



Sydney2030/Green/Global/Connected

CITY OF SYDNEY  

# DRAFT Alternative natural ventilation of apartments in noisy environments

## Performance pathway guideline

*city of villages*









**In noisy or hostile environments the Apartment Design Guide states that the impacts of external noise and pollution are minimised through the careful siting and layout of buildings. In a limited number of situations this may not be possible.**

**In these limited situations the performance pathway described in this guideline should be used to confirm the adequacy of natural ventilation proposals in apartment buildings that do not meet the prescriptive requirements of the Apartment Design Guide (ADG) Objective 4B-1, which requires an ‘effective openable area’\* consistent with 5% of the floor area served be provided to each habitable room.**

**The aim of this performance pathway is to provide greater clarity to applicants on the minimum levels of natural ventilation that are acceptable in residential developments.**

\* ‘effective openable area’ is defined in the ADG

## **01 Performance pathway purpose and application**

The performance pathway is expected to be applied only where there is genuine physical or environmental constraint on the design of an apartment’s natural ventilation. An example would be where acoustic requirements dictate attenuation of traffic noise, which requires air inlets, other than windows and doors, to provide natural ventilation whilst controlling noise.

## **02 How the performance pathway works**

The performance pathway allows constrained natural ventilation openings to be sized to provide a minimum level of ventilation (the ‘minimum performance requirements’) resulting in acceptable amenity to the occupants. This will allow applications to deliver smaller opening sizes than required by the prescriptive design guidance of the ADG.

The performance pathway also requires that additional ventilation openings are provided (‘purge ventilation requirements’) for the users to increase ventilation beyond the minimum when pollutant loads in the apartment may be elevated. Examples include, redecorating of the apartment or following extended periods of non-occupation. The provisions made for purge ventilation do not need to meet acoustic requirements as they are not relied upon in normal circumstances.

The performance requirements relate to the climatic environment in the eastern part of metropolitan Sydney. They should not be used in other areas with different climatic conditions.

### 03 Minimum performance requirements

The natural ventilation system for each apartment must provide an average hourly volume flow rate equivalent to the greater of the following criteria:

1. 10 litres/second/person (where the number of persons is equal to the number of bedrooms in the apartment + 1),

or

2. 0.3 litres/second/m<sup>2</sup> of floor area of the apartment

for:

- a. 85% of all hours in the year for cross-through and cross-over apartments,

or

- b. 90% of all hours in the year for all other apartments.

For the purposes of the above, the definitions of cross-through and cross-over apartments are consistent with the ADG definitions and are limited to those where the total area proposed for natural ventilation is evenly distributed across at least two opposite facades with differences in orientation of  $180^\circ \pm 35^\circ$ .

Each habitable room must be provided with effective natural ventilation and its distribution between different rooms must be proportional to reasonable expectations of use and occupation. For cross ventilated apartments the arrangement must promote air movement. In other situations the litres/second/m<sup>2</sup> flow rate criteria above should be used as a guide for the requirement for each room.

Refer to Table 1 for examples of applying minimum performance requirements.

**Table 1:** Example of application of minimum performance requirements

Number of bedrooms	'Threshold Apartment Area' (m <sup>2</sup> ) *	Criteria 1 (use when apartment area is less than threshold area)		Criteria 2 (use when apartment area is more than or equal to the threshold area)
		Num. occupants	Performance requirement Air Flow (l/s)	Performance requirement Air Flow (l/s)
1	67	2	20	Apartment area x 0.3
2	100	3	30	Apartment area x 0.3
3	133	4	40	Apartment area x 0.3

\* the 'Threshold Apartment Area' is advisory only

### 04 Additional purge ventilation requirements

Additional purge ventilation is to be provided to each habitable room by determining the difference between the size of the natural alternative ventilation system proposed and the area of unobstructed open window corresponding to 5% of the floor area – as per Apartment Design Guide (ADG) Objective 4B-1.

### 05 Relationship between the performance requirements for natural ventilation and the natural cross ventilation requirements of ADG Objective 4B-3

The performance pathway addresses Objective 4B-1 natural ventilation, it does not offer an alternative means of compliance with Objective 4B-3 natural cross ventilation.

## 06 Performance pathway assessment requirements

Hourly natural ventilation modelling over a full year is to be performed and reported upon to demonstrate that the 'minimum performance requirements' have been met. Modelling of the natural ventilation performance of the apartments is required over a full year of hourly weather data representative of Sydney conditions. Probabilistic analysis of weather or wind alone is not sufficient.

Natural ventilation modelling must be performed on the following basis:

1. Each unique apartment design must be discretely tested and each habitable room must be demonstrated to meet the minimum performance requirements;
2. Apartments with a similar plan but difference in height of more than six storeys must be considered unique. Where multiple floors are represented by a similar plan, the lowest floor apartment must be modelled;
3. Arrangement and features of apartments modelled must be consistent with the architectural drawings;
4. Natural ventilation openings that comprise the alternative proposal must be assumed open at all times and all other openings must be assumed closed.
5. The calculations must adequately factor in loss in 'effective openable areas' caused by the characteristics of ventilation devices, plenums, control dampers, insect screens and similar as defined in the ADG;
6. Performance must be calculated by predicting average hourly airflow rates each hour of the year, i.e. 24 hours x 365 days;
7. Multi-zone air flow modelling using dynamic thermal simulation software must be used to verify the performance of the alternative proposal;
8. Hourly weather data for a full calendar year in Sydney must be used as described in the Test Reference Year for Mascot 1987 (94767 Mascot (Syd AMO) 1978-87 1987 available from [www.ozemail.com.au/~acadsbsg](http://www.ozemail.com.au/~acadsbsg));
9. Wind must have city terrain type for velocity profile modification;
10. For the purpose of façade pressure coefficient correction, all neighbouring buildings must be assumed to be the greater of;
  - the same height and equivalent massing as the subject building, or
  - the full height and massing allowed by the planning controls;
11. Specific façade pressure coefficients may be determined using wind tunnel or computational fluid dynamic (CFD) testing which more accurately accounts for the surrounding features (buildings, streets, topography). If wind tunnel or CFD testing is applied, all assumptions must be published and full allowance must be considered for all reasonably anticipated development that will impact the wind pressures on the proposed building. This is taken to be the full extent of future development permitted under the current or exhibited planning controls (whichever is larger);
12. Where natural ventilation systems proposed incorporate a device to enhance performance that is not able to be supported with manufacturer performance data relevant to a natural ventilation context, or is highly contextualised by neighbouring environments, such as the reliance upon venturi capped exhaust stacks, additional point of time testing is required using either CFD or wind tunnel testing.

## 07 Minimum level of reporting

Reports submitted using the performance pathway to support an application must show the percentage of annual hours that are predicted to meet or exceed the 'minimum performance requirements'. The report must also show the annual distribution of predicted average hourly ventilation rates to demonstrate that the full year has been tested.

Reports must be authored by a suitably qualified or experienced person and correspond clearly to the plans submitted. Reports must include a full list of assumptions that affect the prediction of performance including, but not limited to:

- Simulation tool(s) used;
- Weather file used;
- All inputs and assumptions used in the simulation(s) that are relevant to predicted results;
- Manufacturers' published performance criteria relied upon for any equipment selection;
- Consistent naming of openings, plenums, chimney/stacks and other system constituents between drawings and reports.

This document is in draft form. Please send any comments to [jMcNicol@cityofsydney.nsw.gov.au](mailto:jMcNicol@cityofsydney.nsw.gov.au)

