

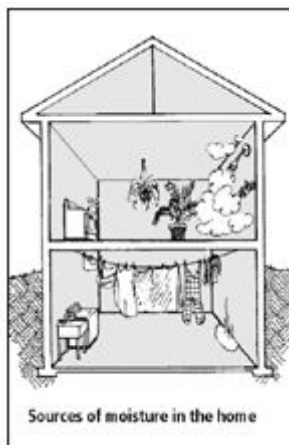
The Heating System and Ventilation and Combustion Air



Introduction

Both you and your furnace need some fresh air coming into the house, but most Canadian homes have too much. In fact, 25 percent or more of your home's heat loss can be due to excess infiltration around windows, doors and other cracks. These drafts not only cost you money, but can make your home unpleasant during the winter.

How tight is too tight? When do humidity and condensation become problems? What are the requirements for ventilation and combustion air? This section looks at some of the implications of air-leakage control: how it can affect air quality and the air needed for combustion appliances.



It is worthwhile to take a systematic look at the moisture balance and ventilation needs of your house. This will involve a list of moisture sources, symptoms of problems and ventilation requirements. Consider how any renovation or retrofit plans will affect the house. For example, if the house already shows signs of excessive condensation, any plans that include making the house more airtight will have to include increased ventilation.

For many, if not most, older homes a program of comprehensive air-leakage control will not reduce the air supply enough to cause problems. Most older houses experience too much air leakage, even after air sealing.

Exceptions

There are times when problems can occur, even without thorough air-leakage control. It is important to be aware of the potential problems, the symptoms to look for and some of the possible solutions. The following circumstances can make a house more susceptible to problems:

- houses with electrical heat or a high-efficiency furnace (no conventional chimney);

- houses where there is competition for air (fireplaces, powerful exhaust vents);
- houses where there are sources of air contamination (smokers, hobbies, etc.); and
- houses that produce a lot of moisture and have high humidity levels.

Symptoms of Problems

If you are aware of the symptoms indicating the start of a problem, you can make adjustments and correct the situation before damage results. Some of the signs to look for include the following:

- excessive condensation on double-paned windows;
- staining and mould growth, which often appears first in bathrooms, closets and on walls or ceilings at corners;
- stuffy atmosphere and lingering odours;
- back-puffing/odours from the furnace; and
- backdrafts from the fireplace.

Solutions

If the problem is one of high humidity or condensation, the first step is to reduce the humidity level by controlling the amount of water vapour that goes in the air. The following suggestions will all reduce a home's humidity levels:

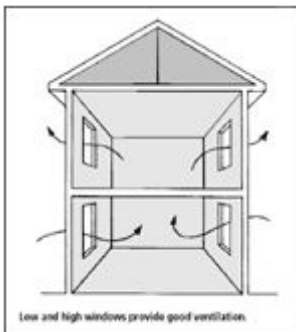
- Do not store wood in the house.
- Avoid hang-drying laundry in the house.
- Disconnect any humidifiers.
- Cover exposed earth floors in basements or crawl spaces with a moisture barrier.
- Install a sump pump to remove excessive moisture from the soil under the slab.
- Fix all water leaks into the basement.
- Do not allow any standing water in the house or against the foundation wall.



- Make sure the ground slopes away from the foundation wall and that there are properly functioning eavestroughs around the house.
- Ventilate kitchens and bathrooms during use.
- Adjust your living habits to produce less humidity (cleaning, washing, cooking, etc.).

The following table shows the maximum levels of humidity at which there will be no condensation on double-glazed windows at various outside temperatures.

Outside Air Temperature (°C)	Maximum Inside Humidity at 20°C (68°F)
-30° or below	15 percent
-30° to -24°	20 percent
-24° to -18°	25 percent
-18° to -12°	35 percent
-12° to 0°	40 percent

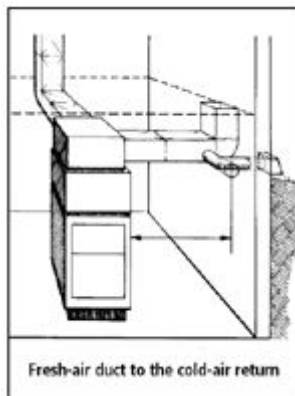


It can be very difficult to accurately measure and maintain the recommended humidity levels. A simple approach is to let the house become your indicator. If condensation starts to appear on the indoor face of any double-glazed windows (except those in the kitchen and bathroom), you have found the balance point. Occasional condensation does not pose a problem. Excessive condensation or frosting is an indication that you should reduce moisture production or reduce humidity levels by increasing ventilation.

Increasing Ventilation

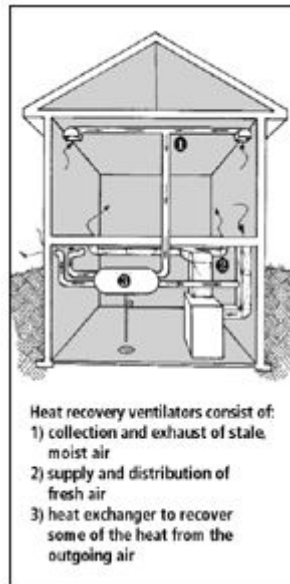
If you still have too much condensation even after reducing moisture production, or your problem is one of air quality, you will have to increase ventilation. There are several ways of doing this; the best method will depend on your house, the degree of the problem and your preferences.

- A simple solution may be to turn on kitchen and bathroom fans more often, especially when those rooms are used. A simple timer switch will turn the fan off automatically to prevent excessive ventilation.
- If you do not have ventilation fans, have them installed. It is worthwhile buying quieter fans since they tend to be used more regularly. Make sure that the fan installation incorporates air-sealing measures.
- Advanced, high-efficiency combustion appliances are ideal for airtight houses. This creates far fewer problems than conventional appliances, and at the same time, increases energy-efficiency benefits.
- Open windows as needed. Windows that are open on either side of the house or on different floors will help ensure better circulation. It is harder to control the rate of ventilation by this method, however.



- If the need for ventilation air supply and distribution is great, a central ventilating system can be installed. A relatively inexpensive and effective technique involves connecting a fresh-air duct to the return-air plenum of a forced-air system. Fresh air is drawn in by the suction of the furnace fan, mixed with house air and preheated by the furnace. Open the damper in the fresh-air duct just enough to prevent window condensation. It will have to be adjusted periodically through the winter. Alternatively, you can install a motorized damper operated by a humidistat control. It will open the damper only when the house becomes too humid.
- There are other types of whole-house ventilation systems that include exhaust and/or supply fans. These systems are for very tight houses that require a great

deal of ventilation. The air must be distributed throughout the house and in a way that maintains comfort levels. The system should not create strong negative or positive pressures in the house. This means that the inlet and outlet air supply has to be in balance



- Some systems are designed with the exhaust fan in the attic and several ducts pulling air from the kitchen and bathrooms. Many central ventilation systems use a heat recovery ventilator that typically recovers 70 percent of the heat from the exhaust air and transfers the heat to the incoming air or to the hot water supply. Central ventilation systems should be designed and installed by a professional.

Combustion Air

Furnaces, fireplaces, wood stoves and any other fuel-burning appliances also require air for combustion and for diluting and exhausting the products of combustion out of the house. If there is not enough air, it is possible that the chimney or flue could backdraft or spill dangerous gases into the house.

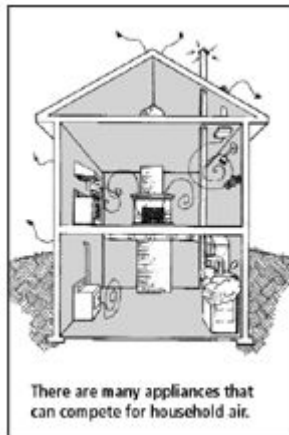
Backdrafts or spillage may be caused by competition for air. For example, a roaring fireplace, a powerful kitchen ventilator, a barbecue range or even a clothes dryer vented to the outside can exhaust air from the house. If the house is too tight, this can cause air to be pulled into the house through the chimney or vent, resulting in backdrafts or spillage.

Some of the signs of combustion air problems include the following :

- back-puffing of the furnace, indicated by soot or staining around the air intake;
- unusual odours from the combustion appliance;
- difficulty starting or maintaining a fire; and
- the house's occupants experience frequent headaches or nausea.

The ideal solution is to remove the source of the problem. If you are replacing your heating system anyway, consider buying a system that uses little or no combustion and dilution air from inside the house (e.g., a mid- or high-efficiency heating system, an integrated heat pump system).

Fireplaces are one of the worst culprits for robbing household air. This can be minimized by installing an outside air duct to the firebox and tight-fitting glass doors. Otherwise, a window should be opened slightly when you operate the fireplace.



Oil and gas furnaces may require a free and unobstructed supply of outside air. The size and type of ducting system will vary according to the type of fuel and the location and heating capacity of the appliance. Obtain specific information on all aspects of combustion air supply systems from your local regulatory authority, fuel supplier or heating contractor before work begins.

Carbon monoxide (CO) detectors are available at most hardware stores. Properly installed, these detectors will help protect occupants from accidental asphyxiation due to a failure or malfunction of combustion appliances or the penetration of automobile fumes from an attached garage. It is recommended that they be installed in any home with combustion appliances (fireplace, wood stove, fuel-burning furnace) or an attached garage.

Care should also be taken to prevent fumes from automobile exhausts penetrating the home from an attached garage. Garage doors should always be open before a car engine is turned on while inside a garage.