



# Healthy Indoor Air-quality Ventilation

## Construction History

For years, changes in North American housing construction requirements have been introduced with the intent to reduce heating and air-conditioning energy consumption. Many older homes with hollow exterior walls did not receive dedicated air-barrier, vapor barrier or insulation materials and experience serious air-leakage. Blower Door depressurization tests have recorded 10 complete air-changes / hour or more at -50 pascals (-0.2" wc.-the standard pressure difference to ambient, estimated to simulate peak building air-leakage conditions).

During the heating season, large temperature differences between indoor-air and ambient-air cause leaky buildings to act like chimneys and this "stack" effect alone causes significant air-leakage to occur. Wind also creates pressure differences that cause air-leakage. With wind and stack effects causing conditioned air to leak out, any air leaking in to replace it must be heated or cooled as required. In winter, humidification is needed as excessive air-change causes uncomfortably low indoor relative humidity levels.

Other air-quality problems are presented as ambient air contains mold and mildew spores, bacteria, pollens, dust, etc. In addition, indoor air leaking through structures carries moisture vapor with it, which often condenses, causing wood decay and contributes to the set-up of micro-environments that are suitable for the development of mold and mildew.

In these older homes, uncontrolled air-leakage is often responsible for 50 to 60 % of the heating and cooling energy consumption and large capacity heating and air-conditioning equipment is required. During times when small temperature differences exist between inside and the ambient and no wind is blowing, even these leaky buildings experience under-ventilated conditions.

Figure 1 illustrates leakage behaviour in relation to combined, increasing stack and wind effects for an older, 2000 sq. ft. home.

Figure 1 also shows the correct air-change rate as recommended by The American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE - 15 cfm. / person or 0.35 air-changes / hour, whichever is greater).

Note: the Air-Leakage scales for all diagrams are logarithmic.

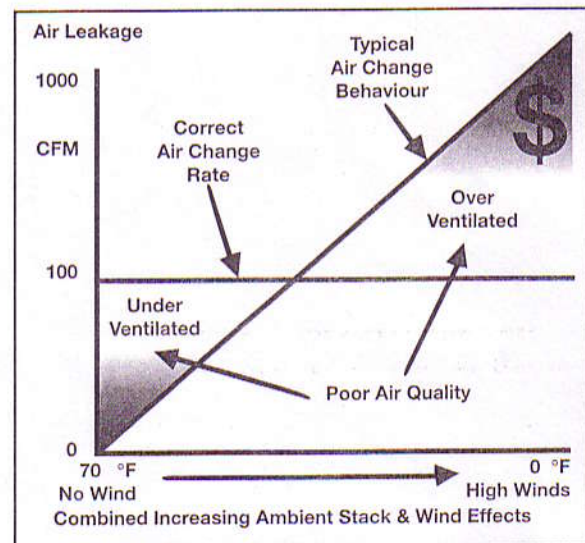


Figure 1

## Where We Are Today

With the adoption of air / vapor barrier and insulation requirements, typical new housing air-leakage rates are now 5 to 7 complete air-changes / hour during peak leakage tests. Builders who provide much attention, labor and many sealing materials provide structures that test for peak air leakage at 3 to 4 air-changes / hour.

Building Code changes and extra tightening efforts by custom builders are implemented with the intent of improving energy efficiency and comfort. Savings on reduced heating and air-conditioning equipment capacities and energy costs are realized but, as energy efficiency is improved, more under-ventilated periods will occur as shown in Figure 2.