ASK THE
INSPECTOR

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The Importance of Ventilation in New Home Construction. What is ventilation and why is it so 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 that 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 buildings 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 air tight, 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, both of which are described below.

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 buildings thermal envelope; this leakage is called natural ventilation. There are several key factors that effect natural ventilation, including how well a buildings 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. The blower door test includes setting up a large fan at an exterior doorway of a home and operating the fan to depressurize the house. Depending on the air flow through the fan and pressure differences measured between the inside and outside of the house during the test, the amount of natural ventilation through the buildings thermal envelope can be calculated.

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, summarized as follows:

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 changers 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 system (ERVS) are installed.

I have a newer house. Why is there an electrical switch beside my thermostat that controls the exhaust fan in my bathroom?

In many new homes, the purpose for this switch is a mystery to homeowners, however, it does serve an important role. The purpose for installing this switch adjacent to the thermostat is partially to educate/remind homeowners that they should regularly operate the bathroom fan (also known as the principal exhaust fan) to maintain adequate ventilation in the home. The logic behind the switch is that if you regularly run the fan to exhaust air from the bathroom to the exterior, then air from the hallway will flow into the bathroom to replace the exhausted air, which in turn causes air from an adjacent room to flow into the hallway, etc. until an exterior wall is encountered. Since air is being "pulled" away from the exterior wall towards the bathroom, fresh air is drawn through the thin cracks/joints in the air barrier installed in the exterior wall, which ultimately brings fresh air into the home. This process of ventilation is much more effective if the furnace blower (if present) is operated simultaneously with the principal exhaust fan. Operating the blower helps to circulate air from the various rooms in the home, eventually to the bathroom and then to the exterior through the bathroom fan. It should be emphasized that regular operation of the principal exhaust fan is particularly important in well sealed houses. Observations made by AmeriSpec from general house inspections completed on newer homes has revealed high humidity levels, and in some cases mould growth caused in part by the high humidity, on many interior window sills and walls. The growth of mould can often be prevented by improving ventilation in a home by simply running the bathroom exhaust fan.

Many of the items described above (including a blower door test and developing recommendations for appropriate ventilation equipment) can be assessed as part of the EnerGuide For Houses energy efficiency assessment program. For further information about this program see our website at www.amerispec.ca.

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