



CPD Tutorial Summary Ventilation

Learning Objectives:

1. Identify 4 of the scientifically proven benefits of ventilation
2. Describe the impact of window types and sizes on ventilation openings
3. Describe the results of a study on the relative energy efficiency implication of air infiltration and ventilation
4. Be aware of WERS ratings for screened products

The scientifically proven benefits of ventilation include:

1. Reduced energy use
 - A study of 25 offices at Sydney University in 1998 identified annual energy savings on heating and cooling of 79% when ventilation was made available.
 - The Breezway head office in Brisbane is designed to use a mixed-mode cooling strategy and runs fully passively for around 20% of the occupied hours during summer and winter and around 40% of the occupied hours during spring and autumn.
2. Improved health
 - Attendance rates are often used as a proxy for health.
 - An American study of 434 classrooms across 22 schools showed that indoor carbon dioxide levels greater than outdoor level (indicating poor ventilation) were associated with increased student absences.
 - Using previous studies, primarily in office buildings, Sepannen and Fisk developed a model in 2005 that showed that increasing ventilation rates from 0.45 air exchanges per hour to 1.9 air exchanges per hour reduced the average sick leave days per year by 22%.
 - The frequency or severity of symptoms is another way to measure health.
 - In a study in Singapore, researchers found that students attending naturally ventilated child care centers had lower levels of asthma symptoms and allergies than those in air conditioned centers.
3. Improved learning
 - A study in 2006 showed that children in classrooms with higher outdoor air ventilation rates tend to achieve higher scores in standardized tests in maths and reading than children in poorly ventilated classrooms.
4. Improved productivity
 - Controlled studies in 1999 and 2000 showed that as ventilation rates increase, children perform school work with greater speed and the performance of adults was also shown to improve.

References and additional studies are available here:

https://www.breezway.com.au/downloads/australia/TB_ventilation_benefits.pdf?20200810



The size of ventilation openings is affected by the window type.

A Breezway study looked at ventilation openings of various window types:

- At both NFRC standard sizes and more commonly seen sizes (2100h x 2400w)
- At opening configurations and frame and sash sizing from manufacturer's websites

Window Type	NFRC 100 Model Size Ventilation area as % of total window area	Common Window Size Ventilation area as % of total window area
Fixed window	0%	0%
Awning window	10%	1%
Double hung window	40%	20%
Sliding window	40%	25%
Casement window	80%	35%
Louvre window	75%	80%

Full report is available here:

https://www.breezway.com.au/downloads/australia/TB_Ventilation_Openings.pdf

Air infiltration vs ventilation

The air infiltration rates of Altair Louvre window are well within the AS2047 limits, but are slightly higher than the air infiltration rates of some of the window types with smaller ventilation openings.

Breezway commissioned an independent study to examine whether reductions in air conditioning efficiency due to higher air infiltration rates would be offset by the reduced usage of air conditioning due to the natural cooling available through natural ventilation.

The results showed:

- An increase in electricity used for heating.
- A decrease in electricity used for cooling.
- An overall reduction of 23% in electricity used for heating and cooling over a year.

A Technical Bulletin describing this study is available here:

https://www.breezway.com.au/downloads/australia/TB_Air_infiltration_ventilation_aircon_load.pdf

External, woven metal mesh screens can improve the energy efficiency of windows and are available as official WERS ratings. Altair Louvre Windows with screens have WERS ratings with U-values as low as 3.6 W/m².K, which is better than many double glazed windows in the WERS database.

Screens also give a shading benefit which is delivered both when the window is open and when it is closed.

Screens will reduce the ventilation opening of a window, using the same methodology as the Breezway ventilation area study, screens have ventilation openings at 40% - 45% of the total screened area.