

Whole house mechanical ventilation systems

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Whole house ventilation systems are increasingly being promoted as the solution to house performance problems such as dampness and cold. However, they're also a very expensive item to install and you will want to be certain they will make a difference.

There are two types of system: Positive pressure or roof cavity systems; and Balanced pressure or heat recovery systems

Positive pressure or roof cavity ventilation systems

These are the most common type available in New Zealand. They bring filtered air from the roof space into the house through a single, or multiple, ceiling vents. This forces the stale air to leak out through gaps, windows and doors. The performance of these systems depends on the sizing of the fans, the distribution of the ceiling vents throughout the house and how airtight your home is.

In an airtight house, pushing the filtered air into the house creates a positive pressure inside the house which causes inside air to move out. However, most existing New Zealand homes are draughty rather than airtight, and in these homes there are too many gaps and leakage points - the ventilation system will not be able to force the air into each room of the house.

The ventilation system will also not work properly if the roof space is not properly sealed from the inside of the house (for example, if you have downlights). The stale indoor air will leak back into the roof and be pumped back into the house again.

Ventilation systems should bring fresh air into the house, but your roof space may be polluted by dust, mould and vermin. Most systems are fitted with filters - the quality of the air entering the house depends on the filter type and whether you regularly change or clean filters. The Energy Efficiency and Conservation Authority (EECA) recommends that the home ventilation systems source their 'fresh' air from the outside, not from the roof space.

Research done by Beacon Pathway which monitored homes with ventilation systems showed that that during the day in winter there is more moisture in the roof space than in the house. Operating a ventilation system during the day actually brings more moisture into the house, making it more expensive to heat your home. At night the air in the roof space is drier but much colder. Operating a ventilation system at night replaces warm air with cold.

University of Otago research also shows that the heat available from moving roof space air into your home doesn't provide enough heat to properly heat a home in winter. In fact, pumping air from the roof space into living areas would often make internal temperatures hotter or colder than desired. Although the roof space can be hot, it tends to be hot in summer when your house doesn't need heating – in winter, it is cold.

Both the research report, the Energy Efficiency and Conservation Authority, and Consumer NZ, recommend that you don't install this type of system for heating your home.

Some ventilation systems have an optional electrical heating unit to provide some pre-heating of air coming from the roof cavity when it is cold. These are known as electric in-line duct heaters. Most electric in-line duct heaters don't have sufficient capacity to meet a home's heating needs and they are a relatively expensive and inefficient way to heat a home. You will have more effective and efficient heating from other heaters (for example, heat pumps, woodburners or wood pellet burners).

Balanced pressure or heat recovery ventilation systems

These systems pre-warm the incoming air from the heat or energy in the outgoing air. These systems have two fans: an intake fan which supplies fresh outdoor air into the house through several ceiling vents; and an exhaust fan which takes stale air from inside the house and discharges it to the outside. An air-to-air heat exchanger (usually in the roof space) transfers heat from the inside air to the incoming fresh air from outside. In this way, most of the heat is recovered.

Note: if the system does not include a heat exchanger, it is not a true heat recovery system.

These systems are most effective in very airtight, new, well-heated homes in very cold parts of the country. Most existing homes are not airtight enough, even if they have full wall insulation and window replacement.

To ventilate effectively, these systems need gaps or vents in internal doors so that air can flow through all areas of the house between the intake and exhaust.

In winter, the heat exchanger transfers a portion of the heat in the warm exhaust air to the colder outdoor air, thus reducing the heat loss associated with the ventilation. To be effective, the house should be airtight so that almost all ventilation air passes through the heat exchanger, rather than being leaked out through draughts.

Heat recovery systems provide good fresh air ventilation but they are not a heating system. However, they can recover between 67–95% of the heat from the inside air which means that the fresh air coming in will be warmer. This means you will need less heating to warm your home.

Before you buy...

Consumer NZ recommends ventilation systems for controlling condensation and moisture. In the homes Beacon has looked at, condensation problems were caused by:

- Lack of insulation
- Not enough heating
- Uncontrolled moisture sources (leaks, ground water, unvented wet areas)

If you are thinking of installing a ventilation system:

1. Address your insulation, heating and moisture removal first.

The actions recommended above (getting rid of moisture sources by extractor fans, vapour barriers under the house, drying clothes outside and making sure dryers are vented to the outside, getting rid of unflued gas heaters, insulating, and regularly airing your house) are cost effective and proven methods for reducing moisture in all houses. These actions should be undertaken before considering a whole house mechanical ventilation system.

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For more information:

- See Fact sheets on
 - Healthy indoor air
 - Introduction to heating your home
 - Keeping heat in: Overview
 - Improving your cold damp house
- Read more about Beacon's research into ventilation systems at http://www.beaconpathway.co.nz/further-research/article/testing_ventilation_systems
- EECA has recently produced a research report on roof space ventilation systems, which you can read at <http://www.eeca.govt.nz/sites/all/files/home-ventilation-systems-09.pdf>
- Read the Consumer NZ report on ventilation systems at <http://www.consumer.org.nz/reports/ventilation-systems>