NATURAL VENTILATION ASSESSMENT

Potts Hill Senior Living

ESD SERVICES

JHA

CONSULTING ENGINEERS

DOCUMENT CONTROL SHEET

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CONTENTS

1 EXECUTIVE SUMMARY

Dynamic simulation was conducted on a number of apartments to determine the effectiveness of natural ventilation. It comes in response to Councils letter dated 15 December 2017. The purpose of this report is to demonstrate that the natural ventilation is compliant with the criteria set in the Apartment Design Guide (ADG), under the Environmental Planning Policy No. 65 (SEPP65).

The apartments listed are part of seniors living development located at Nelson Short Street, Potts Hill, referred to as Potts Hill Senior Living. Natural ventilation studies were carried out on selected apartments to determine if the proposed design achieves performance that are equivalent to reference apartments (i.e. apartments that satisfy the cross ventilation requirements in the ADG). One reference apartment was selected for each level.

The natural ventilation flow rates were analysed, the average volume flow rates in air changes per hour (ACH) was determined for;

i. Annually; and
ii. Summer (December – February)

The results (Section 4) show that the selected apartments should have sufficient natural ventilation rates capable of effectively ventilating the habitable spaces. They show the selected apartments have comparable flow rates to the reference apartments; a number of selected apartments have higher volume flow rates than the reference apartments.

Based on the dynamic simulation results, it was determined that the window configuration as per the proposed design, is capable of producing natural ventilation performance that meets ADG SEPP65 requirements.

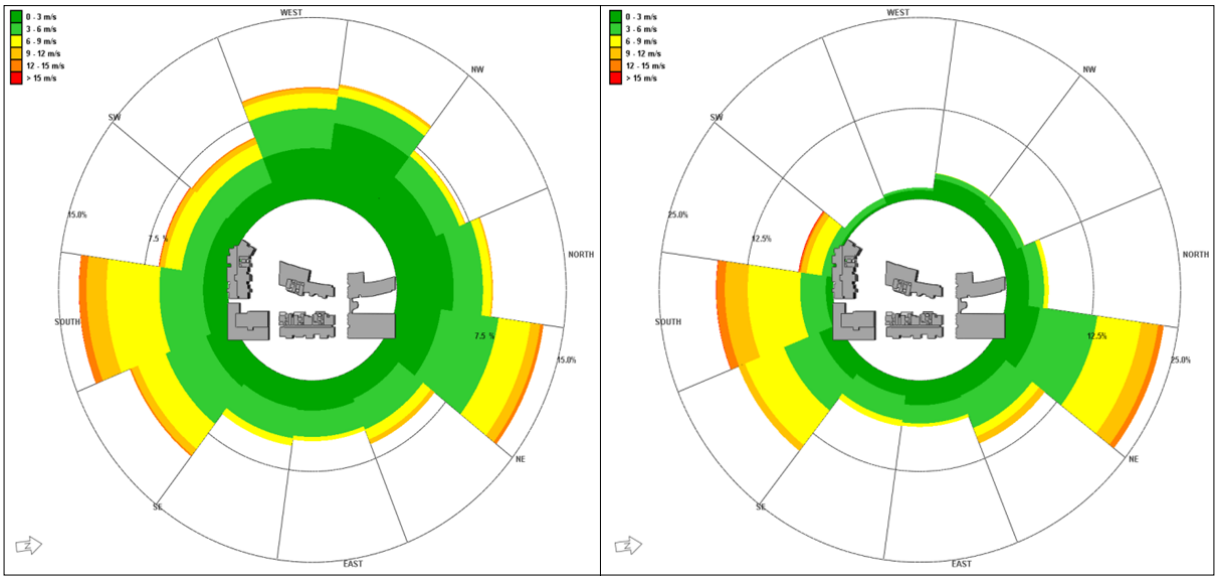
2 INTRODUCTION

JHA was engaged by Jackson Teece Architecture to conduct a natural ventilation assessment to demonstrate the natural ventilation performance of the subject apartments, meet the requirements set in the ADG for the Potts Hill Seniors Living Development located Nelson Short Street, Potts Hill.

Natural ventilation is most beneficial for an apartment during the summer season (December, January & February), in which the occupants can operate the windows to facilitate the following:

- Allow outside air to draw into the apartment to remove heat and moisture from air circulation; and
- Increase the internal airflow to improve both the air quality and the level of thermal comfort of an internal space.

The image below represents the average wind rose diagram of Sydney International Airport obtained through IES VE. Wind prevails mainly from the north-eat and the south of the development.



Annual Average Wind Rose **Summer Average Wind Rose**

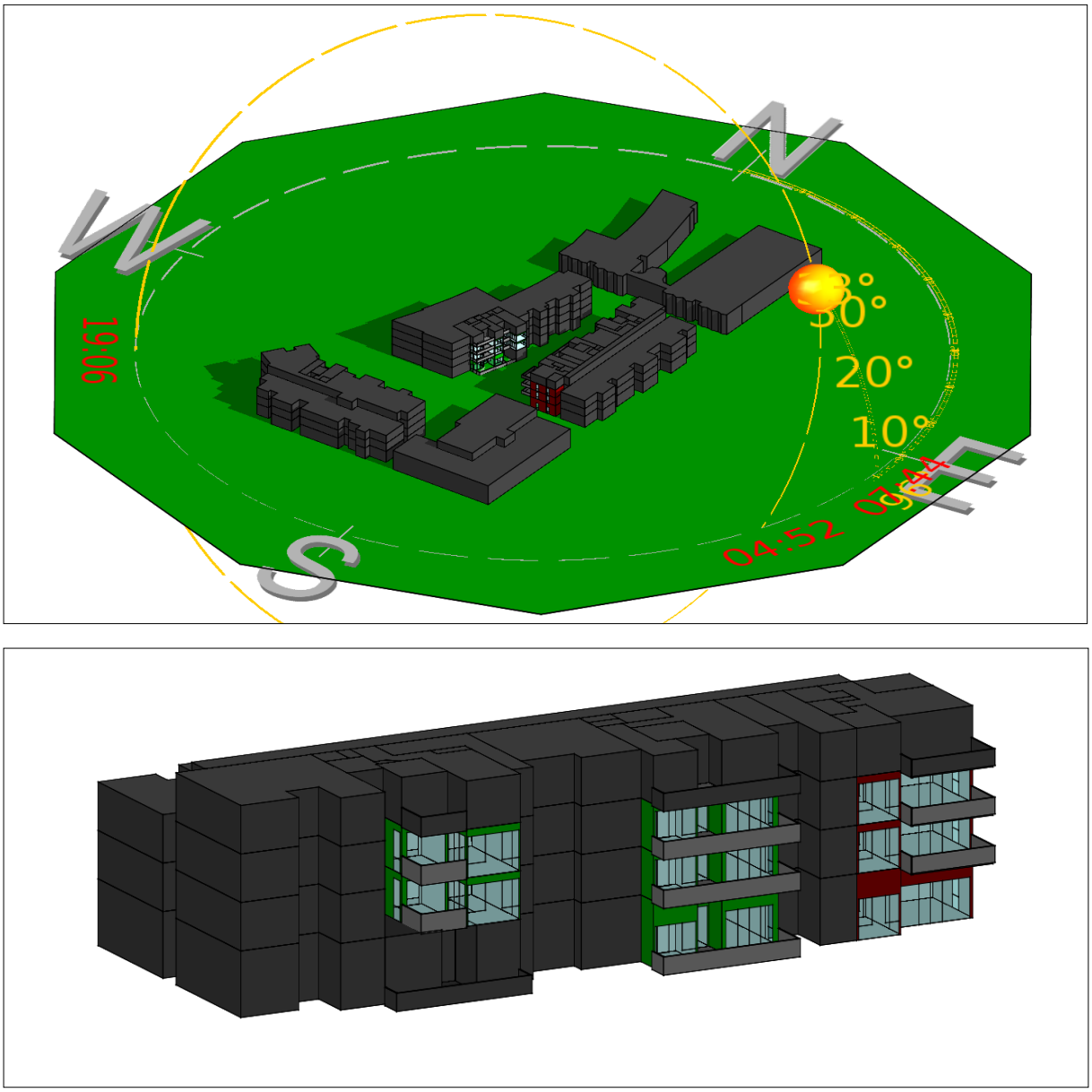
The assessment was based on the Architectural DA drawings (table below) and Architectural mark-ups of the window openings provided by Jackson Teece Architecture.

Drawing No	Drawing Title	Revision
DA-100	Floor Plan – Ground Floor	E
DA-101	Floor Plan – Level 1	D
DA-102	Floor Plan – Level 2	E
DA-103	Floor Plan – Level 3	E
DA-400	Section 01	E
DA-401	Section 02	D

3 NATURAL VENTILATION MODELLING

Modelling and Software

Dynamic simulation was carried out using the software IES Virtual Environment 2018, to determine the effectiveness of natural ventilation. The model was established using the ABCB Protocol for House Energy Rating Software Version 2006.1. This included the zoning, internal loads such as people, lighting and equipment and the associated schedule profiles for each space types. The loads and schedules can be found in Appendix A.

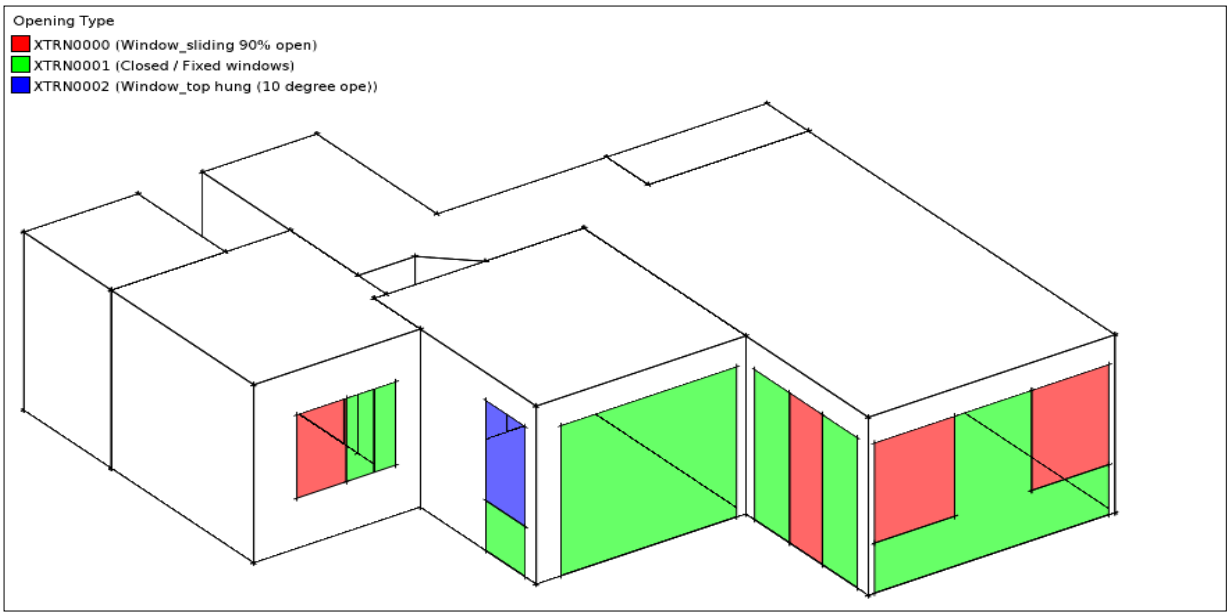


IES Model used for Dynamic Simulation

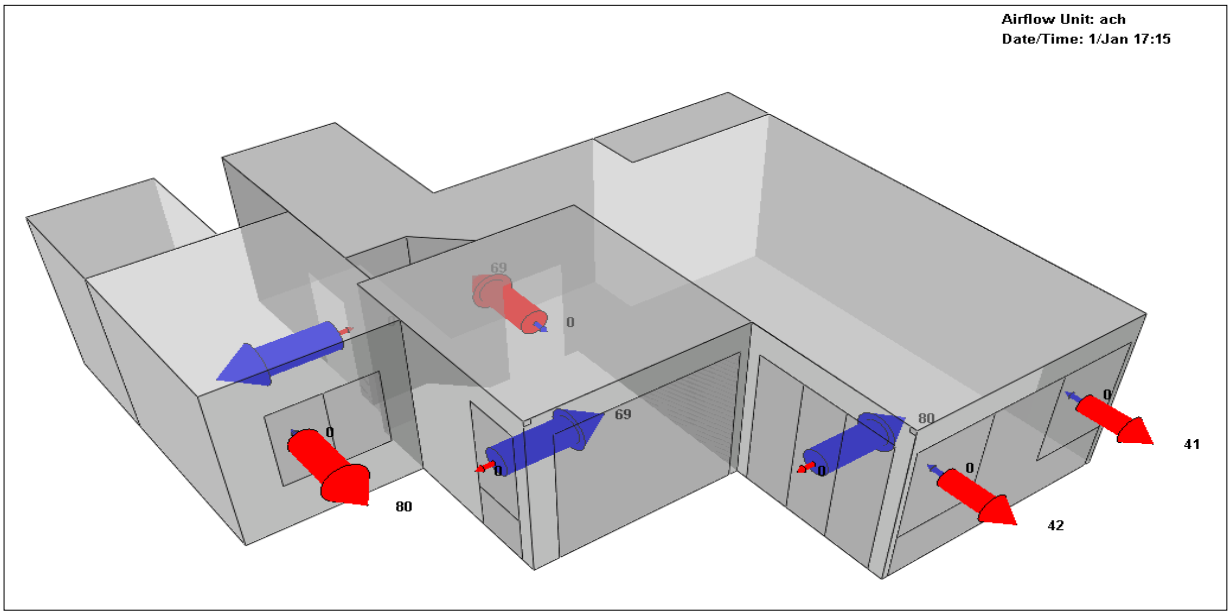
Window Openings

All the window sizes and types were modelled as per the drawings and architectural mark-ups. The window opening has been defined to open when the outside air temperature is between 18-28 degrees Celsius. The openable sections of the windows are defined in the table below. The images show the typical window openings and volume flow rates / air movement through an apartment.

Window type	Operable Area (%)	Opening Angle (°C)
Sliding Windows / Doors	90	N/A
Top Hung windows	90	10
Fixed Window Pane	N/A	N/A



IES Screenshot of window opening types (Apartment B-02-03)



IES Screenshot of natural ventilation flow rate and air movement (Apartment B-02-03)

4 SIMULATION RESULTS

Simulation results have been broken down into annual average volume flow rates and summer average volume flow rates. The tables below include reference apartments details used to compare the average volume flow rates of the subject apartments.

Annual Simulation Results

Subject Apartments			Average Volume Flow Rates (Annual)		
Reference	Building	Level	Total In (ACH)	Total Out (ACH)	Reference (%)
B-GR-11	*B*	*Ground floor*	*21.8*	*21.0*	*Reference Apartment*
B-GR-01	B	Ground floor	17.1	18.4	88%
E-GR-10	E	Ground floor	17.6	17.8	85%
B-GR-12	*B*	*First Floor*	*30.2*	*29.2*	*Reference Apartment*
B-01-01	B	First floor	23.7	25.5	88%
B-01-03	B	First floor	46.7	43.6	150%
E-01-11	E	First floor	32.5	32.7	112%
E-01-10	E	First floor	56.0	50.1	172%
D-01-01	D	First floor	28.9	28.9	99%
B-GR-13	*B*	*Second floor*	*30.3*	*29.3*	*Reference Apartment*
B-02-01	B	Second floor	23.8	25.7	88%
B-02-03	B	Second floor	49.0	51.3	175%
E-02-11	E	Second floor	32.6	32.9	112%
E-02-10	E	Second floor	56.0	50.1	171%
D-02-01	D	Second floor	28.8	28.9	99%

Summer Simulation Results

Subject Apartments			Annual Average Volume Flow Rates (Summer)		
Reference	Building	Level	Total In (ACH)	Total Out (ACH)	Reference (%)
B-GR-11	*B*	*Ground floor*	*43.81*	*38.99*	*Reference Apartment*
B-GR-01	B	Ground floor	32.9	36.4	93%
E-GR-10	E	Ground floor	34.9	34.9	89%
B-GR-12	*B*	*First floor*	*60.31*	*53.81*	*Reference Apartment*
B-01-01	B	First floor	45.4	50.2	93%
B-01-03	B	First floor	88.1	84.5	157%
E-01-11	E	First floor	63.9	63.7	118%
E-01-10	E	First floor	111.7	99.0	184%
D-01-01	D	First floor	54.4	54.5	101%
B-GR-13	*B*	*Second floor*	*60.35*	*53.86*	*Reference Apartment*
B-02-01	B	Second floor	45.4	50.2	93%
B-02-03	B	Second floor	92.7	97.5	181%
E-02-11	E	Second floor	63.9	63.8	118%
E-02-10	E	Second floor	111.8	99.1	184%
D-02-01	D	Second floor	54.4	54.5	101%

5 DISCUSSIONS & CONCLUSIONS

The annual average volume flow rates for the selected apartment's range between 17.8–51.3 ACH, while the reference apartments (deemed to satisfy the ADG) range between 21–29.3 ACH. The results also demonstrate a number of apartments have a greater quality of natural ventilation (higher air change per hour) than the reference apartments.

Apartment E-GR-10 is the worst performing apartment, it achieve an average volume flow rate 85% that of the reference. However the apartment still has an average 17.8 ACH, this is deemed to be a high natural ventilation rate for apartments.

The summer average volume flow rates for the selected apartment's range between 34.9–99.1 ACH, while the reference apartments (deemed to satisfy the ADG) range between 38.9–53.86 ACH. The results also demonstrate a number of apartments have a greater quality of natural ventilation (higher air change per hour) than the reference apartments.

Apartment E-GR-10 is the worst performing apartment, it achieve an average volume flow rate 89% that of the reference. However the apartment still has an average 34.9 ACH, this is deemed to be a high natural ventilation rate for apartments.

Based on the computation modelling results, it was determined that the proposed type with window configuration as per the proposed design, is capable of producing natural ventilation performance that meets ADG SEPP65 requirements.

6 APPENDIX A

Internal Heat Gains

Apartment type	Occupancy (W/m^2)			Lighting (W/m^2)	Equipment (W/Room)
	Maximum Sensible gain	Maximum Latent gain	Density (person)	Maximum Sensible gain	Maximum Sensible gain
1 Bedroom Apartment	75	55	2	9	160
2 Bedroom Apartment	75	55	3	9	160

Building Fabric

External Walls - Concrete Block with R1.5 insulation

Floors/Ceilings - 200m Concrete with plasterboard

Internal Walls - Plasterboard with stud wall within apartments

- Concrete with plasterboard between common walls

MacroFlo Input data

- Windows open when temperature outside is greater than 18 degrees Celsius and less than 28 degrees Celsius.
- Window opening percentage = 90%
- Exposure type = long sheltered wall