

SUMMARY EXPERT OPINION LIGHT AND VENTILATION WELL PROPOSED RESIDENTIAL REDEVELOPMENT 231 Miller Street North Sydney 8 June 2015

1.0 PRELIMINARIES

1.1 I comment as an independent expert on natural ventilation and daylight provision of a light and ventilation well to be formed between the proposed development at 231 Miller Street, and at the neighbouring residential flat building.

2.0 CREDENTIALS

I have taught 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.

I have taught the wind and ventilation components of environmental control in the undergraduate and masters courses in architecture at UNSW, and am the author of internationally referenced, web accessed coursework materials on the subject. I supervised PhD level higher degree research specifically on natural ventilation of multi-storey apartments.

I have delivered the key papers in the general area of assessment of *ventilation and solar access performance and compliance* at the NEERG Seminars and other professional development settings. Senior Commissioner Moore cited my assistance in reframing of the Land and Environment Court Planning Principle related to solar access (formerly known as the Parsonage Principle) in *The Benevolent Society v Waverley Council [2010] NSWLEC 1082*.

I practised as a Registered Architect for 42 years and maintain a specialist consultancy primarily in passive environmental performance of buildings. I regularly assist the Land and Environment Court as an expert witness in related matters.



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3.0 DOCUMENTS

3.1 I base this preliminary opinion on:

- DA drawings issue B, provided by PA studio, dated 31.03.2015
- Email communications by the architects which included extracts of comments by Council planner.

3.2 I have visited the site.

4.0 DISCUSSION

4.1 Context and issue

4.1.1 History and description

I have been advised:

- PA Studio lodged a development application for a development at 231 Miller Street, North Sydney in December 2014.
- The adjoining property to the north of the proposal, is 237 Miller Street. This building appears to have been constructed in 2004 and is 16 stories high.
- The southern wall of this building is mostly built along the boundary; in the middle of the building there is a recess, which becomes a light well for the lowest 7 storeys, where it adjoins the building at 231 Miller Street.
- Some bedrooms of the apartments facing Miller Street have windows into the recess or light well.
- On the eastern side of the recess the bathrooms do not have windows and are mechanically ventilated through to the roof.
- The existing building at 231 Miller Street is 7 storeys high and was in existence when the building at 237 Miller Street was approved by the Land and Environment Court.

The aerial photograph below clearly illustrates the relationship between the existing buildings.



The issue is that if the recess on the boundary of 237 Miller Street is enclosed for its full height by a new building of similar height, it will form a light and ventilation well of some 14 storeys depth. This is expected to diminish the amenity of the bedrooms facing onto such light and ventilation well.

4.1.2 Controls

In this summary opinion I do not comment on my understanding of any legal or regulatory basis, which might encourage or prohibit the proposed new building being built to a zero lot line on the common boundary.

I am advised that Council considers that there may have been an expectation that the recess in the boundary wall would be matched by a corresponding recess in any future building at 231 Miller Street. My understanding is that there is no record of such an assumption, nor would it be enforceable by any particular extant control.

4.2 Ventilation and natural light

I deal first with the likely ventilation and natural light performance of a prospective 14 story light well.

4.2.1 Natural ventilation

It is important to note that if the light well is formed as expected, if I understand it correctly it would be serving one apartment per floor. This is the most favourable condition for the ventilation performance of the light well, as it ***minimises other overlooking and acoustic impacts between tenancies***.

A number of my previous expert opinions on ventilation performance of light wells were based on **CFD simulation** by specialist wind engineering consultancies, primarily Vipac, SLR (formerly Heggies) and CPPWind. Those investigations of comparable sized light wells give me considerable confidence in predicting the ventilation performance of the proposed light well.

The following ventilation performance may be expected:

- Wind accelerating over the top of the contiguous buildings will lead to a marked reduction in pressure over the top of the lightwell, causing a significant pressure differential between the facades of 237, and the top of the lightwell.
- If any window is opened into the light well, it will form a path for significant cross ventilation through the apartment between the façade and the light well.
- Because those pressure differentials are likely to be comparable for all apartments, there is little or no likelihood of short-circuiting the air path, leading to cross contamination between apartments.
- Only if all windows are closed, is suction under light well likely to cavitate. However, turbulence would assure enough air exchange to avoid 'stale' air in the light well.

In brief, the lightwell would be adequate for the purpose of continued cross ventilation of apartments to which it is connected.

4.2.1 Natural lighting

I have carried out a number of simulation based daylight studies of light wells. These have been generally for the purpose of demonstrating adequate natural light to bedrooms served only by the light wells.

Through that experience I have established that ***a light well of comparable dimensions to that which is proposed here, with very light coloured finishes, can expect to be the source of adequate light for typically only four to five storeys from the top of the light well.***

Beyond that depth, the light through a conventional window is not sufficient for carrying out most tasks in an adjacent room without artificial lighting. On the other hand, for all intents and purposes **the available daylight changes only imperceptibly** for the next several floor levels.

In summary therefore, the issue with the present proposal is not ventilation, but the provision of daylight to the bedrooms.

4.3 Options for enhanced daylight provision

4.3.1 Setback

I understand that Council has suggested that the provision of *".. a setback on the northern boundary from the lightwell and along the boundary from the lightwell to the rear boundary from level 10 up would resolve the concerns. The setback should be about 1500mm and would create a breezeway and another source of daylight to the lightwell"*.

Thus a slot would be provided connecting the existing recess to the rear of the site on the east. The slot would not be directly above the lightwell.

Any such setback on the top levels would result in minimal additional daylight provision to affected bedrooms on the lower levels of the building.

However, there would be significant restrictions on the use of the side wall of the currently proposed building, arising mainly from requirements for fire separation. It would be fair to suggest that ***the applicant for development of 231 Miller Street would be effectively providing the equivalent of an easement solely for natural lighting of the said bedrooms.***

4.3.2 Active or passive heliostats

Heliostats are devices for capturing direct sun, and redirecting it, typically down a light shaft in a building. A particularly elaborate heliostat has been implemented as part of the One Central Park project at Broadway.

In principle, it would be possible to significantly enhance daylighting through the lightwell by providing reflected sunlight from roof level. In practice regardless of where it is structurally supported, such a heliostat would have to be located above the lightwell in airspace belonging to 237 Miller Street.

Also in practice, the primary mirror of such a heliostat would have to be programmed to track the sun, involving constant mechanical movement in response to a computer control program. While not altogether counter indicated, I am not aware of how responsibility for the continued operation of such a heliostat could be reliably assured.

4.3.3 Permanent supplementary solar powered artificial lighting

Technology of both photovoltaic collectors and LED light sources has evolved to the point where it would be practical to suggest the provision of suitably located LED spotlights powered by rooftop photovoltaic panels.

This arrangement would have the advantage of no moving parts and a likely initial maintenance free period of perhaps 20 years. The photovoltaic panels and LED lights could be mounted on 237 Miller Street, supplied at the expense of the applicant for the development of 231. This would avoid complicated cross easements and other legal undertakings between the bodies corporate.

Such a system would be used to supplement the natural daylight available on the lower levels of the lightwell. Technically, the ***supplementary artificial lighting could be chosen for colour temperature, and controlled to achieve a credible semblance of the variability of additional natural light.*** Painting the walls of the lightwell and the walls of the new building with a highly reflective white paint would further improve light reflectance.

If this proposal is deemed appropriate by Council and acceptable to the adjoining owners, a technical specification could be included as a condition of consent.

In my personal opinion, this option is nevertheless an excessive response to the loss of an amenity originally borrowed across a side boundary of the subject site.

5.0 SUMMARY

I can say with considerable assurance that even if a lightwell of some 14 stories high is formed by the applicant building to the common boundary, ***such a lightwell would perform satisfactorily as part of cross ventilation arrangements*** for the relevant neighbouring dwellings.

If, as perhaps expected in the original approval, the lightwell were mirrored on the subject site, fire separation issues would probably diminish its utility, and that there would be potentially unacceptable privacy impacts between the properties. A setback connecting the lightwell to the eastern extent of the building would have minimal advantages for daylighting on the lower levels, but would otherwise suffer the same disadvantages as a 'mirrored' lightwell.

I consider any form of heliostat as an excessive response, difficult to realise without complicated legal provisions between the bodies corporate, and unlikely to operate successfully in the long-term, because of reliance on sophisticated moving parts.

A permanent supplementary artificial lighting solution could technically provide a simulacrum of natural light availability. Such a provision could be powered by photovoltaics specified as 'net zero energy'. Appropriate sensor controls could assure that the brightness of the illumination provided would be proportional to the concurrent brightness of the daylight.

However, I still consider it a somewhat excessive proposal, which however may be attractive to residents of the adjoining building.