	12	29	33	39	43	98	9	180	29%	7.14	5.20	12.00	2.70	2.45	2.00
48	S3		01	Living - Kitchen	11	45	41	30	28	5	100	9	180	31%	3.40	5.20	5.00	2.70	2.53	2.00
49	S3		01	Living - Kitchen	13	39	66	46	75	6	26	5	180	28%	4.25	8.10	5.00	2.70	2.01	2.00
50	S3		01	Bed room	63	14	58	35	32	30	27	5	180	29%	1.70	2.60	4.00	2.70	2.17	1.00
51	S3		01	Bed room	22	13	51	35	48	30	59	5	180	29%	1.70	2.80	3.50	2.70	2.32	1.00
52	S3		01	Living - Kitchen	40	45	26	34	36	30	78	5	180	28%	7.14	5.20	11.00	2.70	2.55	2.00
53	S2		01	Bed room	56	10	47	27	21	26	56	5	180	32%	1.70	2.60	4.00	2.70	2.41	1.00
54	S2		01	Bed room	42	9	39	27	30	26	69	5	180	32%	1.70	2.60	4.00	2.70	2.42	1.00
55	S2		01	Bed room	18	45	34	9	71	27	57	5	180	30%	1.70	2.60	4.00	2.70	2.29	1.00
56	S2		01	Living - Kitchen	40	45	54	26	86	35			180	24%	7.14	5.20	11.00	2.70	2.11	2.00
57	S2		01	Bed room	43	25	62	30	57	35	18	6	180	26%	1.70	2.60	4.00	2.70	1.98	1.00
58	S2		01	Living - Kitchen	40	45	94	35	46	6			180	25%	6.12	5.00	11.00	2.70	2.02	2.00
59	S2		01	Bed room	34	29	67	35	79	6			180	29%	1.70	2.60	4.00	2.70	2.20	1.00
60	S2		01	Living - Kitchen	40	45	46	35	94	6			180	29%	7.14	5.20	11.00	2.70	2.58	2.00
61	S1		01	Living - Kitchen	30	30	67	12	60	35	23	6	180	29%	6.08	5.20	11.00	2.70	2.20	2.00
62	S1		01	Bed room	36	30	49	12	75	35	20	6	180	28%	1.70	2.60	4.00	2.70	2.09	1.00
63	S1		01	Bed room	34	30	28	12	85	38	33	6	180	27%	1.70	2.60	4.00	2.70	2.03	1.00
64	S1		01	Bed room	19	30	31	12	88	38	42	6	180	27%	1.70	2.60	4.00	2.70	2.07	1.00
65	S1		01	Bed room	15	30	27	12	83	38	55	6	180	28%	1.70	2.60	4.00	2.70	2.12	1.00
66	S1		01	Living - Kitchen	13	30	23	11	72	38	72	6	180	29%	6.08	5.20	11.00	2.70	2.23	2.00
67	S1		01	Bed room	41	4	67	4	56	5	16	6	180	36%	1.70	2.60	4.00	2.70	2.73	1.00

Table 5.3: student housing results

5.6 Daylight reception in buildings within the new development overall conclusion

The BRE report recommends as a methodology for assessing sufficient daylight reception in a habitable room, that the calculated average daylight factor (ADF) of a habitable room to be in excess of the BRE bench marks of a kitchen at 2%, a living room at 1.5%, a bedroom at 1% and a living room/bedroom at 1.5%.). The ADF daylight has also been calcilated to include for diffused daylight where the architects have indicated privacy screens / louvres effecting the reception by 2% to 12% pending the extend and location of the screens.

The calculation assessment was segregated according to building type, these are;
(a) Residential apartments, R1 and R2
(b) Residential housing
(c) Student housing, S1, S2 and S3

Calculation findings are as follows (see images throughout chapter 5 for receptor locations):

(a) Residential apartments – R1 and R2
From the calculation result table 5.1 we note;
- R1 Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- R1 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- R1 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor typically 0.3%-0.5% per floor level.

- R2 Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- R2 Level 01: All floors above the ground floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

(b) Residential housing
From the calculation result table 5.2 we note;
- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 01: All floors above the ground floor dwellings are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

(c) Student housing – S1, S2 and S3
From the calculation result table 5.3 we note;
- S1 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S1 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

- S2 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S2 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

- S3 Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S3 Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- S3 Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

(Note on privacy screens/louvers: Receptors with screens have been incorporated into the ADF calculation and albeit a reduction in receiving daylight reception, these receptors still achieved an ADF in excess of the guidelines.)

Given the results and conclusions above we, DKP, deem the proposed project at Lissywollen to be in compliance with the recommendations in the BRE design guidelines ‘site layout and planning for daylight and sunlight - a guide to good practice’.

No mitigation measures required.