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SUMMARY EXPERT OPINION: REVISED
SEPP65 AMENITY COMPLIANCE:
SOLAR ACCESS AND CROSS VENTILATION
31-39 Mindarie St, Lane Cove
DEVELOPMENT APPLICATION

12 April 2011

1.0 PRELIMINARIES AND SUMMARY

1.1 I provide this summary report as an expert opinion, relating to **solar access and cross ventilation compliance** with the relevant local controls, and the Residential Flat Design Code as it gives effect to the Amenity provisions of SEPP65, for apartments on the above site. My qualifications and experience are included at 2.0 *Credentials*.

1.2 *My instructions limit the scope of this opinion to the issues raised in Council's letter of 2 March 2011, Reference 290/2010, as they relate to the above amenity compliance:*

1.2.1 Issue (f) Solar Access

The applicant prepared hourly views from the sun in order to examine in detail the projected periods of effective winter sun for glazing and private open space of each apartment. That detailed examination confirms the general characterisation of compliance of the relevant apartments. Minor amendments to the design of ground level private open space were undertaken to further assure that claimed solar access should be reliably met. Those changes are incorporated in the amended plans which are the subject of this opinion.

The quantitative requirements of the applicable DCP and the numerical standards of the RFDC *Rules of Thumb* are fully satisfied: the proportion of apartments that are projected to receive over **3 hours of sun between 9am and 3pm on June 21 is 73%**.

The impact of a future residential flat building on adjacent sites to the north has been examined. It has demonstrated that complying solar access can be maintained for the subject building, by relatively minor adjustment of the massing of such a building. The analysis clearly demonstrates that the development potential of sites to the north is not unreasonably limited by this constraint.

1.2.2 Issue (c) Cross Ventilation

My appraisal of the submitted design concurred with that of Council, in so far as I advised the Applicant that I could not support the characterisation of a number of apartments as complying with the performance objectives for cross ventilation. The applicant undertook design changes to four apartments on each typical floor, in order to achieve a genuine corner condition for the relevant six apartments, without compromising privacy considerations. Those changes are incorporated in the amended plans which are the subject of this opinion.

With respect to cross ventilation, the numerical controls of the RFDC *Rules of Thumb* are fully satisfied: the proportion of **apartments that are projected to be cross ventilated is 65%**.

2.0 CREDENTIALS

I have been teaching architectural design, thermal comfort and building services at the Universities of Sydney, Canberra and New South Wales since 1971. From 1992, I was a Research Project Leader in SOLARCH, the National Solar Architecture Research Unit at the University of NSW. Until its

disestablishment in December 2006 I was the Associate Director, Centre for Sustainable Built Environments (SOLARCH), UNSW.

My research and consultancy includes work in solar access, energy simulation and assessment for houses and multi-dwelling developments. I am the principal author of *SITE PLANNING IN AUSTRALIA: Strategies for energy efficient residential planning*, published by AGPS, and of the BDP Environment Design Guides on the same topic. Through UNSWGlobal and NEERG Seminars, I conduct training in solar access and overshadowing assessment for Local Councils. I have delivered professional development courses on topics relating to energy efficient design both in Australia and internationally.

SOLARCH/UNISEARCH were the contractors to SEDA NSW for the administration of the House Energy Rating Management Body (HMB), which set up and accredited assessors under the Nationwide House Energy Rating Scheme (NatHERS), NSW. I was the technical supervisor of the HMB, with a broad overview of the dwelling thermal performance assessments carried out in NSW over the first five years of the scheme. I have been a member of the NSW BRAC Energy Subcommittee, and also a member of the AGO Technical Advisory Committee on the implementation of the mandated software tool AccuRate under NatHERS.

I teach the wind and ventilation components of environmental control in the undergraduate course in architecture at UNSW, and am the author of internationally referenced, web accessed coursework materials on the subject.

Of particular relevance, I have delivered the key papers in the general area of assessment of *ventilation and solar access performance and compliance*, for NEERG Seminars, cited by Commissioners of the LEC. Most Recently, Senior Commissioner Moore cited my assistance in reframing of the Planning Principle related to solar access (formerly known as the Parsonage Principle) in *The Benevolent Society v Waverley Council [2010] NSWLEC 1082*. See <http://www.lawlink.nsw.gov.au/lecjudgments/2010nswlec.nsf/19eb930e64c0733bca257363001d0a87/34316f1bf070268eca257703000db6e0?OpenDocument>

I am a Registered Architect and maintain a specialist consultancy practice in Sydney and Canberra. I regularly assist the Land and Environment Court as an expert witness in related matters.

3.0 DOCUMENTS

In preparing this opinion, I have referred to Architectural drawings and documents issued to me by the architects:

- Describing the DA Submission, Drawings dated 07.12.10
 - DA01through 13; DA-F1, C1&2; DA-V1
 - DA-SS1 through SS4 (Views from the sun);
 - DA-S1 through S5 Plan Shadow Diagrams;
 - *Accommodation & General Compliance Schedule* dated 07.12.10
- Describing the Amended plans that are the subject of this opinion, Drawings dated 16.03.11
 - DA01through 13

5.0 SOLAR ACCESS TO APARTMENTS

5.1 Methodology

5.1.1 Quantification of solar access for compliance with the requirements of theDCP and the Residential Flat Design Code has been carried out by the architects, by use of a 3D digital model and the heliodon routine of a commercial CAD application. *I provided advice and solar geometry data for the analysis.*

5.1.2 I have reviewed the architects' analysis and independently generated my own quantification and compliance table.

5.2 Relevant solar access standards

5.2.1 Residential Flat Design Code

The Residential Flat Design Code gives the following quantified recommendations:

- Living rooms and private open spaces for at least 70 percent of apartments in a development should receive a minimum of three hours direct sunlight between 9am and 3pm in mid winter.
In dense urban areas a minimum of two hours may be acceptable.
- Limit the number of single-aspect apartments with a southerly aspect (SW-SE) to a maximum of 10 percent of the total units proposed.
- Developments which seek to vary from the minimum standards must demonstrate how site constraints and orientation prohibit the achievement of these standards and how energy efficiency is addressed (see Orientation and Energy Efficiency).
(Rules of Thumb: Daylight Access p. 84)

5.2.2 Local controls

The local control is *Lane Cove DCP Part C Residential Development Clause 2.8.2 Solar Access and Cross-Ventilation*. The Clause is consistent with the requirement of the RFDC.

5.3 Achieved solar access

5.3.1 Predicted solar access: methodology

I independently verified the direction of North against the cadastral grid north, which is, as expected, within 1° of the 'True North' provided on the Applicant's drawing and model.

For the purpose of calculating the compliance with the control, I have examined sun patches on the relevant glazing line of each apartment. Given the design, verandas will in most cases enjoy a more favourable sun exposure.

I have generally characterised as complying when sun access is over three hours total of partially and fully sunlit glazing between 9am and 3pm mid-winter. In determining exposure times, I ignore very *large angles of incidence* to the glazing surface, and unusably *small areas of sunlit glazing*. In critical instances, the interest is in the minimum area of sunlit glazing, generally at 12 noon. I take guidance from the revised L+EC Planning Principle in *Benevolent Society vs Waverley Council* (which has corrected the previous anomaly in *Parsonage*) for the minimum sunpatch area in this case to be one which would be acceptable on a normal sized window in the same location.

The technique of hourly 'views from the sun' allows very accurate assessment of what is sunlit. A typical view is illustrated in Figure 1. The whole set of views from 9am to 3pm on June 21 is, I understand, included in the Architects' submission.

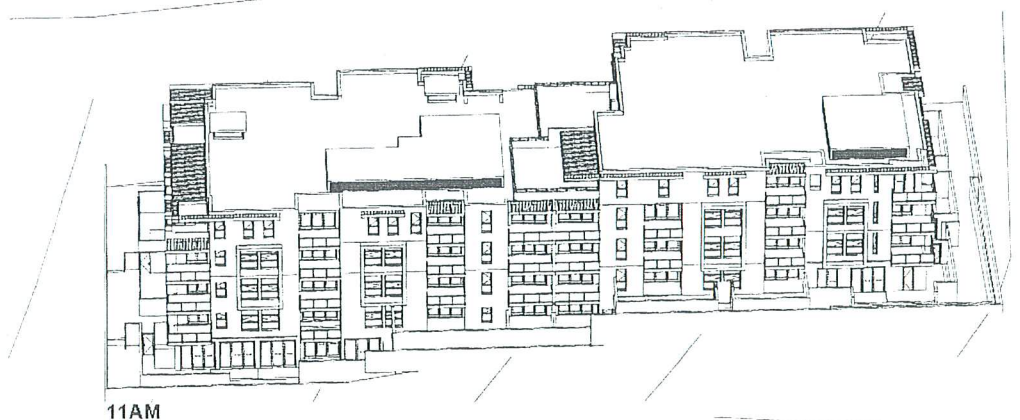


Figure 1: Typical 'view from the sun'

Note that by definition, such views do not show shadows.

5.3.2 Solar access compliance

Table 1 summarises the projected solar access for the residential dwelling units in the development. In Appendix A, I attach Table A.1, which reports in detail the schedule of achieved mid-winter (June 21) solar access for each apartment.

Table 1: Summary of solar access for units

Total No of units	60	
Units which achieve 3 hours or more sunlight	44	73%

The proportion of dwellings which may be characterised as complying with the controls for solar access at the **3-hour standard is 44 units from a total of 60, being 72%**. Of the apartments in this category the majority face near due north, and will have sun all day in mid-winter. The RFDC *Rules of Thumb* nominate as a minimum 70%.

5.3 Future solar access

Council refers to the potential for future development of the north of the site to significantly affect the proportion of north facing apartments achieving complying durations of midwinter sun.

It appears inappropriate burden the development potential of the downhill southerly site – which is the subject of this development application – with the unknown variety of scenarios for consolidation and development of sites to the north. Nevertheless, the detailed analysis of the 3-D digital model was extended to consider this scenario where development to the north of the site is of similar scale, as determined by the rezoning of the area.

5.3.1 The most conservative scenario is where development occurs on a site of similar dimensions, achieved by the consolidation of three existing properties to the north. The reason this is a likely worst case scenario is that this is the situation where the greatest duration of adverse overshadowing will occur for north facing apartments in the middle of the subject building.

The modelling was developed to examine a notional 3 to 4 storey apartment block being developed on the site to the north. Drawing on experience of designing an otherwise complying apartment block to achieve near a maximum yield on a site of similar dimensions in the same area, the architects include a small re-entrant courtyard in the southern elevation. It is considered that such a configuration is most likely, in order to avoid an excessive number of single sided south facing apartments.

The model as described was then located on the site to the north at the minimum allowable rear set back, and the maximum allowable height, and the impact on solar access compliance of the subject development was examined by use of our early views from the sun for June 21. Figure 2 illustrates two of these views. The maximum extent of the hypothetical worst case apartment block to the north can be seen as the pink line representing the parapet.

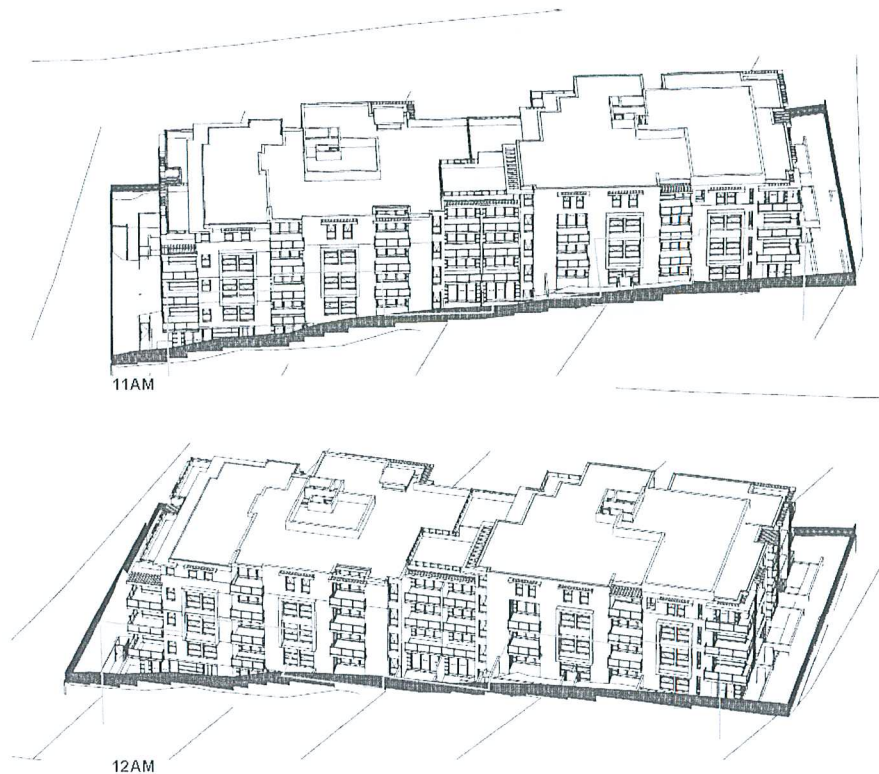


Figure 2: Investigation of overshadowing by fully developed building to the North

5.3.2 The analysis suggests that such a worst case scenario would effectively curtail midwinter solar access to the lowest storey of the subject development (The north-east corner apartment), and would significantly reduce solar access for the first and second storeys above ground level. The effect of the re-entrant 'notch' in the south facade of the hypothetical apartment block can be clearly inferred by inspection: a minimum of two hours of sun (close to three hours) is maintained to four of the six of the living areas on the first and second floor levels in the subject development. Given that the scenario of the adjacent sites both being fully developed the medium rise higher density constitutes a closely built-up context as envisaged by the Residential Flat Designed Code, these apartments would be considered to be complying with the relevant control.

5.3.3 Further inspection of the model makes clear that the affectation on the remaining four apartments on the first and second floors, and on the corner apartment on the lowest floor of the subject buildings is caused by the top of the hypothetical neighbouring building.

To preserve complying solar access for the lowest floor would require the moving of the entire subject building some 4 to 5m to the south. To achieve the same result only requires moving the top floor of the hypothetical building to the north to achieve a similar result. The resulting massing would have the same stepped section ('wedding-cakeing') as appears to be the inevitable design solution for other similar sites in the locality, to address the same overshadowing issue.

Therefore in order for the applicant to comply without any adjustments to the worst case scenario for the northern building, the loss to the subject building is far greater than that for the building causing the shadow. This situation is clearly inequitable and the onus should be on the less affected building to provide relief.

6.0 NATURAL VENTILATION

In Appendix A, Table A.1 I report in detail the schedule of the cross ventilation status of each apartment. I note here only the factors I have taken into consideration in that characterisation:

6.1 Design changes

Six apartments on three floors, forming the corners of the approximately 14 m wide recessed portion of the south elevation were previously characterised by the architects as cross ventilated. In my initial appraisal, I was unable to support that characterisation because I felt that the apartments did not develop appropriate corner conditions for operable glazing, or appropriate ventilation paths in plan. The applicants accepted my advice to undertake appropriate design changes. Those changes have now been incorporated in the amended plans. An example of one of the modified apartments is illustrated below in Figure 3.

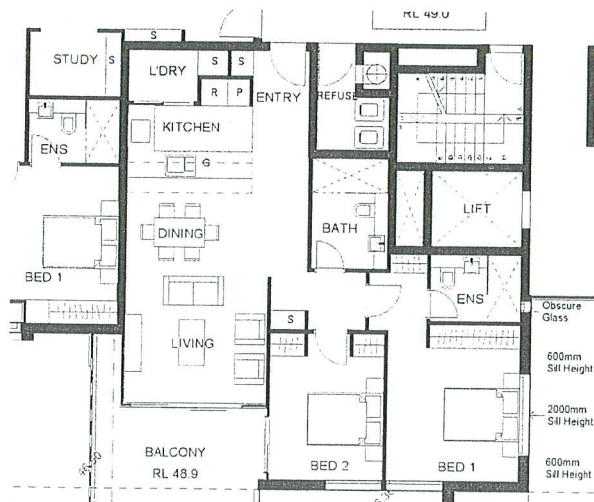


Figure 3: Amended plan of typical corner apartments on south elevation

I am now satisfied that inlet and outlet conditions were sufficiently different pressure distributions are available in conditions of prevailing summer cooling breezes, to drive genuine cross ventilation of these six apartments.

6.2 Achieved natural ventilation compliance.

The proportion required by the RFDC is a minimum of 60%. The overall number of apartments in the proposed development which may be characterized as cross-ventilated is 39 out of the total of 60, being 65%.

7.0 CONCLUSIONS

7.1 I confirm that I was commissioned to provide expert advice as to the appropriateness and probity of the architects' evaluation of likely amenity for solar access and natural ventilation of the proposed development, and that I have provided some design advice to achieve improvements in the compliance standards achieved. I have checked the likely accuracy of the 3-D digital modelling of the proposal, employed for the purpose of examining effective solar access.

7.2 Solar Access

The proportion of dwellings which achieve projected solar access of **3 hours between 9am and 3pm June 21 is 44 units from a total of 60, being 73%**. The RFDC *Rules of Thumb* nominate as a minimum 70%. The proposed development is therefore fully compliant with the RFDC *Rules of Thumb*.

The effect of a development to the north of the subject site has been investigated by digital modelling. I am satisfied that complying solar access can be maintained for the north facing apartments, albeit reduced from the 'all day' amenity to one more applicable in the closely built up context which such a scenario represents.

In my considered opinion, while the design of this subject building imposes some constraint on the design of a future building to the north, in order to maintain complying solar access for the current proposed development, the analysis described above demonstrates that the development potential of sites to the north is not unreasonably limited by this constraint.

7.3 Natural Ventilation

The design has been amended to ensure that six apartments previously unable to be included as complying with respect to cross ventilation can now be safely characterised as cross ventilated. The numerical controls of the RFDC *Rules of Thumb* are now fully satisfied: the proportion of **apartments that are projected to be cross ventilated is 65%.**

A handwritten signature in black ink, reading "Steve King". The signature is written in a cursive, flowing style with a large, stylized 'S' and 'K'.

Steve King

A.0 APPENDIX

Table A.1

Level	Plan Ref.	Cross vent.	Solar Access to Living: Jun 21 9am-3pm (>3hrs)
Lower Ground	LG01	x	x
	LG02	yes	x
	LG03	x	x
	LG04	yes	yes
	LG05	x	yes
Ground	G01	yes	x
	G02	yes	x
	G03	x	x
	G04	yes	yes
	G05	x	yes
	G06	x	yes
	G07	yes	yes
	G08	yes	yes
	G09	yes	x
Upper Ground	UG01	yes	x
	UG02	yes	x
	UG03	x	x
	UG04	yes	yes
	UG05	x	yes
	UG06	x	yes
	UG07	yes	yes
	UG08	yes	yes
	UG09	x	yes
	UG10	x	yes
	UG11	yes	yes
	UG12	x	yes
	UG13	yes	yes
	UG14	yes	x
First	101	yes	x
	102	yes	x
	103	x	x
	104	yes	yes
	105	x	yes
	106	x	yes
	107	yes	yes
	108	yes	yes
	109	x	yes
	110	x	yes
	111	yes	yes
	112	x	yes
	113	yes	yes
	114	yes	x
Second	201	yes	yes
	202	yes	yes
	203	yes	yes
	204	yes	yes
	205	yes	yes
	206	yes	yes
	207	yes	yes
	208	x	yes
	209	x	yes
	210	yes	yes
	211	x	yes
	212	yes	yes
	213	yes	x
Third	301	yes	yes
	302	yes	yes
	303	yes	yes
	304	yes	yes
	305	yes	yes
TOT ALS	60	39	44
		65%	73%