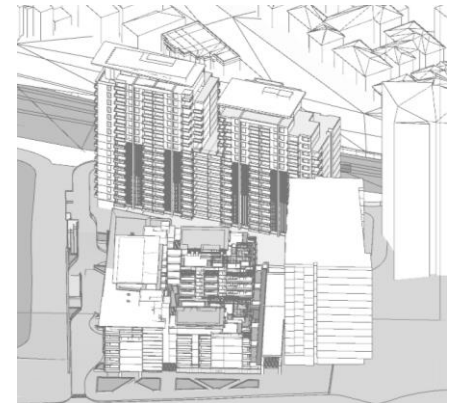


Appendix 4

Expert opinion – SEPP 65 compliance Building F – solar access and natural ventilation

Prepared by Steve King – Consultant Architect UNSW

**EXPERT OPINION
VERIFICATION
SEPP65 AMENITY COMPLIANCE
SOLAR ACCESS
NATURAL VENTILATION**



**PROPOSED RESIDENTIAL FLAT BUILDING
EAST QUARTER BUILDING F
10 August 2014**

Signed,

A handwritten signature in black ink, which appears to read "Glen King". The signature is written in a cursive, flowing style.

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1.0 PRELIMINARIES AND SUMMARY

1.1 I provide this report as an expert opinion, relating to **planning submission concept plans** of the building known as Building F, being part of the multi-stage mixed use development known as East Quarter, 1 Jack Brabham Dr, Hurstville. This report is a detailed assessment of likely solar access and natural ventilation compliance with the relevant local controls and with the Residential Flat Design Code as it gives effect to the Amenity provisions of SEPP65.

I note that the planning submission also includes the proposal for Building X in the same development. The plans for Building X are substantially unchanged from those that were the subject of a previous detailed analysis.

1.2 I was commissioned to provide preliminary advice relating to potential amendments of the design of Building F. I have separately reported on a methodology to establish the variation of the previously approved building envelope, such that any overshadowing impact on residential properties to the south of the site would be assured to comply with relevant controls.

1.3 The analysis employed in this report is based on the same full 3D digital model incorporating the East Quarter development together with extensive block modelling of several streets of individual dwellings and low rise RFBs to the south of the railway corridor.

Notwithstanding the provisional nature of the concept plans, in order to establish a very high degree of confidence in the likely compliance of any development application that may rely on them, I have been provided with draft architectural plans of all levels of Building F. The documents on which I rely are included at 3.0 *Documents*.

1.2 My qualifications and experience are included at 2.0 *Credentials*.

1.3.1 **Solar access.**

My analysis was carried out with the use of the *Trimble SketchUp Pro* software package, analysing a 3-D digital model prepared by the architects. As noted, the model incorporates any other building on the site which may occasion overshadowing of the subject building.

The proportion of dwellings which have complying periods of mid-winter direct sun is 188 out of 261, or 72.0%.

The RFDC *Rules of Thumb* recommend 70%.

I am therefore confident that any future Development Application based on these concept plans will be fully compliant with controls for solar access.

1.4 **Natural ventilation.**

The proposed development is located with effectively unobstructed access to summer cooling winds from the north-east and from the south. In this situation, a high proportion of single aspect apartments will achieve natural ventilation equivalent to cross ventilation, due to exposure to higher wind speeds at elevated locations in the building.

165 out of 261 (63.2%) of the proposed apartments in Building F can be conservatively described as complying with the RFDC performance objectives for cross ventilation.

This proportion includes 110 apartments (42.1%) which are simply cross ventilated, and all apartments at and above Level 10, sufficiently elevated in the building that ventilation of single aspect apartments is not an issue.

The RFDC *Rules of Thumb* recommend a minimum of 60%.

I am therefore confident that any future Development Application based on these concept plans will satisfy the performance objectives of the RFDC for natural ventilation amenity.

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 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.

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*, in the NEERG Seminars, which are cited in the L+EC as the basis of appropriate consideration of these issues. 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*.

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

3.1 I base my report on:

- Design Concept detailed architectural drawings issued to me by DEM Architects on 9 August 2014.
- Original analysis carried out on *EQ-S3-MP-ForSK-30July2014_.skp* being the digital 3D model file in Trimble SketchUp modelling software provided to me for my overshadowing analysis. I have been unable to infer very minor changes of the model which will arise due to subsequent amendments of the architectural plans.

3.2 I have visited the site.

4.0 SITE PLANNING AND BUILDING MASSING

- 4.1 The building is at the south-east corner of the comprehensive development, and is sited on that portion of the site backing onto the railway line and facing north onto Building X.
- 4.2 The site for this stage of the development is an irregular rectangular shape with near due north and south orientations of the two long facades. The dominant due north elevation determines the solar access is available to the majority of apartments throughout the day in winter, limited only by any overshadowing from other buildings in the development.
- 4.3 The south side of the double loaded floor plate has apartments subject to acoustic performance which presumes a 'closed window mode', and therefore the supply of mechanical ventilation.

For the purposes of determining the complying proportion of dwellings for natural ventilation, this could be dealt with by excluding the said units from the relevant total number of dwellings. However, I take the conservative approach that the windows are not required to be sealed (as defined in the BCA), and therefore natural ventilation is available to the occupant when they choose to employ it. I therefore base my proportions of units on the total number of dwellings, regardless of whether they are required to have mechanical ventilation.

- 4.4 The design of the building has been amended from a previously withdrawn DA scheme, in part to assure overshadowing compliance for a number of residential properties to the south of the railway line. This has resulted in significant change to some unit layouts, while maintaining a similar level of compliance with both solar access and natural ventilation performance.

5.0 SOLAR ACCESS

5.1 Relevant solar access standards

- 5.1.1 The *Residential Flat Design Code* (SEPP65) gives the following quantified recommendations:

Inter alia

- 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.
(*Rules of Thumb: Daylight Access p. 84*)

- 5.1.2 The relevant DCP adopts provisions that consistent with the requirement of the RFDC.

5.2 Predicted solar access: methodology

5.2.1 3D digital model

My review and analysis were conducted with the use of the *Trimble SketchUp Pro* software package. A 3-D digital model prepared by the architects and supplied to me as a native SketchUp file. I independently checked the geolocation of the 3D digital model, and the direction of True North by reference to cadastral grid north, but otherwise rely on the accuracy of the provided model.

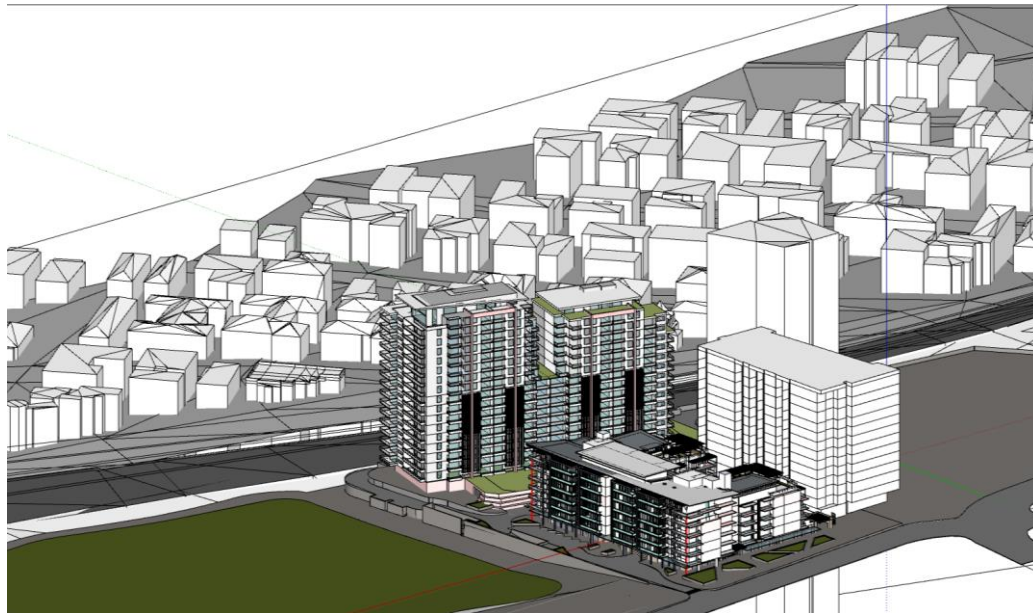


Figure 1: 3D digital model in SketchUp: view from the sun at 9am
Note Building X and Building A in the foreground

I carried out my analysis of the design primarily by use of 'views from the sun'. The projection referred to as a '*View from the Sun*' shows all sunlit surfaces at a given time and date. It therefore allows a very precise count of sunlight hours on any glazing or horizontal surface, with little or no requirement for secondary calculations or interpolation. Figure 1 illustrates the technique. *Note that a 'view from the sun' by definition does not show any shadows.*

5.2.2 Characterisation of solar access compliance

For the determination of what is 'effective sunlight' for characterisation of compliance, for both glazing and private open space, I refer specifically to the application of the relevant *L+EC Planning Principle (The Benevolent Society v Waverley Council [2010] NSWLEC 1082)*:

- I ignore very large angles of incidence to the glazing surface, and unusably small areas of sunlit glazing. I quantify as complying all sun patches of 'reasonable size'.

- 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 the case of units where the total direct sun between those times is insufficient, I examine extended hours.
- If the relevant sun before 9am or after 3pm can be demonstrated to be maintained into the future, I consider it equally effective, especially for east or west facing units.

At the time of a Development Application, I would expect to confirm my detailed analysis by providing views from the sun on a half hourly basis, and to rely on finer examination of timings of solar access by selected detailed views of particular glazing areas.

5.3 Achieved solar access

Table 1 summarises the projected solar access compliance of the development overall. In any future Development Application, I would provide a comprehensive table of available midwinter sun for all apartments individually.

Units which achieve 3 hours or more sunlight to Living and POS 9am – 3pm	144	55.2%
Additional units which achieve 2 hours or more sunlight to Living and POS 9am – 3pm	11	4.2%
Additional units which achieve 2 hours or more sunlight to Living and POS 8am – 4pm	33	12.6%
Total that may be considered to comply	188	72.0%

Table 1: Summary of solar access for units

The RFDC Rules of Thumb nominate as a minimum 70%.

6.0 NATURAL VENTILATION

6.1 Performance Objectives

The Residential Flat Design Code (RFDC) gives a quantified recommendation for interpreting SEPP 65 with respect to natural ventilation:

- Building depths, which support natural ventilation typically range from 10 to 18 metres.
- Sixty percent (60%) of residential units should be naturally cross ventilated.
- Twenty five percent (25%) of kitchens within a development should have access to natural ventilation.
- Developments, which seek to vary from the minimum standards, must demonstrate how natural ventilation can be satisfactorily achieved, particularly in relation to habitable rooms.

(Rules of Thumb: *Natural Ventilation* p.87)

SEPP65 itself does not refer to prescribed quantitative standards, but may be regarded as a performance based regulatory instrument. Proper reading of the Residential Flat Design Code as it interprets SEPP65 similarly makes clear the *performance based approach* of the Code.

6.2 Natural ventilation/cross ventilation

So-called 'cross-ventilation' describes where a dwelling has operable openings to two or more distinctly different orientations, thus making likely that in any conditions of breeze, relative pressure differentials will assure some air movement through connected spaces in the dwelling. The *Rules of Thumb* in the Residential Flat Design Code give a quantified recommendation *with respect only to cross ventilation*, and relating only to the overall proportion of complying dwellings, but not to the expected performance for any one dwelling.

6.2.1 Cross ventilation by openings in adjacent or opposite facades

In the subject development, all such apartments are classified as cross-ventilated without further discussion – the simple definition of cross ventilation is met by all 'corner' and 'through' apartments in the complex.

6.2.2 Cross ventilation by roof openings

Apartments on the top floors of buildings can be characterised as cross ventilated by virtue of suitably detailed horizontal ventilated skylights. In a flat roof under all wind directions, such openings may be relied on to be in a region of reduced static pressure, and therefore to act as outlet openings for cross ventilation, effectively independent of the orientation of the inlet glazing. *In this proposal, roof openings are not employed for ventilation, and therefore may be provided as sealed skylights for solar access.*

6.2.3 Cross ventilation with secondary openings to large facade slots.

Increasingly, large residential flat building designs may employ a high degree of articulation of long facades, by what might be referred to as facade 'slots'. These 'facade slots' may provide the opportunity for secondary openings giving rise to *de facto* corner conditions, within a facade of otherwise single primary orientation. In some configurations and with the secondary openings appropriately related to the relevant apartment plans, it becomes appropriate to include such apartments as simply cross ventilated.

I note that in my characterisation of simple cross ventilation for the present concept scheme, I do not include those apartments that have a secondary opening to what might be described as a 'facade slot' in the south elevation of the proposed building F concept. In this instance, I do not consider that without more detailed investigation there is sufficient confidence in the likely pressure distributions – and therefore the resultant ventilation patterns – to justify the assumption of equivalence to simple cross ventilation. However, I take the approach that at elevated locations in the building, the likely wind speeds are such as to assure such apartments will in any case have ventilation performance equivalent to cross ventilation.

6.2.4 Two storey apartments

I usually characterise as cross ventilated two-storey apartments where the glazing is to one orientation, but the operable openings can be widely vertically separated. This accords with conventional interpretation of the RFDC, but also in my opinion is a realistic projection of the likely performance of such dwellings. *In this application, there are only two apartments for which I rely on this characterisation.*

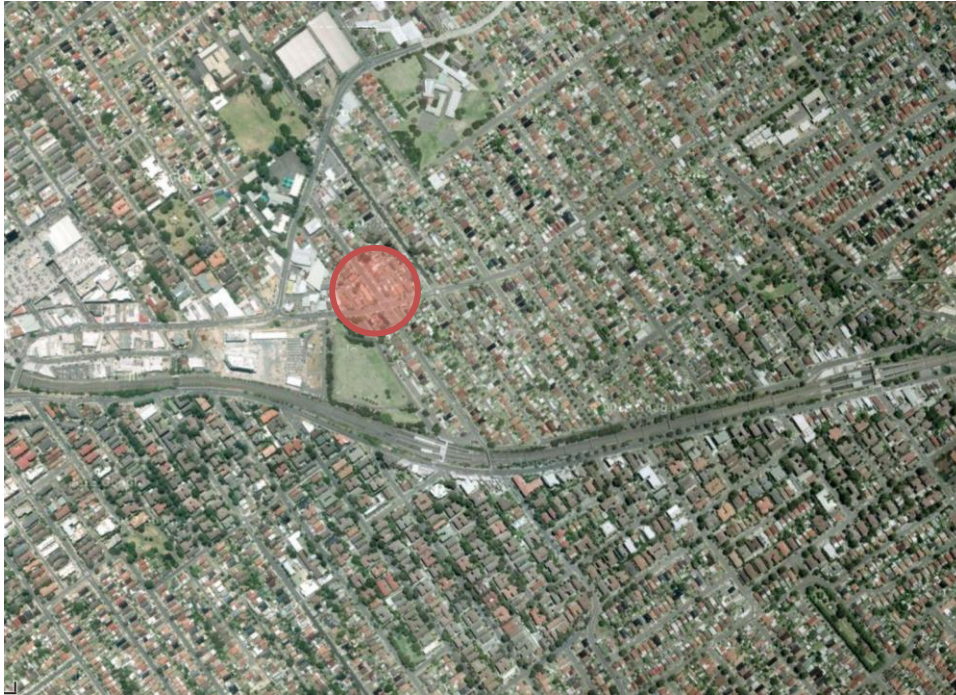


Figure 2: Site location

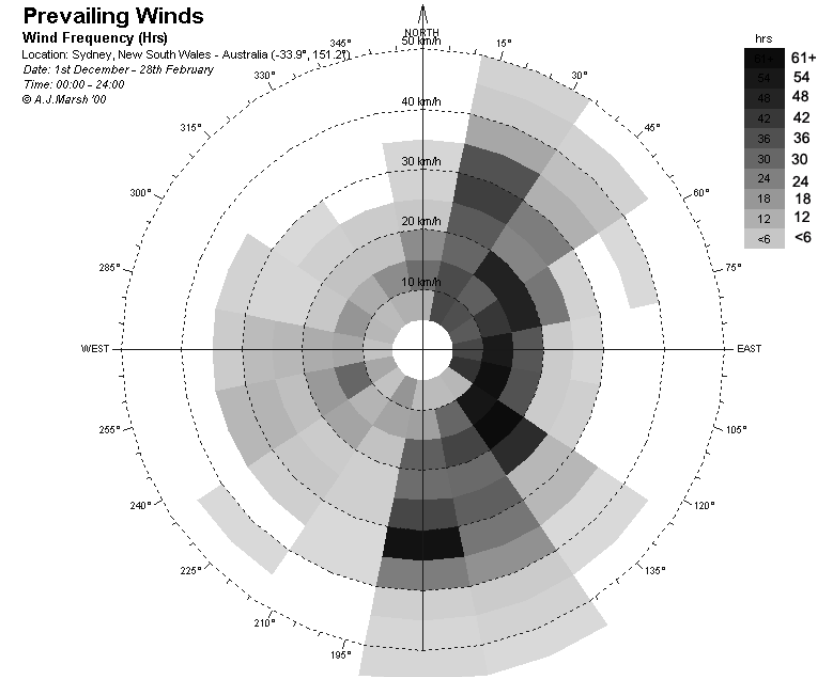


Figure 3: Summer wind rose for Sydney East

6.3 Equivalence to cross ventilation due to elevated exposure

I consider that at a certain height, suitable single sided apartments can be treated as subject to winds of so much greater velocity, *that the distinction between single sided ventilation and cross ventilation is no longer relevant*. A greater concern in fact becomes the quality of façade construction to minimise wind induced nuisance. The former provision for the 'cross ventilation bonus' in BASIX suggested this blanket categorisation may apply from level 10 above ground in all cases. Other authorities have typically adopted eight storeys above ground as the threshold in typical urban settings.

The subject site is located on a ridge at the eastern edge of the Hurstville town centre, with little or no likelihood of obstruction of the Sydney summer prevailing winds. See Figure 2 and refer to the wind rose in Figure 3.

Notwithstanding the relatively exposed location, for sake of consistency with precedents I have only applied this characterisation of blanket compliance at and above Level 10 of Building F.

6.4 Quantification of ventilation compliance

Table 2 summarises the apartment types with their ventilation status.

Simply cross ventilated	110	42.1%
Additional apartments at and above Level 10	55	21.1%
Total deemed complying	165	63.2%

Table 2: summary of natural ventilation compliance

7.0 CONCLUSIONS

I confirm that I was commissioned to provide expert opinion and review of likely amenity for solar access and natural ventilation of the concept for the amended design of the proposed development. I have carried out my own analysis and quantification of the solar access and natural ventilation likely to be achieved in the current concept plan for Building F.

7.1 Solar access

The location, shape and orientation of the building places a practical maximum proportion of the apartments on the northern façade. **The proportion of dwellings in these concept plans achieving more than 2 hours of solar access on June 21 to principal living spaces is 188 out of 261, being 72.0%,** with the majority of those complying apartments achieving the higher standard of a minimum of three hours. The RFDC *Rules of Thumb* nominate as a minimum 70%.

The concept proposal indicates that a detailed development application will fully comply with the controls for solar access amenity.

7.2 Natural ventilation

110 apartments out of a total of 261 (42.1%) are simply cross ventilated by openings in two or more facades of different orientations. A further 55 single aspect apartments at or above Level 10 of the building are likely to be subject of sufficiently high wind velocities as to make conventional cross ventilation irrelevant to achieve the required amenity ventilation performance. **A total of 165 out of 261 apartments (63.2%) may be deemed to satisfy the performance objectives for natural ventilation.** The proportion required by the RFDC *Rules of Thumb* is a minimum of 60%.

The concept proposal indicates that a detailed development application will fully comply with the relevant control for natural ventilation.