

Project: Crows Nest OSD Site B

Project No: 301351270

To: Anna Limnios

Date: 02/04/2025

From: Rebecca Dracup

RE: ESD Response to State Design Review Panel – 12th March – Review 5

This memo provides a review of comments presented in the State Design Review Panel (SDRP) design advice on the *ESD Report for Crows Nest OSD – Site B* (revision 6, issue date 25/09/2024) and the *Wintergarden Ventilation Assessment* (issue date 11/03/2025).

SDRP Item 2

2. Seek expert analysis to guide the design of the proposed wintergardens and natural ventilation strategy of the apartments.

a. Provide technical reports to support the proposed approach and to demonstrate how the wintergarden design will facilitate natural ventilation in the apartments and attenuate noise.

Response: Modelling of the airflow dynamics in the typical wintergarden design has been undertaken and presented in *Wintergarden Ventilation Assessment* which demonstrates that the wintergardens achieve high quality turnover of fresh air and wind protection.

SDRP Item 4

4. Clarify how the natural ventilation and acoustic strategies meet the requirements of BASIX, the NCC and the ADG through coordinated technical reports to support the proposal.

Response: The current natural ventilation strategies were incorporated in the most recent BASIX Certificate, presented in the *ESD Report for Crows Nest OSD – Site B* (revision 6). All units pass the minimum thermal comfort requirements (NatHERS heating and cooling loads) for BASIX, indeed the average NatHERS rating for the building is 7.9 Stars, which is above the Green Star Buildings v1 NatHERS target of 7 Stars for the Climate Positive Pathway. The NatHERS models include detailed thermal performance modelling of each apartment unit. Each unit is modelled with the windows, the locations and type of window, and the percentage that window is expected to be able to be safely kept open for natural ventilation. Additionally, wintergardens are included in the models to account for their influence on natural ventilation and shading, both of which are factors in the overall thermal performance of each unit. In summary, the natural ventilation strategies have been assessed and meets the requirements of BASIX.

SDRP Item 10

10. As the design develops, continue to demonstrate and develop the sustainability strategy that encompasses the operational aspects of the building and is embedded in the architecture.

Response: The building design is currently, and will continue, to display best-practice sustainability initiatives integrated in the design and operational elements of the building. These have been benchmarked against the North Sydney Council's Efficient Use of Resources Commitment Table; draw from the Green Star Buildings v1 Guideline; and go above and beyond regulatory frameworks including the Sustainable Buildings SEPP 2022, North Sydney Development Control Plan, and NCC 2022.

The selected sustainability initiatives have been chosen for the tangible improvements they will make to minimise the environmental footprint of the building, including:

- 100% electric design

- Naturally ventilated corridors and carparking areas - representing a saving of a **fifth** of total estimated building energy consumption.
- Electric heat pump hot water system
- Lifts with regenerative braking
- Energy efficient LED lighting including motion sensor controls and zoned switching
- Induction stovetops
- Solar PV array

All the above, and more, has been detailed in the *ESD Report for Crows Nest OSD – Site B* and summarised in the report's *Section 4 Project Design Response*. This project responds to the call for higher sustainability performance of buildings by critically considering, and selecting, initiatives which will deliver meaningful outcomes.

SDRP Item 11

11. Refer to items 2 to 4 of this advice letter and respond to the advice provided in the attached document regarding the proposed ventilation strategy.

Response: Refer to responses provided above.

Review of additional information 13 March 2025

- The assessment tests only one steady-state condition, which is inadequate for evaluating the performance of wind-driven natural ventilation. Any wind-sensitive ventilation analysis should ideally consider 16 wind attack angles. Anything under eight wind directions will not adequately describe the range of wind pressures on a facade.

A unit dweller can expect to experience the reported level of ventilation on a daily basis and therefore this is a practical assessment for the purposes of responding to the query on ventilation effectiveness in the wintergardens. A single steady state example under regular conditions is sufficient to communicate the typical level of ventilation for the wintergardens. The question posed to the project was whether “the team [had] undertaken testing of the effectiveness of the proposed high-level natural ventilation system in the wintergardens”.

IESVE’s MicroFlo and MacroFlo has been utilized for the study. MicroFlo is the Computational Fluid Dynamics (CFD) module used for detailed airflow analysis within and around buildings. However, when assessing wind pressures on facades and windows, IESVE utilizes MacroFlo, the module dedicated to simulating natural ventilation driven by wind and buoyancy forces. MacroFlo calculates wind pressures on building exteriors by employing wind pressure coefficients derived from wind tunnel experiments on simple building models. These coefficients are provided for various exposure types, which characterise the geometrical aspects of the surface (such as roof pitch) and the degree of sheltering by nearby obstructions. The coefficients are specified for 16 azimuthal angles of attack, reduced to 9 by symmetry, representing different wind directions relative to the building facade. This approach allows MacroFlo to estimate wind pressures on windows and other openings based on the building’s orientation, typical wind direction and custom window types.

- The single condition chosen for the assessment represents a near best-case scenario for positive wind pressure on the facade. Wind pressures will be lower for almost every other wind direction, and for most directions, they will be negative rather than positive.

An average 9am wind scenario was taken for the assessment and 10.6km/hr wind speeds are conservative and typical as per the wind roses on p.3 of the *Wintergarden Ventilation Assessment*. We could have selected an east-facing apartment, which experiences stronger wind speeds (average of 16.6 km/hr) and higher positive pressures at 3pm, but elected not to, on the basis that this option could have been interpreted as picking a near best-case scenario. The selection of a mid-range scenario is intended to be a balanced example that would not artificially favour wind speed comfort levels or ventilation rates within the wintergarden. Therefore, we do not agree that the selected scenario can be criticised as being near best-case.

- The assertion that the results apply to a typical day is incorrect. The change in wind direction between 9 a.m. and 3 p.m., mentioned in Part 2 of the memo, shows that the selected westerly wind attack angle cannot adequately represent any given day.

The statistics from the Bureau of Meteorology are presented in Part 2 Methodology and show that at 9am, the wind speeds and direction from the west is regular and can be considered a daily occurrence. The memo does not indicate that an apartment would experience a constant westerly wind at the speed of 10.6km/hr the entire day, indeed the memo is very transparent in outlining the assumptions and limits to the assessment, including the change of direction of the wind during the day.

- Natural ventilation for comfort must be assessed probabilistically. The report does not provide a method for translating the single tested condition into performance over the year, which is essential to confirm adequacy of natural ventilation.

The memo responds to the question of the effectiveness of the proposed high-level natural ventilation. The review undertaken fundamentally responds to this question, confirming that the level of natural ventilation in the space is of high quality on a daily basis.

- The analysis of wind speed is insufficient. The report fails to adjust the Bureau of Meteorology’s recorded wind speeds for the site environment. Considering terrain and local sheltering is arguably more critical for wind-driven natural ventilation than for pedestrian comfort studies (although the project wind report appropriately considers both). Neglecting these factors will significantly overstate ventilation capacity.

As above, the memo has responded to the query from the panel on the effectiveness of the proposed high-level natural ventilation. No query has been received to-date with concerns of occupant comfort within the wintergardens. We also note that further studies on comfort within the wintergardens would be overengineering the design as they are spaces which may be operated by the occupants according to their personal comfort preferences.

- The IES Computational Fluid Dynamics (CFD) code applied is inappropriate for wind-driven natural ventilation analysis because it does not allow for the coupling of outdoor and indoor environments within simulations. Additionally, the IES descriptions of openings are limited to a simple palette of mechanical ventilation devices or a fixed pressure boundary.

The IES MicroFlo-CFD application allows boundary conditions to be set, including external air flows. IES includes a detailed window module, which is not a fixed pressure boundary, but an openable window, allowing external air flow velocities to be incorporated into the CFD analysis. The reviewer may wish to provide evidence for the above claims.

- Any application of CFD for natural ventilation requires expert consideration of input parameters to portray the aerodynamic performance of openings and pressure boundaries accurately. This is even more critical when the CFD code is inherently limited, as in this case. However, there is no evidence of any consideration in the memo.

The IES MicroFlo-CFD application is designed for use-cases such as this one. The reviewer may wish to provide evidence for the above claims.

- The report omits crucial details about the model and inputs, which are essential to validate the modelling. Fundamentals such as the air relief path, pressure assumptions, the aerodynamic open area of the inlet, and inlet pressure are not disclosed, yet they are critical determinants of the results.

Additional information on the modelling inputs can be provided on request.

- The report describes the NCC open area requirements for the wintergarden windows assuming that a single bedroom is connected to the wintergarden. However, it fails to consider the amenity in the bedroom itself, which is critical for determining adequacy of any natural ventilation proposal.

To develop an assessment against the question posed by the SDRP, the project team had to identify standards to compare the design's performance against. One standard relating to natural ventilation is the NCC's F6D7 Natural ventilation section. Providing commentary of the project's natural ventilation strategy against this standard is therefore a measure of determining the adequacy of the natural ventilation proposal. Those who developed F6D7 Natural ventilation will have determined why the design requirements in that section provide adequate natural ventilation. It seems excessive to ask this project to reengineer a standard which has been developed for national adoption by all Australian buildings.

- The NCC measure of a window's openable area should not be used to inform natural ventilation calculations, as it has no correlation to the aerodynamic effective open area. The ADG measure of effective open area should always be utilised in New South Wales to ensure performance.

The section on Natural Ventilation was to provide confirmation that the natural ventilation strategy complies with the NCC's F6D7. Commentary could also be provided in relation to the ADG measures of natural ventilation if the SDRP panel requires this too.

- The report lacks essential details regarding the calculations, including the turbulence model used and whether convergence has been achieved. The results display artefacts that indicate the solution may not have converged.

Convergence has been achieved and the turbulence model used was k- ϵ , this is no different to any other standard CFD model for building natural ventilation.

- Additionally, the report only presents results with a single 2D slice through the space, which cannot demonstrate performance for the volume tested.

2D slices are a commonly used method to visualise CFD dynamics and are adequate for communicating how natural ventilation operates within the space, given the wintergarden design is effectively same for any 2D cross section selected. The high-level openable window is in the same location and is the same shape across the full length of the wintergarden.

The only exceptions to this are the frames. Providing a more comprehensive picture, including 2D slices influenced by the windows frames and the boundary walls is considered unnecessary and would not provide meaningful information to change the final assessments against the local air change effectiveness and local mean air age indicators.

More comprehensive testing of the natural ventilation capacity using CFD or other techniques will only reaffirm the design's inherent limitations previously identified.

We fundamentally disagree with this assertion that the design has inherent limitations.