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Daylight Modelling Report
139-141 Hawthorn Road, Caulfield North VIC

Apartment development
Prepared for: DO Architects
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1.0	26/10/2023	TP Issue	Rev. A	AV	JN

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1. Executive Summary

Modelling has been undertaken to assess the daylight performance of the proposed development at 139-141 Hawthorn Road, Caulfield North, against council's best practice standard for daylight ingress. Results shown in Table 1 below:

Table 1 - Summary of Results

	% Compliance
Living Areas	81
Bedrooms	95

In reviewing the results of the daylight modelling:
- The development achieves compliance with the Best Practice framework for bedrooms with 95% of bedrooms achieving a daylight factor of 0.5% for >= 90% of the floor area.
- The development achieves compliance with the Best Practice framework for Living areas with 81% of living areas achieving a daylight factor of 1% for >= 90% of the floor area.

2. Introduction

2.1. Scope

Low Impact Development Consulting was engaged to perform the required daylight analysis of the proposed development. The following report encompasses the daylight analysis, illustrating the performance of habitable rooms within each dwelling against councils best practice standard for natural daylight provision.

2.2. Framework Adopted

Stonnington City Council 'Best Practice Standard' for natural daylight provision has been adopted in line with the best practice standard presented within the 'Built Environment Sustainability Scorecard (BESS)' as well as the 'Indoor Environmental Quality' Sustainable Design Assessment in the Planning Process (SDAPP) factsheet.

Habitable rooms have been taken as the living areas (including kitchens) and bedrooms in line with BESS the IEQ credits 1.1 & 1.2. BESS requires 80% of living rooms achieve a daylight factor of 1%, and 80% of bedrooms achieve a daylight factor of 0.5% for 90% of the floor area. Refer to Appendix 1 for further details.

2.3. Documentation & Drawings

The drawing set forming the basis of this daylight assessment was provided by DO Architects on the 26th of October 2023 labelled TP06 to TP13.

2.4. Software

The software utilized for this assessment is DesignBuilder V7.0.0.116 which encompasses a suite of building performance simulation tools including daylight modelling. The modelling conditions adopted are detailed within section 3.1.

3.Inputs

3.1. Modelling Conditions

3.1.1. Built Form

All aspects of the building form including external walls, partitions, glazing, shading devices, screens and neighbouring buildings have been modelled per the architectural drawings cited.
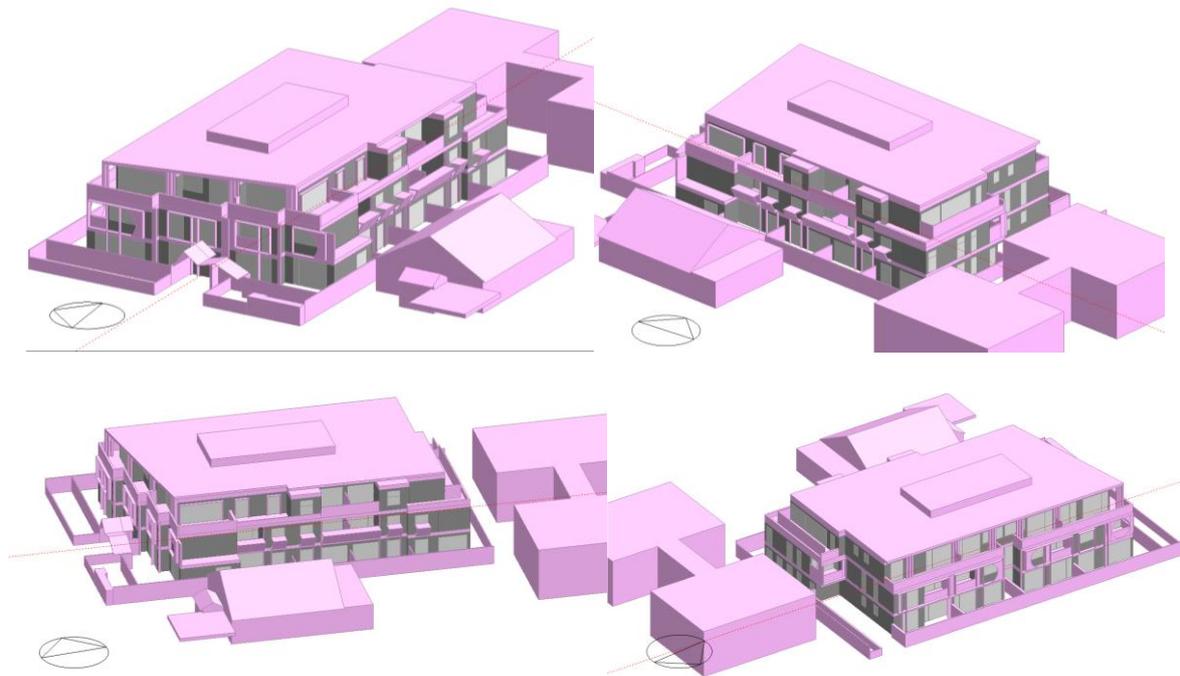

Figure 1 – Built Form

3.1.2. Sky Model

The simulation sky model used throughout all modelling scenarios is the CIE overcast day sky model, with a zenith illuminance input of 10,000lux.

3.1.3. Orientation

Under the CIE overcast day sky model, illuminance is consistent across all orientations (azimuth), gradually reducing across the zenith.

3.2. Surrounding Conditions

The adjoining buildings have been modelled under existing conditions, as seen in Figure 1 above. The following neighbours have been considered: 143 Hawthorn Road (Single storey brick house) and 3 Halstead St (Two storey brick flats).

3.3. Assessment Plane

Daylight levels have been assessed at an assessment plane of 700mm from FFL, reflecting the expected typical activity height for building occupants.

3.4. Material Assumptions

Relevant materials reflectance's are as follows:

Component	Reflectance
Internal wall reflectance	0.8 (white plasterboard)
Internal ceiling reflectance	0.9 (white plasterboard)
Internal floor reflectance	0.4 (light timber or carpet)
External wall reflectance	0.3 (concrete precast panel)
Surrounding buildings reflectance	0.3

Visible Light Transmittance (VLT%) of glazing is as follows:

Glazing type	Visible Light Transmittance (VLT)
External windows	0.71 (clear double glazing)
External windows obscured	0.65
Balcony balustrade	0.8 (clear single glazing)

4. Results

The daylight modelling results indicate that the development achieves compliance with the Best Practice framework for both Living areas and bedrooms with 81% of living areas achieving a daylight factor of 1% for >= 90% of the floor area, and 95% of bedrooms achieving 0.5% daylight factor for >=90% of the floor area. A summary of results and daylight maps are shown in Appendix 2.

5. Conclusion

Compliance against the BESS best practice standard for natural daylight provision has been achieved for bedrooms and living areas within the proposed development.

Daylight ingress measured within the daylight modelling assessment are dependent on the architectural design, glazing, finishes values and surrounding conditions as specified within, deviation from these values will result in differing daylight levels.

Appendix 1.   Assessment Framework

Built Environment Sustainability Scorecard (BESS) online tool notes[1]

1.1 - Daylight Access - Living Areas

Applies to

Multi-unit development (Apartments, aged care and hotels)

Objective

To provide a high level of amenity and energy efficiency through design for natural light.

Summary

Points are awarded where at least 80% of the total number of living areas (including lounge rooms, dining rooms, family rooms and similar, and kitchens) achieve a daylight factor greater than 1% to 90% of the floor area of each living area, including kitchens. Additional points are awarded where 100% of dwellings comply. This can be demonstrated by using the in-built BESS daylight calculator or by alternative daylight modelling where the alternative methodology is accepted by Council.

Documentation & evidence required

If using the BESS daylight calculator:

- References to floor plans and elevations showing window sizes and sky angles

If using an alternative daylight modelling program:

- A short report detailing assumptions used and results achieved.

Other Considerations

- Daylight modelling using third party software may be more appropriate than the BESS daylight calculator where neighbouring properties are too close to allow for vertical sky angle to be calculated.
- Lightly coloured materials will improve reflectivity. Consider using lightly coloured materials surfaces near windows, such as window sills and jambs.
- Specify glazing with high Visual Light Transmittance (VLT) and combine this with shading systems such as blinds, overhangs or retractable awnings, rather than using heavily tinted glass.
- Light shelves can increase daylight penetration by 'bouncing' light deeper into a room
- The BESS daylight calculator only works for rooms which have a single aspect only (i.e 1 window to the space) as rooms with more than one aspect are deemed to have adequate daylight

Further Information

- Moreland Apartment Design Code

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[1] Built Environment Sustainability Scorecard 2017, Council Alliance for a Sustainable Built Environment, accessed 22 August 2017, <http://www.bess.net.au/tool-notes/>

1.2 - Daylight Access - Bedrooms

Applies to

Multi-unit development (Apartments, aged care and hotels)

Objective

To provide a high level of amenity and energy efficiency through design for natural light.

Summary

Points are awarded where at least 80% of the total number of bedrooms achieve a daylight factor greater than 0.5% to 90% of the floor area in each room. Additional points are awarded where 100% of dwellings comply. This can be demonstrated by using the in-built BESS daylight calculator or by alternative daylight modelling where the alternative methodology is accepted by Council.

Documentation & evidence required

If using the BESS daylight calculator:

- References to floor plans and elevations showing window sizes and sky angles

If using an alternative daylight modelling program:

- A short report detailing assumptions used and results achieved.

Other Considerations

- Daylight modelling using third party software may be more appropriate than the BESS daylight calculator where neighbouring properties are too close to allow for vertical sky angle to be calculated.
- Lightly coloured materials will improve reflectivity. Consider using lightly coloured materials surfaces near windows, such as window sills and jambs.
- Specify glazing with high Visual Light Transmittance (VLT) and combine this with shading systems such as blinds, overhangs or retractable awnings, rather than using heavily tinted glass.
- Light shelves can increase daylight penetration by 'bouncing' light deeper into a room

Further Information

- [Moreland Apartment Design Code](#)

Appendix 2. Daylight Modelling Results

Bedroom Numerical Results:

| Level	Zone	Floor Area (m2)	Floor Area within Limits (m2)	Floor Area within Limits (%)
GF	G.01 B1	10.6	10.6	100.0
GF	G.01 B2	10.9	10.9	100.0
GF	G.02 B1	12.8	10.3	80.2
GF	G.02 B2	10.5	10.5	100.0
GF	G.03 B1	12.8	11.5	89.1
GF	G.03 B2	10.5	10.5	100.0
GF	G.04 B1	10.8	10.8	100.0
GF	G.04 B2	10.2	10.2	100.0
GF	G.05 B1	12.0	12.0	100.0
GF	G.05 B2	9.4	9.4	100.0
GF	G.06 B1	10.6	10.6	100.0
GF	G.07 B1	10.6	10.6	100.0
GF	G.08 B1	10.6	10.6	100.0
GF	G.09 B1	10.3	10.3	100.0
GF	G.09 B2	10.5	10.5	100.0
1F	1.01 B1	11.1	11.1	100.0
1F	1.01 B2	10.1	10.1	100.0
1F	1.02 B1	12.8	12.8	100.0
1F	1.02 B2	10.8	10.8	100.0
1F	1.03 B1	12.8	12.8	100.0
1F	1.03 B2	10.8	10.8	100.0
1F	1.04 B1	10.8	10.8	100.0
1F	1.04 B2	10.2	10.2	100.0
1F	1.05 B1	10.6	10.6	100.0
1F	1.05 B2	9.5	9.5	100.0
1F	1.06 B1	12.4	12.4	100.0
1F	1.07 B1	12.3	12.3	100.0
1F	1.08 B1	12.3	12.3	100.0
1F	1.09 B1	11.0	11.0	100.0
2F	2.01 B1	11.3	11.3	100.0
2F	2.01 B2	9.3	9.3	100.0
2F	2.02 B1	10.6	10.6	100.0
2F	2.03 B1	10.6	10.6	100.0
2F	2.04 B1	10.3	10.3	100.0
2F	2.04 B2	9.0	9.0	100.0
2F	2.05 B1	10.8	10.8	100.0
2F	2.06 B1	10.8	10.8	100.0
2F	2.07 B1	12.6	12.6	100.0
2F	2.08 B1	12.2	12.2	100.0
2F	2.08 B2	9.0	9.0	100.0

Living Room Numerical Results:

Level	Zone	Floor Area (m2)	Floor Area within Limits (m2)	Floor Area within Limits (%)
GF	G.01 Living	34.6	34.6	100.0
GF	G.02 Living	32.6	31.2	95.8
GF	G.03 Living	32.5	31.2	95.2
GF	G.04 Living	30.7	28.9	90.1
GF	G.05 Living	29.1	26.4	90.6
GF	G.06 Living	21.2	21.2	100.0
GF	G.07 Living	21.2	21.0	99.0
GF	G.08 Living	21.2	20.0	94.2
GF	G.09 Living	31.9	31.9	100.0
1F	1.01 Living	34.7	34.7	100.0
1F	1.02 Living	26.0	12.3	47.4
1F	1.03 Living	26.0	12.2	47.0
1F	1.04 Living	26.6	13.8	51.7
1F	1.05 Living	31.8	31.8	100.0
1F	1.06 Living	20.5	20.1	98.0
1F	1.07 Living	20.5	20.5	100.0
1F	1.08 Living	20.5	13.4	65.1
1F	1.09 Living	27.9	19.0	68.3
2F	2.01 Living	28.6	28.6	100.0
2F	2.02 Living	24.3	24.3	100.0
2F	2.03 Living	24.3	24.3	100.0
2F	2.04 Living	32.3	32.3	100.0
2F	2.05 Living	26.1	26.1	100.0
2F	2.06 Living	23.1	23.1	100.0
2F	2.07 Living	23.0	23.0	100.0
2F	2.08 Living	30.0	30.0	100.0

Daylight maps are as follows, with coloured area indicating daylight levels above relevant daylight factor (DF) threshold (0.5% for bedrooms and 1.0% for living rooms).

Ground floor daylight map:
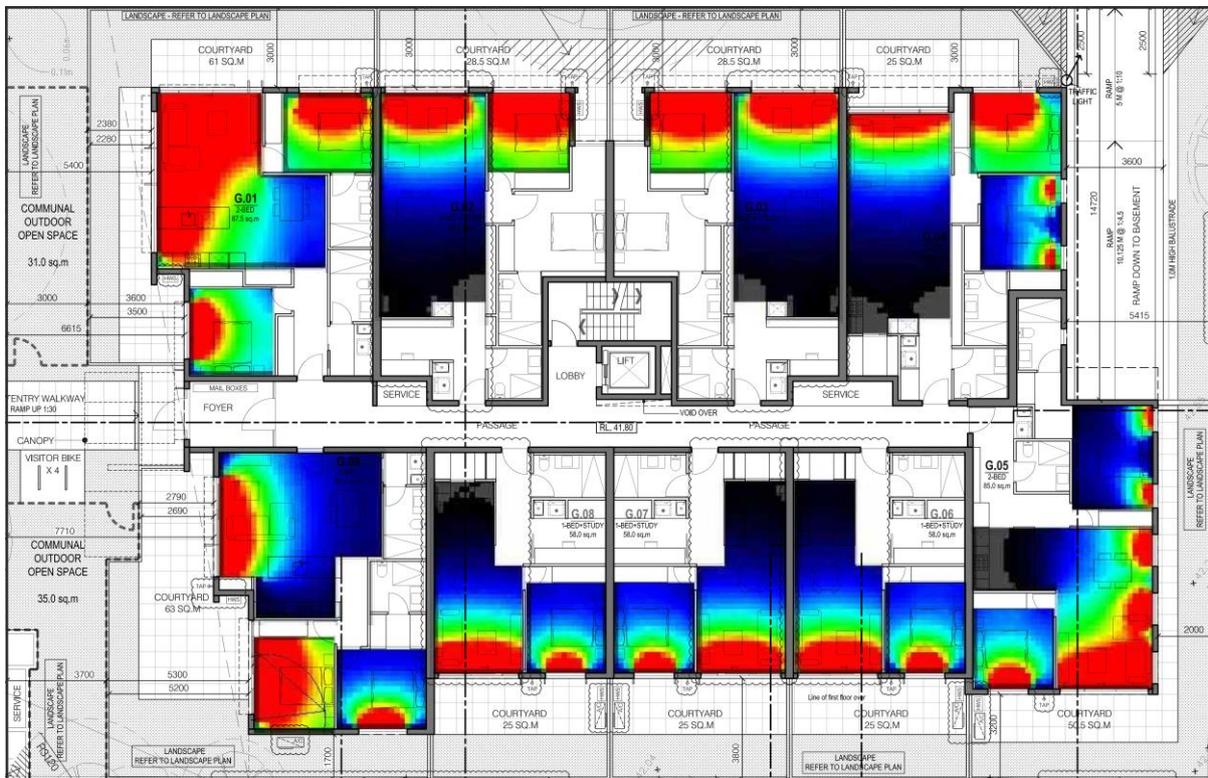
First floor daylight map:
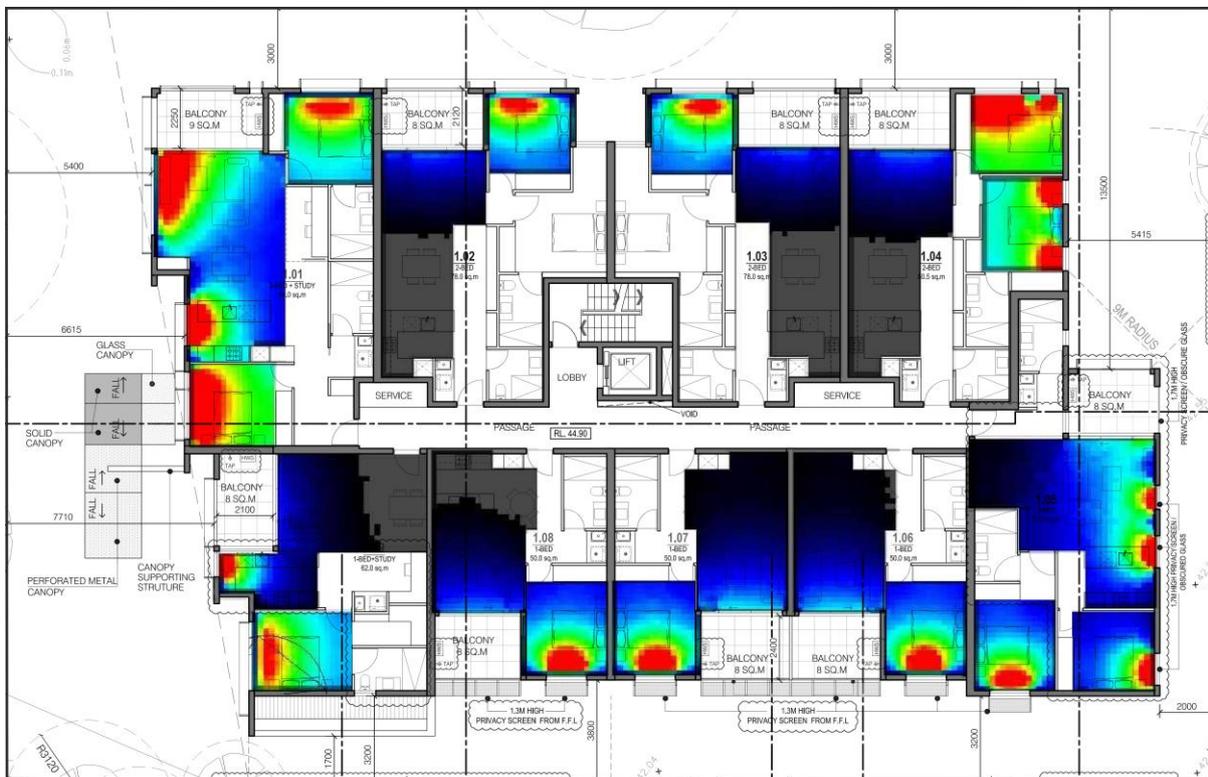
Second floor daylight map:
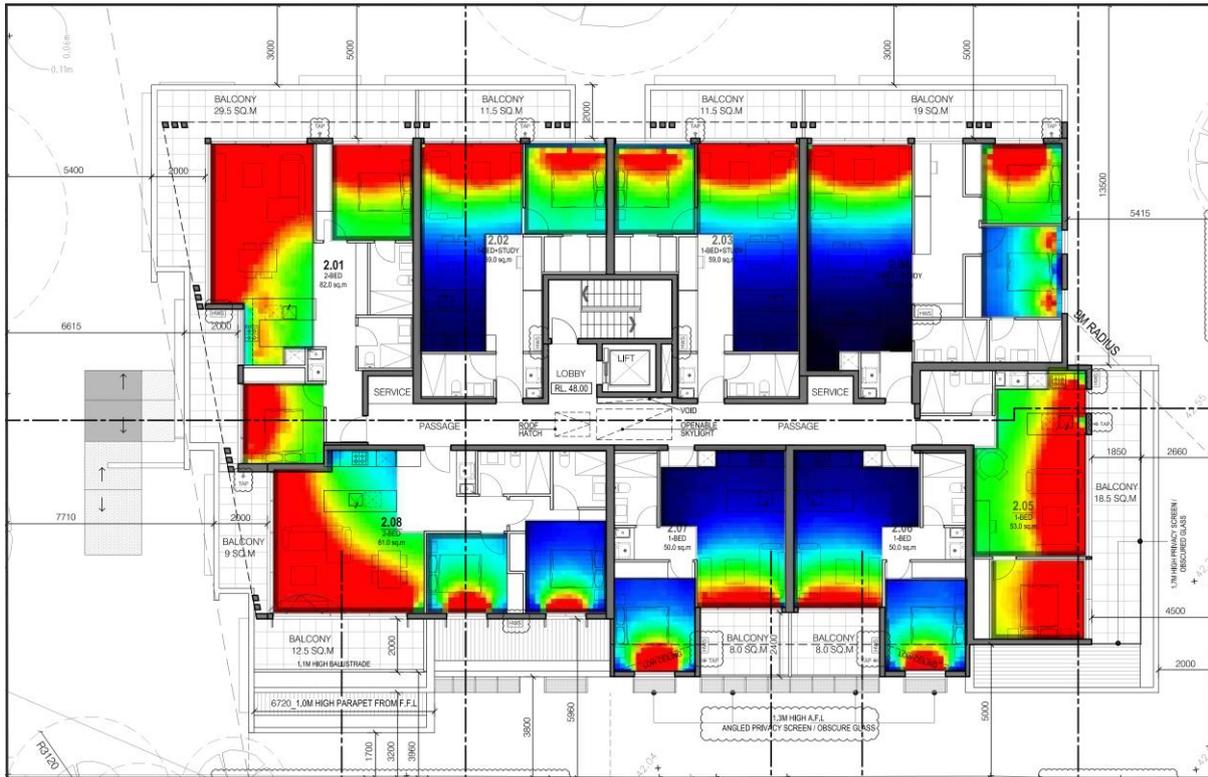
Daylight factor scales:

Living room scale:

Bedroom scale: