EASY$ TIP SHEETS

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Quick Links

Good ventilation is important

Whether you're buying a new home or taking care of the one you're in now, good ventilation is important because it helps protect your health and your home. It is as critical to your comfort and safety as a reliable heating system or a smoke alarm.

Your health

Good ventilation protects you, your family, and your guests from unpleasant odours, irritating pollutants, and potentially dangerous gases like carbon monoxide. A well-designed and properly-operated ventilation system also prevents the growth of mould and mildew, which can cause or aggravate allergic reactions and lung problems such as asthma. Because people generally spend about 90% of their time inside, indoor air pollution can actually be a bigger health risk than outdoor air pollution.

Your home

Good ventilation protects your home from damage by working to eliminate excess moisture from the air. Too much moisture rots window sills and attic eaves, peels paint, and invites insect infestation. Damp insulation in walls and ceilings means lost heat, higher fuel bills, and destructive mould growth. Carpeting, wallpaper, electronic equipment, and furniture can all be damaged by excess moisture.

Goal and Summary

This Easy$ tip sheet explains the importance of a well ventilated home, for health, for safety and for keeping your home in good condition. You will learn about how ventilation works in your home and techniques you can use to improve your ventilation system.

Ventilation means fresh air

Ventilation supplies fresh air to your home and dilutes or removes stale air. There are many ways this can happen. For example, opening windows to air out your home can supply fresh outdoor air that dilutes stale indoor air. Turning on the fan over the kitchen range or in the bathroom removes odours and moisture. Other common examples of home ventilation include chimneys, which remove combustion gases, and clothes dryer fans, which exhaust warm, moist air and chemicals from laundry soaps.

You may already know if you have a ventilation problem. Do you notice the sour smell of garbage from a trash can; a musty, gym-like smell coming from the bedroom walls; or mould or mildew in closets, or on ceilings or exterior walls? Is there condensation on the inside of your windows? Are your eyes irritated when you're at home? These conditions may be signs of poor ventilation. Remember: every pollutant has a source. It may be as simple as an overflowing garbage can or as complicated as mould growing inside walls. Whatever the case, you must identify the source before you can solve the problem. One of the easiest ways to improve indoor air quality is to remove or avoid using common sources of moisture, odours, and gases. Some examples include: not storing firewood in the house, taking out the garbage and then washing the can, and using milder cleaners or water-based paints to avoid chemical odours. Although only a temporary solution, cleaning surface mould and mildew freshens the air. Be aware, however, that some moulds can be dangerous to your health when their spores are released.

Ventilation basics

There are two basic approaches to ventilating your home:

1. Spot ventilation for localized pollution sources.

2. General ventilation to dilute pollutants from sources that exist in many locations or move from place to place. General ventilation can be provided in two ways: exhaust-only, and supply-and-exhaust. Whichever method you choose, spot ventilation is also needed in those places where significant indoor air pollution sources are located, such as bathrooms and kitchens.

Spot ventilation

Spot ventilation uses exhaust fans to collect and remove pollutants before they spread throughout your home. The exhaust fan is generally turned on only when the source is producing pollutants. Bathrooms, kitchens, and laundry rooms all contain obvious sources of moisture and odours. Spot ventilation may also be appropriate for home offices, hobby rooms, or workshops.

General ventilation

General ventilation fans run continuously to control pollutants from sources that can't be spot-ventilated. Some sources, including carpets, furniture, and drapes, all of which may release fabric fibres and gases such as formaldehyde, are too large or spread out to be spot-ventilated. General ventilation mixes fresh outdoor air with stale indoor air to lower or dilute the concentration of pollutants. Fresh air is provided by fans blowing outdoor air into the house, which forces air out through exhaust vents or through your heat recovery ventilator, and to some degree through cracks and openings.

Exhaust-only

With exhaust-only ventilation, exhaust fans pull stale air out of your home and fresh air is left to enter any way it can through fresh air intakes, cracks, or windows. Exhaust-only ventilation is a good choice for homes that do not have a heat recovery ventilator or existing ductwork to distribute heated or cooled air. If you use this strategy, your home will be depressurized, meaning that the air pressure inside your home will be less than the air pressure outside your home. This is a potentially dangerous situation if you have a combustion appliance such as a wood stove or oil furnace in your home, because it can cause the exhaust from these appliances to be drawn into your home. This exhaust contains dangerous gases including deadly carbon monoxide.

Supply-and-exhaust

With supply-and-exhaust ventilation, exhaust fans pull stale air out of the house while an intake fan blows in fresh air. This system is more complex than exhaust-only, but may ensure a better flow of fresh air into your home.

Outdoor air is drawn in by fans and delivered to rooms through heating and cooling ducts. Supply-and-exhaust ventilation is a good choice for homes with heating or cooling ducts because it's an inexpensive way of providing fresh air. In the Yukon, homes can benefit from heat-recovery ventilation, which warms incoming air with outgoing exhaust air, reducing your home's over all heating cost.

Air movement

Air pressure differences are caused by such things as wind, temperature differences, and fans. For example, air moves into a home on the upwind side and out of a home on the downwind side because of pressure differences; heated air from a boiler or fireplace goes up a chimney because of temperature differences; exhaust fans remove cooking odours by drawing air from the kitchen to the outside. Air always moves from higher-to lower pressure areas. Understanding how air moves inside your home can help you avoid or fix such ventilation-related problems as excess moisture, and backdrafting.

How to check your exhaust fans

You can check the air flow through exhaust fans with these two tests. The first tells if your fan is working; the second tells how well it's working.

Test #1
From six inches away, squeeze a cloud of baby powder from its container toward the intake grille of an operating exhaust fan. If the fan is working properly, the powder should be drawn into the grille. If it goes to the center of the grille and is blown back into the room, then the fan is blocked; if the powder simply hangs in the air, then the fan is not working.

Test #2
Find a cardboard box with an opening big enough to fit over the exhaust fan grille. If the fan is mounted in the wall, cut a hole slightly smaller than a credit card in the bottom of the box, or, if the fan is mounted on the ceiling, in the side of the box. Using any kind of tape, attach a credit card inside the box over the hole. Make sure the card can swing back and forth in the box.

Turn the fan on and put the box over the exhaust grill. If the fan is working, the credit card will swing into the box. The greater the air flow, the more the credit card will swing open. If it swings open 1 1/2 inches or more, the fan is moving at least 25 cubic feet of air per minute, which is a reasonable amount for a bathroom. If the card swings open less than 1 1/2 inches, you should consider repairing or replacing the exhaust fan. (Tip: use a pencil instead of a ruler to measure how far the card swings open, because a ruler will block the air flow.)

Backdrafting

In the winter, we close up our homes. At the same time, we run exhaust fans and numerous other devices that pump air out of the house. (In fact, many appliances, particularly fireplaces, exhaust a considerable amount of air even when not operating.) As a result, the air pressure indoors falls below the air pressure outdoors, and the house becomes depressurized.

If your house is sufficiently depressurized, air may be sucked in through the chimney of your wood stove, furnace or fireplace. When this happens, air flows down the chimney, rather than up, drawing combustion gases such as carbon monoxide and aldehydes into the house. This is called "backdrafting" and is a very serious condition that can quickly cause severe injury or even death. Before installing a ventilation system, you should have your home checked to make sure there is adequate make-up air for the fuel-burning equipment. After the building has had significant air-sealing, a ventilation system installed, or any major structural change, it is very important to recheck for backdrafting.

Looking at your home

Here are some questions to help you evaluate your home's ventilation system. If you answer "no" to any of these questions, you should consider making some changes.

- Do you have both continuous general ventilation and as–needed spot ventilation?
- Is your home free of lingering odours?
- Are your windows free of condensation?
- Is the dryer vented to the outdoors?
- Is each fuel-burning device, such as the woodstove, furnace, and hot water heater, vented separately?
- Is there an exhaust fan in each bathroom?
- Are outdoor air inlets located away from pollutant sources?
- Is each exhaust fan working and vented to the outdoors (not to the attic, soffit, or crawlspace)?

Fixing your home's ventilation

While just opening a window may seem like an easy, low-cost way to provide fresh air, you may need a fan to make sure this air goes where it is needed.

Why ventilate

Kitchen and bathroom fans are an important part of your home's ventilation system. By removing odours and other contaminants they help maintain good

indoor air quality. And by removing excess moisture, humidity can be kept at an acceptable level. High humidity can damage building materials. Worse yet, high humidity can cause mould growth and mould can harm your family's health.

What are your options?

Either spot ventilation fans, which draw air from one location, or a central system, which draws from several areas, can provide the ventilation necessary to remove moisture and odours.

The most common spot ventilators are bathroom fans and kitchen range hoods. Most fan units have the fan and fan motor located right at the inlet grill. In-line fan systems, on the other hand, locate the fan and motor assembly in the ducting which can reduce the amount of fan noise.

Spot ventilators often rely on leaks and cracks throughout the house to bring in the required make-up air from outside. A passive vent — a hole through an outside wall — may be installed to help provide make-up air and prevent unwanted drafts. Central systems, which draw from two or more areas of the home, have a motor and fan unit that is generally located some distance from the areas it is ventilating. Often these systems balance the volumes of air entering and leaving the home by using a supply air fan in combination with the exhaust fan. A heat recovery ventilator (HRV) is a balanced central system that uses a heat exchanger to recover 60 to 75% or more of the heat in the exhaust air by transferring it to the intake air. HRVs are best suited for homes that are fairly airtight and are a standard feature in energy efficient R2000 homes.

What to look for

Three of the most important characteristics to look for in a fan are size, noise level and energy efficiency. If a fan is the wrong size it will be ineffective, if it is too noisy it will be annoying and if it is too costly to operate it will be uneconomical. Any of these factors may lead to it not being used as often as it should be used.

Fan exhaust capacity is rated in litres per second (L/s) or cubic feet per minute (cfm). For new construction, the National Building Code specifies that the minimum bathroom and kitchen ventilation rates, operated on an intermittent basis, be 50 cfm (25 L/s) and 100 cfm (50 L/s) respectively. It may be desirable to have a range hood that has a capacity greater than this minimum but it should have multiple speeds to meet specific needs. Remember that a fan that is too large can cause furnace or woodstove backdrafting problems. Ask your supplier or installer to help determine the right size of fan for your needs.

Fan noise level is measured in sones. The higher the sone rating, the noisier the fan. Spot fans are typically rated at 3 to 4 sones, though some can be quite a bit louder. Fans rated at 1.5 sones are very quiet, and low-capacity fans rated as low as 0.5 to 1 sone are nearly inaudible. The quietest bathroom fans have sound ratings of 0.5 sones or less; kitchen fans move more air and are louder with the quietest rated around 2.0 sones. For a fan to work, it must be turned on, and it probably won't be if it's too noisy! Buy as quiet a fan as you can afford.

The efficiency of a residential fan is expressed as cubic feet per minute per watt (cfm/W). It is determined by dividing the volume of air that the fan moves in one minute by the amount of energy used. Efficient small-bathroom fans — less than 76 cfm — will have a minimum efficiency of 1.4 cfm/W. Better large bathroom fans — 76 cfm and over — as well as range hoods will have a minimum efficiency of 2.8 cfm/W.

Remember: the larger the efficiency number, the better!

The following example illustrates the difference that can often be found between old and new bathroom fans. An older bathroom fan, with a noise level of 4 sones, might move 70 cfm of air using 80 watts giving it an efficiency of 0.9 cfm/W. A new quiet and efficient bathroom fan can move the same amount of air, at 0.5 sones and with 15 watts of energy, giving it an efficiency of 4.7 cfm/W. You should be prepared to pay more for a quality fan.

Costs

Good ventilation can be achieved at a reasonable cost. Depending on your home's design and location and the type of system you select, a ventilation system may cost anywhere from $500 to $10,000. The cost to operate it can range from almost nothing to a couple of hundred dollars per year, depending on your home's location, the type of system used, the way you operate it, and how your home was built. With new construction, operating costs can be minimized by building a well-insulated, tightly sealed home with a well-designed ventilation system. These same features in existing homes can reduce operating costs because many homes are leakier than they need to be. Some ventilation systems include energy-recovery features. While more expensive to install, in time they can pay for themselves in energy savings.

New construction

When gas and oil were cheap, most people didn't pay attention to how leaky their homes were; they just turned the thermostat up in the winter and down in the summer. Buildings often had 3 to 5 times more ventilation than they needed. With rising fuel prices, people looked for ways to reduce the cost of heating and cooling their homes.

The building industry responded by developing and installing better windows, more insulation, high efficiency furnaces and air conditioners, and limiting the amount of outdoor air leaking into homes. Many of the problems discussed in this guide soon began to appear. Although "tight" homes were part of the problem, they were also part of the solution. Well-sealed homes are less expensive to heat and ventilate because you can control how much outdoor air comes in and where it goes. The answer, then, is to "build tight and ventilate right".

Installation

Once you've chosen the right fan, the next step is to have it installed correctly. Exhaust ducting should be sized, sealed and insulated properly. If the ducting is too small or has many bends in it, the ventilation system will not perform as it was intended. The exterior vent hood must be located so that it will not cause moisture damage to exterior surfaces.

Controls

Proper controls are important in ensuring that the fan operates when and as often as it should. Control options fall into two main categories – manual or automatic. Manual controllers include simple on/off switches, timers (spring wound or electronic) and delay-off switches. The advantage of manual controllers is that the occupant can turn on the fan when needed; their main disadvantage is that they sometimes do not get used. Automatic controls can be fully or semi automatic. With a fully automatic switch, you set it and forget it. A semiautomatic control is an automatic control that has an override switch. Automatic controls include occupancy (motion) sensors, humidity sensors (de-humidistats) and automatic timers. Automatic timers are sometimes used to control bathroom fans that provide whole house ventilation at the rates prescribed under the building code. The key is to first understand your life-style and ventilation needs and then select the right control, or combination of controls, that provides proper ventilation with little or no involvement by you.

Safety first and last

And finally, if you have heating appliances with chimneys, make sure that your new fan won't cause your heating appliances to backdraft. Many older ventilation systems depend on leaks or cracks throughout the house to bring in sufficient air to replace the volume of air being exhausted. If you want to install a high capacity exhaust fan, you may need a matching supply air fan to balance air pressures within the home.

Selecting a contractor

Whether designing a new home or improving the ventilation of your existing home, you will probably need the services of an experienced contractor. The Yukon Housing Corporation can help you find certified ventilation professionals. Contact Yukon Housing at (867) 667-5759. You can also find certified ventilation professionals in the Energy Solutions Directory online: **http://www.emr.gov.yk.ca/energy/directory.html**

This Easy$ tip sheet is provided by the Energy Solutions Centre.

If you have additional questions or comments, please contact the Energy Solutions Centre:

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