



### What is ventilation and why is it important?



In short, ventilation is the process of removing polluted, stale, moisture-laden indoor air and replacing it with fresh outdoor (often dryer) air. Over the past several decades there has been a trend in the residential building industry to make houses more energy efficient during construction.

In fact, in the early nineties, the national building code was changed to include the requirement for a continuous air barrier (that's essentially a big sheet of plastic) to be installed around a building's thermal envelope. A thermal envelope is the surface between the heated and unheated spaces of a building (i.e. an exterior wall or the upper floor ceiling of a home). There have been many advances in construction techniques to make building envelopes more airtight, however, this has been at the cost of often escalating the problem of poor air quality (polluted, stale, moisture laden air) in houses. The solution for this problem has been to install mechanical ventilation equipment in houses, in conjunction with the continuous air barrier, to simultaneously keep indoor pollutant levels down and maintain high energy efficiency.

#### How much ventilation is necessary?

There are several of ways to discuss and some debate regarding how much ventilation is "ideal" for a home. In residential construction, an ideal amount of ventilation has generally been accepted to be on the order of 0.3 air changes per hour. In other words, the indoor air is completely replaced with outdoor air approximately once every three hours. This level of ventilation is achieved by two types of ventilation; natural ventilation and mechanical ventilation.

#### What is natural ventilation and how is it measured?

In spite of all the efforts to make the building envelope more air tight, some air still leaks through the building's thermal envelope; this leakage is called natural ventilation. There are several key factors that effect natural ventilation, including how well a building's thermal envelope was

sealed during construction; stack effect (which is a pressure effect caused by temperature differences between the outside and inside of the house, and that is most pronounced in the winter); and wind. The amount of natural ventilation that occurs is completely specific to each house, and is commonly measured by completing a blower door test on a home.

#### What are the different types of mechanical ventilation equipment that are available and when should they be installed?

There are three primary types of ventilation equipment, including exhaust only equipment, supply only equipment and balanced ventilation equipment.

Exhaust-only equipment includes bathroom and kitchen exhaust fans. This type of equipment is commonly installed in homes that have a forced air heating system and have natural ventilation rates of 0.2 to 0.3 air changes per hour. The installation and proper use of a principal exhaust fan, which usually doubles as a bathroom exhaust fan, is often sufficient to meet the 0.3 air changes per hour that is recommended.

A common example of supply-only equipment includes a direct connected outdoor air duct to the return air plenum of the furnace. Every time the furnace fan turns on, outside air is brought into the home. These systems tend to slightly pressurize the home and can reduce infiltration of soil gases into the home.

When blower door tests are completed on new houses with extremely well sealed thermal envelopes, and a result of less than 0.2 air changes per hour is calculated, or where there is no duct work installed in association with the heating system (i.e. electric baseboard or hydronic heating systems are installed), balanced ventilation equipment is often recommended for installation. These systems draw in fresh air from the exterior and discharge stale air from the interior in equal amounts. In order to achieve the goal of 0.3 air changes per hour, balanced ventilation equipment such as a heat recovery ventilation system (HRVS) are installed. In cases where humidity control is also a concern, energy recovery ventilation systems (ERVS) are installed.