RWDI Australia Pty Ltd
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MEMORANDUM

DATE:	February 12, 2021	**RWDI REFERENCE #:** 1904405
TO:	Anthony Witherdin	Director, Key Sites Assessments - DPIE
FROM:	Kevin Peddie	**Email:** kevin.peddie@rwdi.com
	Michael Pieterse	michael.pieterse@rwdi.com
RE:	**ADG Natural Cross Ventilation– City of Sydney Review Response** **Waterloo Metro Quarter – Building 4**	

Dear Anthony,

It is understood that after submission of the planning documents for the Waterloo Metro Quarter Development, commentary has been provided on the submission. The comments received are noted below, with commentary in response discussed in this report. This document is as an addendum to the submitted Appendix RR – Natural Cross Ventilation for the southern precinct.

City of Sydney Comments

Item 28 of the City of Sydney comments under the heading Amenity – social housing pertains to the Natural Cross Ventilation requirement of the Apartment Design Guide and noted the following:

Item 28 - Natural cross ventilation –The application erroneously claims that 60% of apartments are designed to achieve natural cross ventilation, however only 34% of apartments meet the definition of naturally cross ventilated. For example:

- *Plenums must not be used to claim natural cross ventilation as they do not provide equal sized outlets for pressure-based airflows.*
- *Corner apartments that do not have opposite openings of equal size and do not provide a logical flow path of air should not be counted.*
- *Natural ventilation paths should not cross common circulation spaces.*

Furthermore, 21 apartments are identified as being noise affected and are designed with acoustic ventilators to achieve natural ventilation and acoustic privacy to achieve Objectives 3B-2, 4J-1 and 4J-2 of the ADG. As a result, only 10% of apartments achieve natural cross ventilation.

RWDI Clarifications

The apartments considered to be naturally cross ventilated in accordance with the Apartment Design Guide for the Building 4 design. The tower design includes a setback to the south-eastern corner apartment on the eastern aspect to create a stepped form and enable exposure to the prevailing winds in accordance with the ADG requirements for Natural Cross Ventilation.

Figure 4B.8 of the ADG (noted in Image 1 below) indicates *one approach* for how natural cross ventilation can be achieved. The design guidance for this simply notes that "The building should include dual aspect apartments……". Dual aspect apartments are noted in the Glossary of the ADG as cross ventilating the apartment which have at least two major external walls facing different directions. These examples and definitions align with the current design of Building 4 which comprises of a stepped form in plan at the south-eastern corner, enabling unimpeded dual aspect openings to the apartment.

As noted in the Response to Submission document prepared by the project architect, Building 4 was required to balance a number of aspects including the apartment mix brief from the LAHC, maximising the solar access to the residential apartments and minimising apartments with no access to sunlight. The floor plan layout was also limited by its location atop the metro station services box, the need to naturally ventilate the corridor space while also considering apartment entrance door operability issues due to pressure differential between the corridor and apartment window openings.

Image 1: Potential Natural Cross Ventilation Flow Paths
One Approach noted in the ADG (Left), Proposed Floor Plan (Right)

It is worthwhile noting that Building 4 is located atop the metro station box, placing the apartment levels at a more elevated and exposed location from a wind perspective. As such, while all 9 Levels of Building 4 have been considered as part of the assessment, from a wind exposure perspective, which Objective 4B-3 of the ADG considers, Level 1 would have similar wind exposure, from an elevation sense, to a typical Level 7 building.

Given the constraints of the site, the inclusion of plenums and open corridors were considered as part of the design to further enhance the natural cross ventilation performance of the building. This approach is in line with the design guidance of Objective 4B-2 which notes that single aspect apartment windows can be augmented with plenums and light wells, although generally not suitable for natural cross ventilation, can be considered in restricted cases. Building 4 is certainly considered a restricted case given the location atop the metro box impacting the lift location and attachment to Building 3, ability to naturally ventilate the common corridors, design requirements for apartment mix and solar access requirements of the ADG. The approach to augment with plenums and light wells has also been undertaken for other developments in the Sydney region, including throughout the Waterloo/Zetland precinct, Sydney CBD and Crows Nest, where the masterplan layout for the precinct as well as requirements for fire egress and lift requirements played a part. Full scale testing has previously been undertaken to verify the effectiveness of this system in completed buildings (Peddie and Rofail, 2011).

An effective open area of the plenum of 0.4m^2 has been noted, in line with previously studied projects and site measurements for suitable flow rates. This opening size will be verified through detailed modelling as the design progresses.

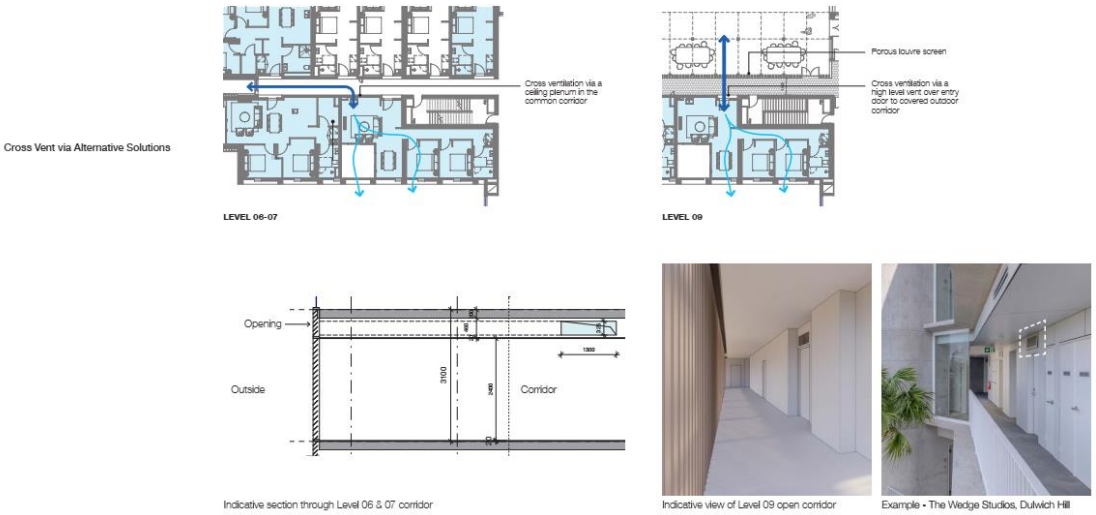

Image 2: Plenum Design Strategy, detailed in the Response to Submission report

Peddie, K.M., and Rofail, T., 2011, 'Designing for Natural Ventilation in Tall Residential Buildings' CTBUH 2011 Seoul Conference

Noting the concern from City of Sydney that only 10% of apartments achieve natural cross ventilation, a summary of the naturally cross ventilated apartments in the development is summarised in the following table for clarification.

Level	Naturally Cross Ventilated	Naturally Cross Ventilated (Augmented Approach)	Total Apartments Naturally Cross Ventilated
01	3 / 6	0 / 6	3 / 6
02	4 / 9	1 / 9	5 / 9
03	4 / 9	1 / 9	5 / 9
04	4 / 9	1 / 9	5 / 9
05	4 / 9	1 / 9	5 / 9
06	4 / 9	2 / 9	6 / 9
07	4 / 9	2 / 9	6 / 9
08	4 / 8	1 / 8	5 / 8
09	2 / 2	0 / 2	2 / 2
Total	**33 / 70 (47.1%)**	**9 / 70 (12.9%)**	**42 / 70 (60%)**

With regards to Natural Cross Ventilation in Noise Environment (Objective 4J-1), the design guidance notes that where developments are not able to achieve the design criteria, alternatives may be considered in the following areas, which includes natural cross ventilation. Further to this, Section 4J notes that SEPP65 developments located near rail corridors and busy roads, must have regards to the NSW Government's *Development near Rail Corridors and Busy Road – Interim Guideline.* Section 4.4 of this document notes that ventilation options for apartments located in these noisy environments can include: Natural ventilation, passive acoustic ventilation or mechanical ventilation can be considered in accordance with the BCA and AS1668.

Summary

As noted above, 47.1% of apartments are naturally cross ventilated in accordance with the ADG - whereas an additional 12.9% apartments are provided alternative methods of ventilation, as supported by the additional design guidance of the ADG for where strict adherence cannot be achieved, hence a total of 60% (42 out of 70) apartments will satisfy the requirements. Of these 42 apartments, 21 of the apartments considered to be naturally cross ventilated in the first nine levels are noted in the Noise and Vibration Impact Assessment report to be noise affected apartments. This does not preclude the apartment from being considered a naturally cross ventilated apartment under the ADG, however design provisions in the form of a ventilated façade design has been incorporated to enable natural ventilation to be enabled even during these noisy periods. It is also noted that an unobstructed window opening of at least 5% of the floor area served for all habitable rooms will be incorporated in the design, allowing suitable air flow through the apartment.