

## Solar Access and Ventilation: Reflections on Parsonage

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## APPLYING THE LAND AND ENVIRONMENT COURT PLANNING PRINCIPLES TO THE DESIGN AND ASSESSMENT OF DEVELOPMENT IN NEW SOUTH WALES

Wednesday, 27 July 2005, Powerhouse Museum

### **Solar Access and Ventilation**

#### **Reflections on Parsonage**

Steve King, Associate Director, SOLARCH UNSW

## **1. Introduction**

This paper combines two quite different discussions. The first is a reflection on the determination of acceptable solar access, or more precisely the concept of 'effective sunlight' as defined/constrained by the Principles commonly referred to as the Parsonage case. The second is, in my view, a principle long overdue to be articulated by the Court — namely how to deal with the conflict between natural ventilation and mandated acoustic performance.

## **2. Parsonage and solar access**

I give the citation below, and quote the relevant part of the judgement.

THE LAND AND  
ENVIRONMENT COURT OF NEW SOUTH WALES  
Roseth SC  
30 June 2004  
10225 of 2004 Stephen Parsonage v Ku-ring-gai Council

CITATION :	Parsonage v Ku-ring-gai [2004] NSWLEC 347
PARTIES :	Applicant: Stephen Parsonage Respondent: Ku-ring-gai Council
FILE NUMBER(S) :	10225 of 2004
CORAM:	Roseth SC
KEY ISSUES:	Development Application - Development Standards :- Planning principle: impact on solar access of neighbours

The judgement *inter alia*:

8 Numerical guidelines dealing with the hours of sunlight on a window or open space usually leave open the question what proportion of the window or open space should be in sunlight, and whether the sunlight should be measured at floor, table or a standing person's eye level. Numerical guidelines should therefore be applied with the following principles in mind, where relevant:

- The ease with which sunlight access can be protected is inversely proportional to the density of development. At low densities, there is a reasonable expectation that a dwelling and some of its open space will retain its existing sunlight. (However, even at low densities there are sites and buildings that are highly vulnerable to being overshadowed.) At higher densities sunlight is harder to protect and the claim to retain it is not as strong.
- The amount of sunlight lost should be taken into account, as well as the amount of sunlight retained.
- Overshadowing arising out of poor design is not acceptable, even if it satisfies numerical guidelines. The poor quality of a proposal's design may be demonstrated by a more sensitive design that achieves the same amenity without substantial additional cost, while reducing the impact on neighbours.
- To be assessed as being in sunlight, the sun should strike a vertical surface at a horizontal angle of 22.5° or more. (This is because sunlight at extremely oblique angles has little effect.) For a window, door or glass wall to be assessed as being in sunlight, half of its area should be in sunlight. For private open space to be assessed as being in sunlight, either half its area or a useable strip adjoining the living area

should be in sunlight, depending on the size of the space. The amount of sunlight on private open space should be measured at ground level.

- Overshadowing by fences, roof overhangs and changes in level should be taken into consideration. Overshadowing by vegetation should be ignored, except that vegetation may be taken into account in a qualitative way, in particular dense hedges that appear like a solid fence.
- In areas undergoing change, the impact on what is likely to be built on adjoining sites should be considered as well as the existing development.

The general objectives of the principles are clear from the Senior Commissioner's preamble, and little objection can be made to his first two particulars, or his last.

It would also be reasonable to infer that the determination to express numerical guidelines was motivated by a history — of the Court seeing a lot of contentious and self-serving characterisations of achieved solar access. It is easy to visualise the last sliver of sunlight, the last tiny corner of sunpatch on a window, the last minute of fleeting sun, being obsessively represented by applicants as part of a minimum (usually two hours) of sun access in mid-winter. And to imagine all manner of excuses why the site of a particular proposed development may determine that some dwellings may not get any winter sun at all. A total waste of the Court's time, and not at all in the spirit of assuring the performance to which DCPs and the RFDC Guidelines seek to address themselves.

The problem is that the particulars of the Parsonage principles referring to quantitative limits are demonstrably wrong, in as much as they fail some crucial tests of application.

Even bigger is the problem that in spite of that statement, the principles are generally reasonable, and therefore should be carefully considered. However, when not appropriate, they should be ignored with impunity, and the contradictory evidence of performance supported by appropriate technical analysis.

To illustrate the problems, I will address the major concerns:

## **2.1 Alternatives to poor design**

Overshadowing arising out of poor design is not acceptable, even if it satisfies numerical guidelines. The poor quality of a proposal's design may be demonstrated by a more sensitive design that achieves the same amenity without substantial additional cost, while reducing the impact on neighbours.

Roseth, SC from the bench, in *Baker Kavenagh Architects ats Sydney City Council* on 22 January 2005, in direct reference to this principle under discussion, stated in effect that he has been advised his practice of comparing designs before him to other possible designs is not an acceptable basis for rejection of an application. I don't think this undermines the basic thrust of the principle, concerning poor design.

## **2.2 Acceptable angle of incidence of sunlight**

To be assessed as being in sunlight, the sun should strike a vertical surface at a horizontal angle of 22.5° or more.

This constraint has had profound influence on developments under consideration, because it can be applied as part of a reductive process of design. And more importantly because it can be easily understood by lawyers — who are generally treating it as if it were a legal precedent. It should not be considered that robust, for a number of reasons I will try to explain.

Referring to the *limitation on angle of incidence in the horizontal plane*, a technically correct

framing of that principle would read in part as follows:

Sunlight striking glazing of a particular orientation may not be considered as 'effective sunlight' if the horizontal shadow angle (HSA) for that glazing exceeds 67.5°. This limitation acknowledges:

- the likely small size of any internal sunpatch resulting from sun at greater angles of incidence,
- the high likelihood of small façade details (including the window reveals) shading the glass, and
- the threshold of total external reflections (the exact value of which is a function of the refractive index of the particular glass employed).

This framing expresses the sun angle to the glazing in appropriate technical conventions, being the angle of incidence which relates to the direction *normal* to the glazing. The actual value used may more properly vary depending on the source from which it is derived — the above figure is from NSW Department of Planning 1978 Technical Report No 13 *Sunlight Indicators*, while relying on Phillips, *Sunshine and Shade in Australia* would give 75°.

As soon as the principle is thus properly framed for the *horizontal*, it becomes apparent that it should also be framed in terms of a similar limitation on the *vertical shadow angle (VSA)*. This is so because the physical parameters that preclude the acceptability of sunlight in one plane, apply equally in all other planes in three dimensions.

However, if the principle is extended to the Vertical Shadow Angle (VSA), it becomes clear that this limitation has *unintended consequences*. While on June 21 the limiting HSA and VSA occur at approximately the same time for relevant north-easterly and north-westerly facades, closer to the Equinoxes, the cutoff threshold in the vertical plane can occur some 1.5 hours earlier than would be indicated by the horizontal limits.

In addition, because of the complexity of determining the VSA by trigonometry, it is very difficult to implement as a design solution boundary. Unlike the HSA limits — which are obtained by simple arithmetic, and represented by simple 2D plan diagrams.

From this I take only that no special status should properly be accorded to the horizontal angle limits, if the vertical angles cannot be expressed in a manner consistent with those limits. And as that is not practicable, this use of limitations only in plan leads to an invalid assessment.

I hold the firm opinion that a more proper treatment would record the full duration of sun exposure, with more explicit discussion of the purpose of the sunlit glazing matched to the predicted exposure. In response to that opinion, the Senior Commissioner has expressed a strong sentiment that experts' assessment of compliance should be clearly *enumerated* — so that little room remains for differing *qualitative characterisation* of such levels of compliance in subsequent submissions by legal counsel, who are allowed the luxury of argument.

### 2.3 Minimum acceptable area of sunlit glazing

For a window, door or glass wall to be assessed as being in sunlight, half of its area should be in sunlight.

Expressing the acceptable minimum area of sunlit glazing as a *percentage* of the particular unit of glazing is necessarily flawed. This is because:

- It takes no account of the *absolute area* of that glazing or
- its *relationship to the room served*.

This 'principle' can be shown to be regressive, where designers reduce window sizes to increase the proportion of the sunpatch. In fact, the principle relating to glazing should have a similar qualification as that relating to open space.

Of further concern is that the controls referred to earlier in the Parsonage judgement, including the RFDC Rules of Thumb, all refer to solar access for the spaces, usually the living spaces. They necessarily refer to the glazing relating to these spaces, but they do not therefore concern themselves *ipso facto* with the sunlit glazing. Assessing the *sunpatch on the glazing* is merely a means to assessing the solar access of the relevant space.

## 2.4 Sun access for outdoor space

For private open space to be assessed as being in sunlight, either half its area or a useable strip adjoining the living area should be in sunlight, depending on the size of the space.

The limitation that only sun on the ground plane can be measured when determining sun access for outdoor space cannot be uniformly applied, and is most unworkable for apartments and courtyard style housing. It is readily demonstrable that applied to such outdoor space, self-shading by likely configurations of privacy walls of necessary heights, will tend to make mid-winter shadows on the ground plane alone appear generally non-complying. Whereas taking account of the actual sun exposure of other relevant vertical and horizontal planes (including for example the table height explicitly excluded by Roseth, SC) will often reveal functionally excellent sun access.

Using this logic, I have in on occasions in the past not adhered to this principle, and had my opinion preferred.

## 2.5 Vegetation

Overshadowing by fences, roof overhangs and changes in level should be taken into consideration. Overshadowing by vegetation should be ignored, except that vegetation may be taken into account in a qualitative way, in particular dense hedges that appear like a solid fence.

This principle is generally poorly applied, by simple reason that it is inattentively read. The Senior Commissioner clearly intended exactly what he describes: any analysis should be carried out *first* ignoring vegetation, but *then* should be properly interpreted to take account of the reality of such plantings.

This is particularly relevant where existing boundary planting is proposed to be retained for privacy, or even because it is protected by tree preservation orders. In one case where I gave evidence, the applicant conveniently ignored an historic avenue of 30m high conifers, that were elsewhere in the design rationale described as of primary significance to the planning of the scheme. Not surprisingly, the Commissioners determining the case took a dim view of this interpretation of the principle.

## 3.0 Natural ventilation and acoustic performance

The second matter on which I comment in this paper is the conflict between:

- *natural ventilation* encouraged by SEPP65/RFDC and for which the Rules of Thumb are the commonly applied control;
- *mandated acoustic performance*, which on many sites may only be achieved by use of closed windows and mechanical ventilation.

This conflict is not uncommon in multi-unit proposals in Sydney. Planning consultants I have questioned on the issue have informed me that the proportion of development proposals in which this consideration has to be dealt with may be as high as 85% in the relevant municipalities.

On the face of it, it is illogical to expect conformity with the natural ventilation guidelines — which have at best discretionary status as part of a ‘model code’ applied at planning approval — if the concurrent requirement under an Australian Standard for minimum acoustic performance would appear to indicate the need for windows to be closed and well sealed (and therefore require mechanical ventilation). This interpretation is, however, incorrect.

Firstly, it should be understood that whatever the mandated acoustic performance imposes on the *worst case* ventilation compliance, future residents have the *discretion* to employ natural ventilation for both air quality and summer cooling control. In other words, the closed window performance *must* be provided, so that the required noise reductions *can* be achieved. But the resident does not *have to* make use of that performance.

In fact, this distinction appears to be well captured in the BCA. Without claiming special expertise, I have always differed in my interpretation of Clause F4.5 *Ventilation of Rooms*, and Clause 4.6 *Natural Ventilation*. I quote the relevant Clauses:

#### **F4.5 Ventilation of rooms**

A habitable room, office, shop, factory, workroom, sanitary compartment, bathroom, shower room, laundry and any other room occupied by a person for any purpose must have –

- (a) natural ventilation complying with F4.6; or
- (b) a mechanical ventilation or air-conditioning system complying with AS 1668.2 and AS/NZS 3666.1.

#### **NSW Variation**

- (b) a mechanical ventilation or air-conditioning system complying with AS 1668.2.

#### **Note:**

The reference to AS/NZS 3666.1 is deleted from the BCA in NSW, as the need to comply with this standard is regulated in the Public Health Regulation, 1991, under the Public Health Act, 1991.

#### **F4.6 Natural ventilation**

Natural ventilation provided in accordance with F4.5(a) must consist of permanent openings, windows, doors or other devices which *can be opened*—

- (a) with an aggregate opening or openable size not less than 5% of the floor area of the room required to be ventilated;

I take from those definitions that in strict interpretation of the BCA, mechanical ventilation is not actually *required* in these situations. In reality, it is a relatively conservative provision to assure the performance objectives of the Code. The specific arrangements to satisfy the mechanical ventilation alternative may be quite varied, though in my opinion would usually be best satisfied by air conditioning — mainly because mechanical ventilation alone cannot hope to deal with peak summer cooling loads. But in any event, the particular mechanical ventilation solution would in my view normally be the subject of Construction Certificate, rather than planning approval, and therefore I am always surprised that it should be treated as a DA compliance issue.

My position on the impact of the mandated acoustic performance on general residential amenity finds support from prominent acoustics consultants. I quote from one Court appointed expert's report:

"On the assumption that future occupants require noise levels not in excess of the noise criteria, it is necessary to consider the implications of the mitigation measures proposed. The mitigation measures essentially involve closed windows with mechanical ventilation or air-conditioning. Having been involved as an acoustic consultant in similar mitigation measures for many other residential premises, it is my view that these mitigation measures are appropriate for this type of development..... I consider that they are appropriate for apartment developments within inner suburbs, primarily within urban environments. There are already numerous residential apartment blocks, including within the City of Sydney, where such mitigation measures have been incorporated and where normal urban lifestyle appears not to be impeded."

Murray, Report No 04306 Version A December 2004

I have therefore taken a conservative approach to compliance evaluation for natural ventilation — namely that *when natural ventilation is possible*, it should approximately correspond to norms emerging in response to the Residential Flat Design Code guidelines. I consider the meeting of the 60% minimum proportion for full technical cross-ventilation to be an appropriate compliance standard in those situations where a significant proportion of apartments are affected by the conflict described.

While I can find no explicit principle articulated by the Court, its attitude since the application of SEPP 65 appears to have been to:

- require *compliance with the natural ventilation requirements* — reflecting the ability of occupants to exercise discretion in the tolerance to environmental noise and therefore open the windows at relevant times;
- balanced with a generally energy efficient approach to design complying with the relevant Australian standard for *mechanical ventilation*, where required for mandated acoustic performance; and
- requiring an appropriate *assured acoustic performance* by condition to approvals.

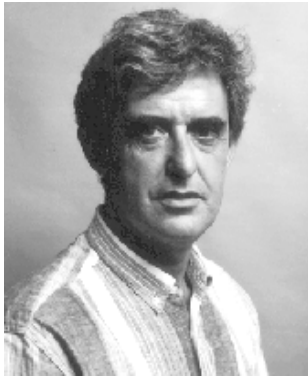
When articulating this in evidence in front of Senior Commissioner Roseth, he enquired whether I might want to draft the appropriate principle. So far, the invitation has not been formally repeated. But I fully expect that when eventually the Court does promulgate a principle applying to the assessment of natural ventilation, it will be very similar to that outlined above.

## 4.0 Conclusion

It's worth mentioning that amongst others, Senior Commissioner Roseth has reiterated a number of times that the RFDC numerical guidelines have no statutory standing, and that applicants may choose to submit development applications with degrees of non-compliance — without that automatically leading to refusal. However, to the best of my knowledge, he has given no guidance as to how such degrees of non-compliance across the disparate quantitative guidelines might be viewed by the Court.

More relevant to this discussion of principles is that, in my experience, including Senior Commissioner Roseth himself, the Commissioners have no difficulty giving due consideration to technically competent evidence that establishes performance appropriate to given controls. After all, the remit of the Court is not to slavishly apply any particular rules of a Commissioner's own making, but to determine the expert evidence to be preferred in relation to any matter.

In the final accounting, none of the rules, be they in DCPs, the Residential Flat Design Code, or now incorporated in principles articulated through judgements of the Court, are a substitute for knowing what you are doing; and doing the right thing.



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As a practice oriented member of the research team at SOLARCH, and with his specialisation in passive environmental control of buildings, Steve King has been responsible for projects affecting the evolution of energy performance expectations for both domestic and institutional buildings in Australia. He provided the technical oversight during the establishment and first five years of operation of the NSW HERS Management Body, which accredits assessors under the National House Energy Rating Scheme, NSW, and of a number of studies for the SEDA NSW to improve the implementation of minimum energy performance requirements for dwellings. He is 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, Steve conducts training in solar access and overshadowing assessment for Local Councils, and as part of professional development courses.

A Registered Architect, Steve maintains a specialised consultancy practice advising designers, developers and local government on ESD and amenity issues. He appears regularly as an expert witness in the Land and Environment Court in NSW, usually testifying on matters where 'rules of thumb' and similar 'deemed-to-satisfy' provisions do not appropriately address environmental performance requirements of planning controls.

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