



## Measuring Building Performance - Testing For Airtightness

With the introduction of energy efficiency standards for new housing the construction industry is now having to build tighter buildings that limit airflow into and out of a building. The tighter the construction the more efficient a building is at limiting energy flow associated with uncontrolled air leakage.

Draughtproofing of a building is one of the three key elements to maximize a building's energy efficiency along with insulation of the building and windows (position, size and protection).

**20% of a building's heating and cooling can be lost by uncontrolled air leakage of the building envelope.**

New, highly energy efficient residential buildings should have a natural air leakage rate\* of no greater than 0.5 air changes per hour natural (achnat). Internationally, the accepted range for energy efficient housing is between 0.3 and 0.5 achnat.

### Improving Energy Efficiency of Existing Buildings

The majority of existing houses have been built using techniques and materials that cannot ensure such a tight construction and as a result air leakage is a major problem. Existing older buildings can have air leakage rates of up to 3.0 achnat. The average housing stock in Victoria has an average leakage rate of 1.49 air changes per hour natural (achnat) (pub. Energy Victoria 1992).

To begin to retrofit an existing building to try and reduce energy consumption requires a detailed and accurate understanding of the rate and nature of air leakage of the building. There are now available specialist tools that can measure air leakage of a building and assist in energy conservation. One such tool is the "Blower Door".



**Blower door in test environment.**

### The Blower Door

The blower door is a specially built, calibrated device that is used to identify the overall leakage area of the building and a HVAC (heating, ventilation and air conditioning) duct system if installed.

Blower door technology is used in many countries, where energy efficiency is mandated, to measure the airtightness of building envelopes, diagnose and demonstrate air leakage problems, estimate natural infiltration rates, estimate energy efficiency losses from building air leakage, and certify construction integrity.

A Blower Door consists of a large fan which is mounted in a frame. The frame is placed in an exterior door and used to either depressurize or pressurize the house. Using the pressure readings, a calculation of the natural leakage of the house air changes per hour natural (achnat) is done.

\* All buildings need a required amount of ventilation to remove indoor pollutants, prevent excess moisture buildup, provide adequate air for occupants to breathe and ensure gas-fired appliances burn correctly. Houses that are very tight will require mechanical ventilation with heat or energy recovery to maintain a healthy energy efficient environment for the occupants.

## Discover your house

Home owners are always amazed at what they learn about their homes during a blower door test. Air leakage sites are identified, the total air change rate of the house is determined, and moisture, humidity, mould and mildew problems can often be traced to their source.



### Tightening a house

The results of a blower door test will indicate where air leakages occur. Given this information appropriate and targeted tightening of a house can occur. There are many house-tightening measures that can be undertaken to reduce air leakage and improve energy efficiency in a house.

Typical measures such as weatherstripping doors, caulking windows, adding insulation are obvious measures and can often result in upto a 30% reduction in air leakage. The result will be a tighter house that is more energy efficient, more comfortable, fewer drafts and often healthier. Reducing natural air leakage from 1.0 airchange per hour to 0.25 ach will reduce energy use by 23% (Energy Victoria Pub 1992)

Blower door tests will also indicate if any installed HVAC (heating, ventilation and air conditioning) system is functioning correctly. Duct systems can contribute significantly to air leakage problems.

**Blower door pressure gauges.**

## Technology

air2energy use the Minneapolis Blower Door manufactured by the Energy Conservatory, Minneapolis, USA. For the last twenty years this technology has been recognized as the best designed airtightness system in the world.

### How long does a standard test take?

A standard airtightness test of a house can usually be completed in 30 minutes or less. The Blower Door can typically be installed in about 5 - 10 minutes. Additional preparation and inspection of the house prior to beginning a test adds another 10 minutes. At this point, a test of the house to determine the overall leakage of the envelope can be conducted in less than 5 minutes.

Once the simple airtightness test has been completed, additional diagnostic procedures to find and prioritize the major leakage sites can add another 20 to 45 minutes depending on the size and complexity of the house, and the procedures used.



**Blower door measurements being taken.**



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