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25 Hume Street, Crows Nest - Natural ventilation

Dear Anna,

Further to our recent correspondence, please find herein a brief report detailing the expected potential for natural ventilation on the lower levels of the proposed development at 25 Hume Street, Crows Nest. The letter aims to address the concerns of the Department of Planning and Environment relative to the natural ventilation potential of the Levels 8 and 9 of the proposed development.

Introduction

The site is located on the border of Crows Nest and St Leonards fronting the Pacific Highway, Figure 1, and is surrounded by low-rise buildings in the majority of directions, with high-rise to the north-east. There is significant topography to the south-east with the ridge running along the Pacific Highway. Wind flow in such an environment is channelled by the massing of the larger buildings.



Figure 1: Site location (Google Earth, 2025)

Natural ventilation fundamentals

Natural ventilation occurs when there is a pressure differential between external openings. Residential buildings with a highly operable external façade are prone to serviceability internal wind-induced pressure issues, such as apartment doors being difficult to control, whistling under apartment doors, apartment exhausts not performing, lifts not working, and apartment creaking. From our experience, there are significantly more complaints from residents around too much, rather than too little ventilation. A difficulty with most residential buildings, is that there is no central control system and pressure related issues can be developed whenever the external opening distribution changes, i.e. someone opens a window or balcony door.

The pressure distribution around the building is based on the incident wind direction and speed. The wind rose showing the probability distribution of wind speed and direction at standard anemometer height of 10 m above ground level at Sydney Airport is presented in Figure 2, where the arms of the wind rose point in the direction from where the wind is coming from. Typically wind speed increases with height above ground level. It is evident that the wind is relatively strong for all directions, which has added implications for providing the opportunity for natural ventilation within high-rise residential buildings.

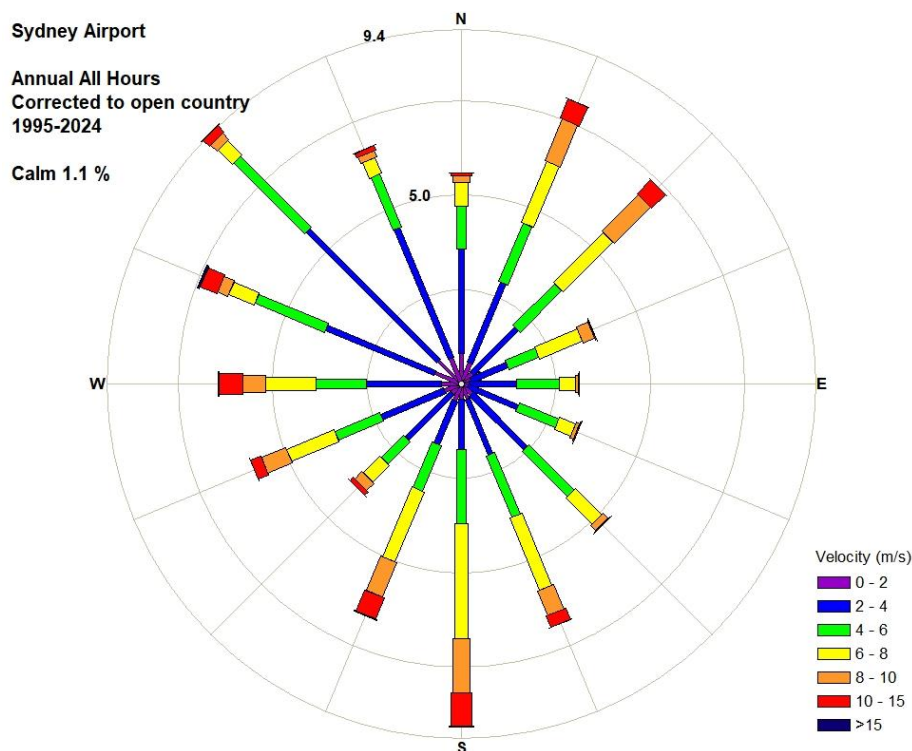


Figure 2: Wind rose for Sydney Airport

Design criteria and assessment

The NSW Apartment Design Guide (ADG) describes ‘natural ventilation’ as sufficient volumes of fresh air through an apartment to create a comfortable indoor environment and reduce the need for mechanical ventilation and air-conditioning. Natural cross-ventilation is further defined as ‘natural ventilation which allows air to flow between positive pressure on the windward side of the building to the negative pressure on the leeward side of the building providing a greater

degree of comfort and amenity for occupants. The connection between these windows must provide a clear, unobstructed air flow path. For an apartment to be considered cross ventilated, the majority of the primary living space and n-1 bedrooms (where n is the number of bedrooms) should be on a ventilation path'. Practically, the ventilation through any apartment requires management of the internal flow path (opening and closing specific external and internal openings) to maximise the quality and quantity of ventilation.

Design guidance in the ADG states an 'effective open area' of at least 5% of the floor area would satisfy the requirement, which is a robust conservative rule of thumb for air quality requirements. This does not clarify the intended performance, as actual airflow rates would vary based on apartment design and external atmospheric conditions. A volumetric flow rate is neither provided in AS 1668 Part 4: *Natural Ventilation of buildings* or other natural ventilation standards (ANSI/ASHRAE 62.2-2016, ASHRAE 55-2004 and EN/DIN 15251-2008). As such, complying with the intent of the ADG cannot be easily established.

Section 4B of the ADG does not describe the purpose of natural ventilation and has no metrics for acceptable ventilation, e.g. flowrates or probabilities of time. People will start to register air flow at about 0.25 m/s, paper will be blown at about 1 m/s, hence people would start to moderate the flowrate at 1.5-2 m/s. With other regulatory requirements, the fundamental need for ventilation is for air quality rather than cooling hence it is to ensure minimum flow requirements rather than heat exchange. Minimum flow rates for mechanical ventilation suspects are 10 L/s per person, or 0.3 L/s/m² of apartment floor area.

To achieve a flowrate of 0.3 L/s through two external openings each with an open area of 0.2 m², the wind-induced differential pressure between the external openings would have to be about 0.08 Pa (about 0.007 mm depth of water, or a wind speed of about 0.35 m/s just above perception levels). This differential pressure between openings is minimal and would typically be expected on openings on different faces, or along a façade with discontinuities. Larger openings or faster wind speeds would evidently produce a higher flow rate.

The external operable opening locations are presented in Figure 3. For a relatively large building compared with the surrounds, the incident wind direction will be redirected by the building massing to induce horizontal flow along the facades. Regardless of the incident wind direction, the articulated nature of the façade would be expected to induce a pressure difference along the length of an apartment. The wind induced pressure in the deep slots would be measurably different to the façade pressures on the Pacific Highway elevation. The wind-induced pressure difference would be expected to allow the resident to naturally ventilate the apartments to meet the air quality air flow rates.

Summary

With the minimal pressure difference required to induce sufficient air flow to meet minimum air quality ventilation requirements, the size and location of the external openings on the articulated façade of the Level 8 and 9 apartments would be expected to meet the design intent of the ADG.



Figure 3: Level 8 plan and elevations

I hope this is of assistance, please do not hesitate to contact me on the numbers below if you have any questions regarding any aspect of this report.

Yours sincerely,

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cc.