

# A breath of fresh air

Just what do Kiwis do to keep their homes free from stuffy air? BRANZ is using science to find the answers and aid in the design of better ventilation systems.

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**ABOUT 2 YEARS AGO**, we acknowledged our lack of understanding of what occupants do when ventilating their homes and why they are doing this.

## **Understanding home occupant behaviour**

We wanted to know whether occupants are:

- regularly opening their windows
- closing internal doors, or whether homes are truly open plan
- using bathroom exhaust fans or rangehoods.

These questions and others have a large impact on the ventilation that occurs in homes and therefore of its moisture load and general indoor air quality. Ventilation behaviour of occupants also has an impact on the effectiveness of installed ventilation systems.

As a lack of ventilation affects health, we need to understand how occupants affect ventilation and the motivation for their actions.

## **Balancing cleaner air and energy loss**

Why should we worry about the amount of ventilation? As with many aspects of life, there is a trade-off. In this case, it is between cleaner air and energy loss. The recommended ventilation rate is about 0.4 air exchanges per hour to maintain a healthy indoor air quality.

For a 100 m<sup>2</sup> home, this means exchanging air with the outdoors at a rate of about 100 m<sup>3</sup>/hr. If we go much below this, we experience higher concentrations of pollutants, odours and moisture, resulting in potential adverse health effects and mould growth. If, on the other hand, we overventilate, excess amounts of heating energy will leave the house, resulting in higher than necessary power bills.

Highly effective ventilation systems can be designed, but the effectiveness of any technical solution largely depends on the actions of the occupant, and these are rarely considered.

## **New project measuring homes**

In March 2015, BRANZ started a new project looking at ventilation-related occupant behaviour.

Survey questionnaires and sensors will be used to study up to 100 homes. Data will be collected on how often windows are opened, whether internal doors are closed or open and the temperature and relative humidity in up to four locations in each house.

Homes from across New Zealand will be studied to capture any climatically driven differences in behaviour. Each sensor will contain a single temperature, relative humidity and motion sensor.

Room temperatures, relative humidities and ventilation behaviour in the winter is of primary interest, but some homes will also be looked at over the summer. Homes will be monitored for up to 6 months. During this time, occupants will have access to the real-time temperature and relative humidity data.

### ***Lead to better ventilation design***

The data collected from windows and internal doors will be used to derive a statistical model that will enable determination of the likelihood that a certain event occurs given indoor and outdoor climate data.

Being able to predict the circumstances under which a certain behaviour occurs will aid in the design of better ventilation systems. 'Better' in this instance means achieving better indoor air quality using less energy.

### ***Part of a wider global project***

To get a critical mass of researchers to help analyse the data and develop the models, BRANZ has joined an international group of researchers working on a larger project of occupant behaviour. This is under the umbrella of the International Energy Agency.

Our study will provide the temperature and humidity profile of residential homes across New Zealand. This will give us an insight into what indoor climate New Zealanders are experiencing and identify potential shortcomings in the quality of the indoor environment.

The motion data will allow the ventilation industry to better target ventilation effectiveness and develop better control methods for ventilation and heating. ◀