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R-2000

SUPER ENERGY EFFICIENT HOME PROGRAM

How To Operate a Heat Recovery Ventilator

AIVC

Canada

About this Booklet . . .

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R-2000

The Heat Recovery Ventilator (HRV) in your home can help ensure a healthy, clean, and comfortable home environment without the penalty of high fuel bills. This booklet has been prepared to help you achieve these full benefits. The following pages explain:

- how your HRV works,
- how to operate it,
- possible problems and solutions, and
- routine maintenance requirements.

This booklet is written primarily for occupants of R-2000 or equivalent homes. However, HRVs are also being installed in other types of homes, including older houses that have been carefully "airtightened". Much of the information presented here will be relevant and useful to any HRV user.

This booklet is intended as a **supplement** to your HRV owner's manual, not as a substitute. To ensure that your unit performs properly, **you should follow the manufacturer's instructions for your particular type of HRV.** If a manual was not supplied or if proper operation was not explained to you, contact the installer or manufacturer.

HRVs can be used year-round. However, for maximum clarity, the text that follows generally refers to operation during the heating season. For specific information on summer operation, see Chapter 4.

CONTENTS

A note on terminology . . .

Until recently, many of the units we now call Heat Recovery Ventilators (HRVs) were referred to as "air-to-air heat exchangers". Though the industry is now moving towards the use of the "HRV" terminology, you may still hear the old name, and the unit in your house may be labelled as an air-to-air heat exchanger. If it is, this booklet is still for you: an HRV by any other name is still an HRV . . .

IS IT A HEAT RECOVERY VENTILATOR OR AN AIR-TO-AIR HEAT EXCHANGER?

If you don't have an HRV, but are considering buying one, Energy, Mines and Resources has a publication that may be of interest to you. **Heat Recovery Ventilators: A Buyer's Guide** can help you decide whether or not to purchase an HRV. If you do decide to buy, the booklet tells you what to look for when comparing different types of HRV, and highlights important installation requirements.

To order this publication, write the **R-2000 Program, Energy, Mines and Resources Canada**, 580 Booth Street, Ottawa K1A 0E4.

THINKING OF BUYING AN HRV?

INTRODUCTION

As shown in the chart on this page and in Figure 1, our daily activities add a wide range of pollutants to the air in our homes. These various pollutants must be removed from the house; in other words, the stale indoor air must be regularly replaced with fresh outdoor air.

In most conventional houses, this "air exchange" process takes place almost accidentally. Household air is exhausted up the chimney when the furnace is operating (and even when it is off), and air leaks in and out of the house through the countless cracks in the structure.

Pollutant	Sources
Excess moisture (humidity)	Cooking, washing, breathing, plants, etc.
Formaldehyde	Urea formaldehyde foam insulation and many types of plywood, particleboard, panelling, carpets, furniture, textiles, etc.
Radon	Soil and sometimes concrete, building materials, and well water
Tobacco smoke	Smoking
Household chemicals	Cleaning products, various hobby supplies, paint, solvents, aerosols, etc.
Odours, viruses, bacteria, dander, and fur	Humans and pets
Combustion products (including carbon monoxide, nitrogen oxides, carbon dioxide, particulates, etc.)	Fuel burning appliances including furnaces, heaters, cookstoves, clothes dryers, fireplaces, wood stoves, etc.

CAUTION: If combustion products are escaping into an R-2000 or equivalent home, a serious problem exists that must be promptly rectified **at the source.** Do **not** rely on an HRV to remove combustion pollutants. Note that unvented fuel-burning appliances (such as portable space heaters) should not be used in R-2000 houses, unless the appliance is provided with a vent to the outside.

SOME TYPICAL HOUSEHOLD POLLUTANTS

Accidental air exchange is greatly reduced in an R-2000 house, since the house is tightly built and since the chimney (if there is one) exhausts relatively little air. Therefore, **a mechanical ventilation system is a necessity in all R-2000 homes.** This system must be capable of replacing the stale indoor air with fresh outdoor air at least once every two hours.

The simplest mechanical ventilation system consists of an exhaust fan that regularly and automatically exhausts stale house air to the outside, plus a second fan that simultaneously draws fresh air from outside into the house (see Figure 2).

Unfortunately, such a system can waste a great deal of energy. As the exhaust fan blows **heated** air to the outside, the intake fan replaces it with **cold** air that must be heated. The resulting energy costs can be considerable: as much as one-third of the heating load in a low energy home.

Heat Recovery Ventilators (HRVs) offer an alternative solution (see Figure 3). As the name implies, these devices provide ventilation, while **also** recovering heat from the exhaust air. Specifically, an HRV that is properly installed, operated, and maintained will:

- exhaust air, indoor pollutants, and excess humidity,
- recover heat energy from the exhausted stale air,
- use the recovered energy to preheat outside fresh air, and
- distribute this fresh air throughout the house.

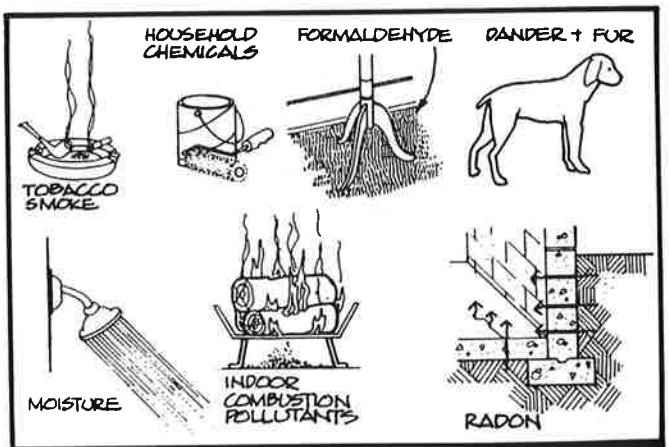


FIGURE 1. **POLLUTANTS IN THE HOME**

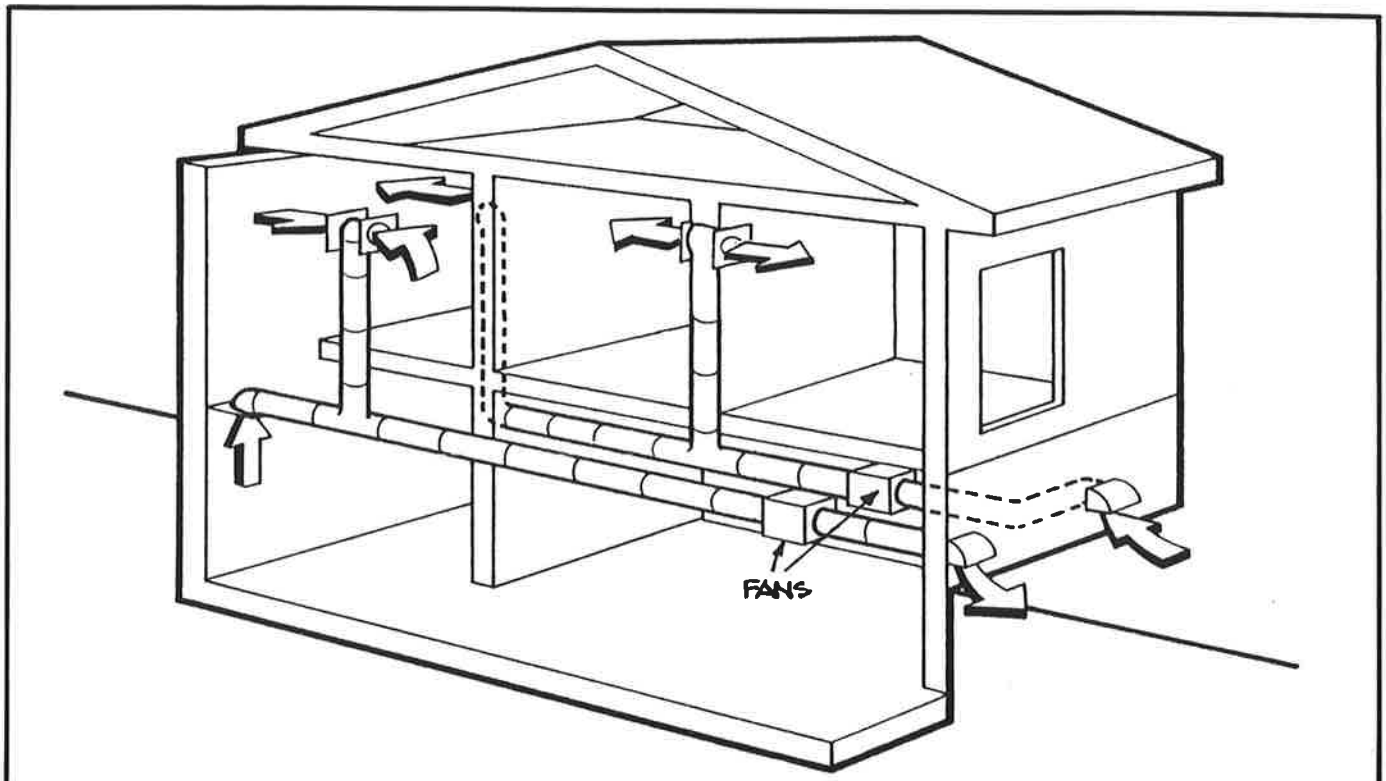


FIGURE 2. **A SIMPLE VENTILATION SYSTEM**

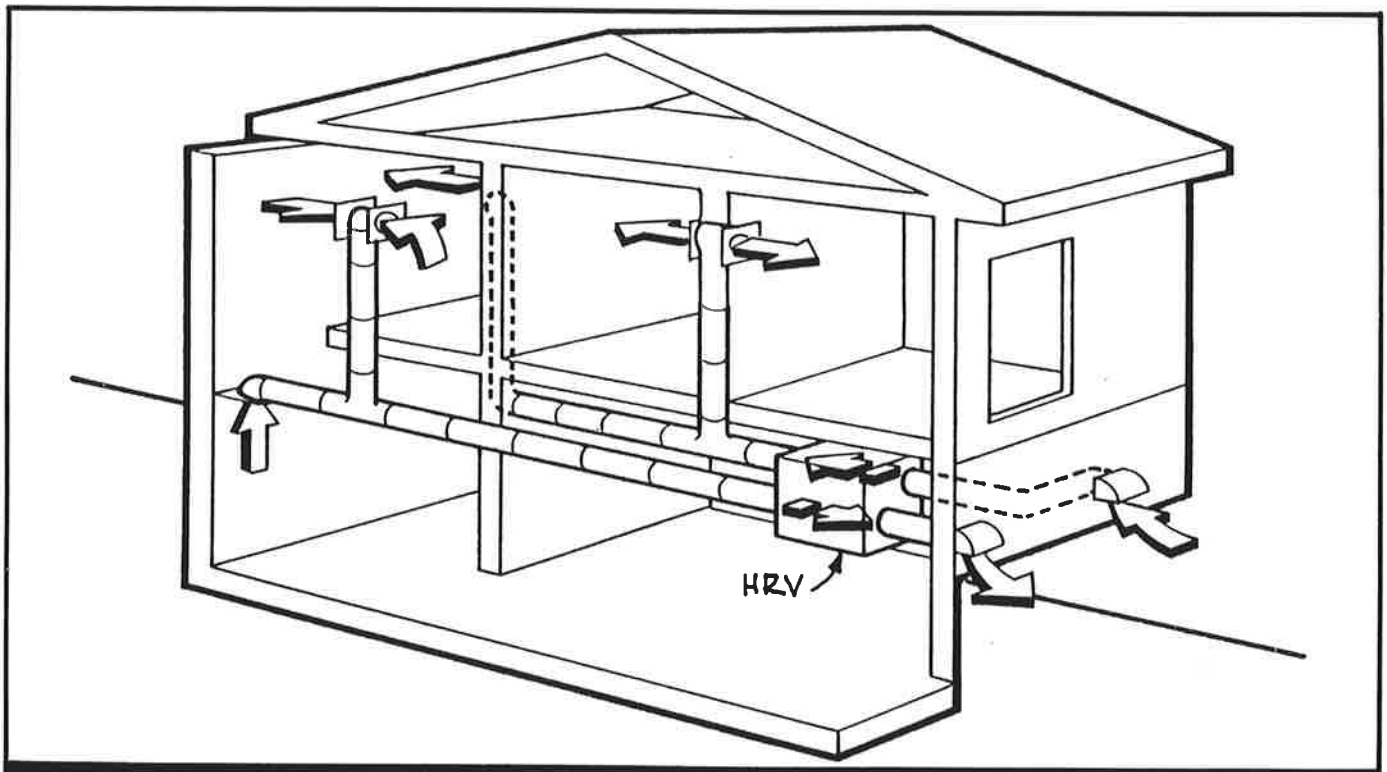


FIGURE 3. **A VENTILATION SYSTEM WITH AN HRV**
(Note: Other methods of HRV installation can also be used)

Chapter 2

THE PARTS OF AN HRV

An HRV (Figure 4) generally consists of the following parts:

CASING

All HRVs are housed in some type of metal or plastic casing. The casing is usually insulated, provided with mounting brackets, and installed with "vibration isolators" (such as rubber pads) that minimize transmission of vibration to floors, ceilings, and walls.

HEAT EXCHANGE CORE

Inside the casing is the heart of an HRV: the heat exchange core. This is where heat is actually transferred from the exhaust air stream to the fresh air stream. The box on this page describes the four major types of core: plate-type, heat pipe, rotary wheel, and capillary wheel.

All of these core types are designed to recover heat while preventing or minimizing the mixing of the two air streams. In addition, it should be noted that capillary and rotary wheel cores, and plate-type cores using paper to separate the air streams, are designed to transfer heat **and** some moisture. In homes where control of excess humidity is a priority, these HRVs will require higher ventilation rates than other units, in order to achieve the same humidity levels.

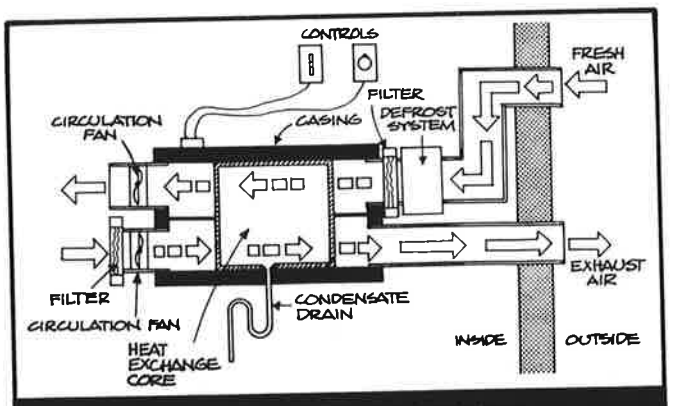


FIGURE 4. **THE PARTS OF AN HRV**
(Note: All illustrated parts are not found on all units)

TYPES OF HEAT EXCHANGE CORE

There are 4 basic types of heat exchange core:

Plate-type cores

In plate-type heat exchange cores, streams of warm exhaust air and cold fresh air are forced through adjacent channels. These channels are separated by a thin plate of plastic, metal, paper, or other material, as shown in Figure 5. The exhaust air warms this plate; in turn, the warmed plate heats the incoming cold air stream.

An HRV with a plate-type heat exchange core has many alternate warm and cold air channels. The channels can be arranged in a variety of ways, as shown in Figure 6.

Heat pipe cores

Heat pipe heat exchange cores consist of a series of sealed pipes, as shown in Figure 7. Inside each pipe (Figure 8) a small quantity of liquid evaporates or "boils off" when warmed by the exhaust air stream.

The warm vapour is forced towards the cool end of the pipe, where it cools enough to condense back into a liquid and release heat to the fresh air stream. The cooled liquid flows back to the warm end of the pipe, where the heat transfer cycle begins again.

Rotary wheel cores

Rotary heat exchange cores (Figure 9) rely on a "heat wheel" to transfer heat. This wheel turns slowly through the streams of warm exhaust air and cold fresh air.

The wheel is "honeycombed" with tiny passages that allow air to blow through. As the warm air stream passes through the wheel, the half of the wheel in the stream is warmed. When the warmed part of the wheel rotates into the cold fresh air stream, this air is heated as it blows over the wheel.

Capillary wheel cores

Capillary wheel heat exchange cores (Figure 10) rely on the same heat transfer principle as the rotary wheel: warm air is passed through one side of a turning wheel and cold air through the other. The wheel picks up heat in the warm air stream and releases it to the cold air stream.

Unlike the rotary wheel, the capillary wheel core is usually a foam cylinder which turns at very high speed. Warm and cold air streams are first drawn into separate compartments in the centre of the cylinder, and then are forced outwards through the foam.

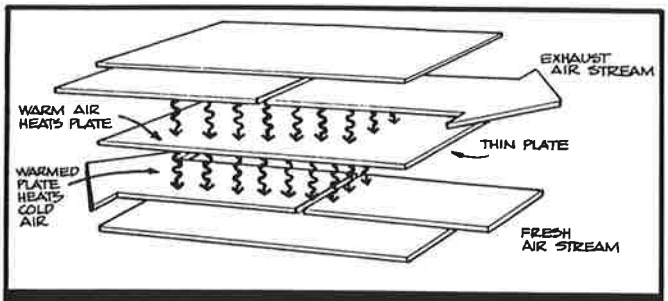


FIGURE 5. **HEAT TRANSFER IN A PLATE-TYPE HEAT EXCHANGE CORE**

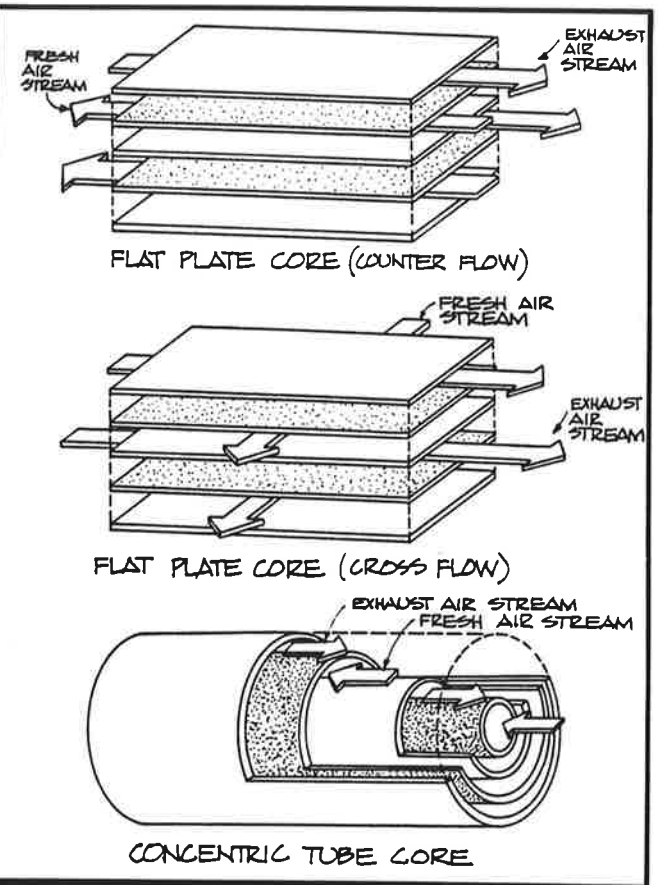


FIGURE 6. **VARIOUS PLATE-TYPE CORES**

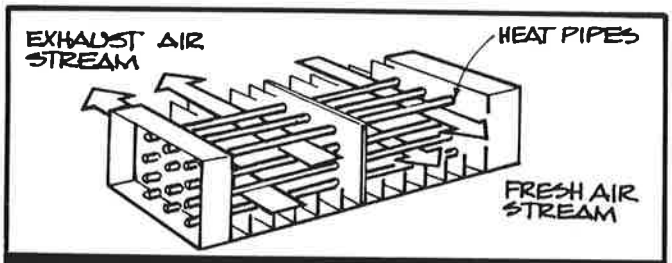


FIGURE 7. **HEAT PIPE HEAT EXCHANGE CORE**

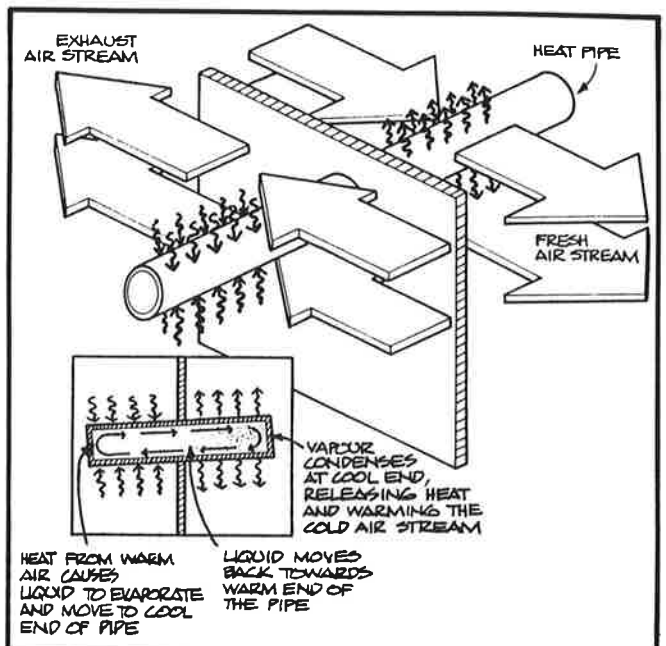


FIGURE 8. **HEAT TRANSFER IN A HEAT PIPE**

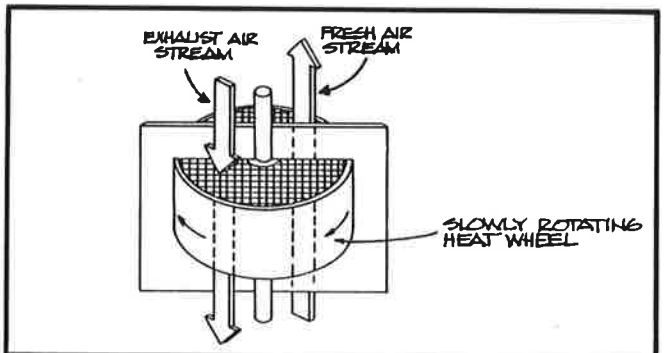


FIGURE 9. **ROTARY WHEEL HEAT EXCHANGE CORE**

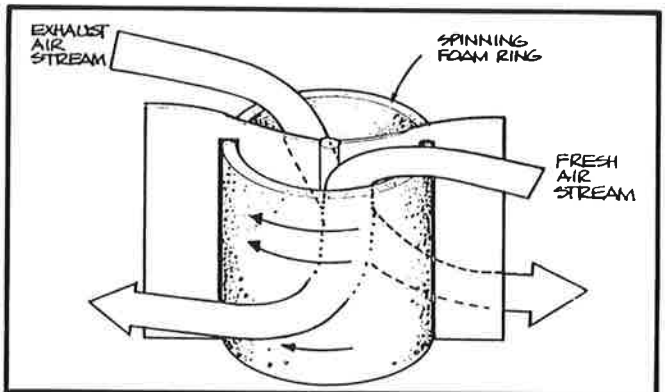


FIGURE 10. **CAPILLARY WHEEL HEAT EXCHANGE CORE**

CIRCULATION FANS

Attached to the casing, or enclosed within it, are two fans — one for the exhaust air and one for the fresh air. As shown in Figure 11, the fans in an HRV may be one

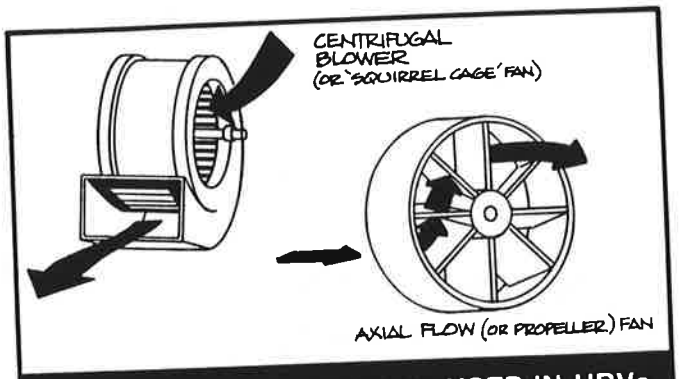


FIGURE 11. **TYPES OF FANS USED IN HRVs**

of two different types: a centrifugal blower (also called a "squirrel cage" fan) or an axial flow fan (also called a propeller fan). If your HRV core is of the capillary wheel type, it will not have separate fans: the rapidly rotating wheel serves as fan for both air streams.

FILTERS

The air entering the HRV contains dirt, which can collect over time in the heat exchange core. To minimize this accumulation, most manufacturers provide removable filters in both the exhaust and fresh air streams. These filters may be part of the HRV itself, or they may be located in the intake grilles of the HRV duct system.

CONDENSATE DRAIN

HRVs have a condensate drain hose attached to the bottom of the casing and leading (via a "U" trap or loop) to a nearby house drain. The condensate drain is required because the HRV can cool the outgoing exhaust air to the point where water vapour condenses on the exhaust side of the core.

Some HRVs have a second condensate drain on the fresh air side of the core. This prevents moisture from accumulating in the core during **summer** operation. The second drain also provides an outlet for snow and water that may be drawn into the core from outside during winter operation.

DEFROST MECHANISMS

If the incoming air is very cold, the moisture condensing out of the exhaust air can freeze. If this ice is allowed to accumulate, the heat exchange core can freeze solid, blocking the air channels. Different manufacturers deal with this problem in different ways.

Some HRVs provide an electric preheat coil in the incoming fresh air stream of the unit. Whenever the incoming air is cold, the preheat coil switches on. This raises the temperature of the fresh air above the point where frosting or icing will occur.

Other HRVs remove frost buildup by automatically reducing the flow of cold fresh air through the core whenever necessary. Warm air continues to pass through the core, warming it to the point where any accumulated ice should melt. Several techniques can be used, including:

- stopping the flow of fresh air into the house while continuing to exhaust stale air to the outside;
- recirculating exhaust air back into the house through the fresh air side of the unit;
- diverting the incoming fresh air so that it bypasses the core and flows directly into the fresh air distribution ducts; or
- drawing warm air directly into the unit from the surrounding room.

Defrosting is not provided on all HRVs. Specifically, rotary wheel and capillary wheel cores are sold without defrost equipment. In addition, some other manufacturers offer models without defrost (for use in relatively warm climates).

CONTROLS

Most HRVs have two distinct modes of operation: low speed for normal use and high speed for occasional use, when extra ventilation is needed. Each mode has its own control system.

Low speed operation is normally controlled by a switch located on the HRV itself. Often, a variable speed or multi-speed type of switch is provided, which allows the user to select the precise fan speed for the low speed mode (see Figure 15, later in this booklet). Except for servicing, the low speed switch should **never** be turned off during the heating season (see Chapter 4).

High speed operation is usually controlled by switches located in the main living area of the house, as shown in Figure 12. Typically, at least one of the following switches is used:

1. A humidistat (sometimes called a "dehumidistat") can automatically switch the HRV to high speed when household humidity climbs to a predetermined level. The humidity setting is adjustable.
2. An "interval timer" can automatically switch the HRV to high speed for a fixed period of time on a regular basis. The timer can be located on the HRV or elsewhere in the house.
3. Simple on/off switches, located in such areas as bathrooms, kitchens, and laundry rooms, can be used to manually activate high speed operation. These switches may be timed, so that high speed operation is turned off automatically after a preselected period (such as 15 or 30 minutes).

If more than one high speed switch is provided, the unit should operate at high speed when any one of these switches is "on".

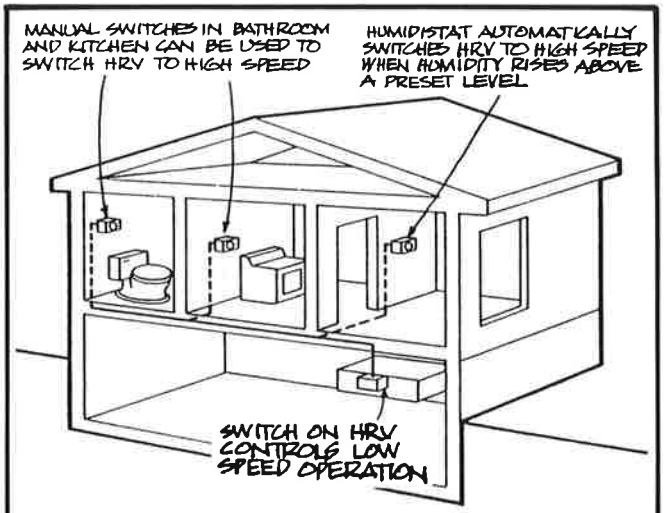


FIGURE 12. **EXAMPLE OF AN HRV CONTROL SYSTEM**

Most HRVs on the market use one of the "heat exchanger" technologies described on pages 4 and 5. Note, however, that HRVs using "heat pump" technology are also becoming available. These units "pump" heat from the exhaust air to the fresh air, in much the same way as an air conditioner removes heat from a hot building.

This booklet concentrates on the heat exchanger type of HRV. However, if you own a heat pump HRV, most of the information presented in this booklet will also apply to your unit. Refer to your owner's manual for additional information on operation and maintenance.

A NOTE ABOUT HEAT PUMP HRVs

THE HRV DUCT SYSTEM

HRVs collect and deliver air via a system of ducts. Each unit is connected to four duct runs: two on the "cold side" and two on the "warm side" (see Figure 13). This chapter summarizes some of the important details of an HRV duct system, based on installation guidelines developed by the Canadian Standards Association (CSA).

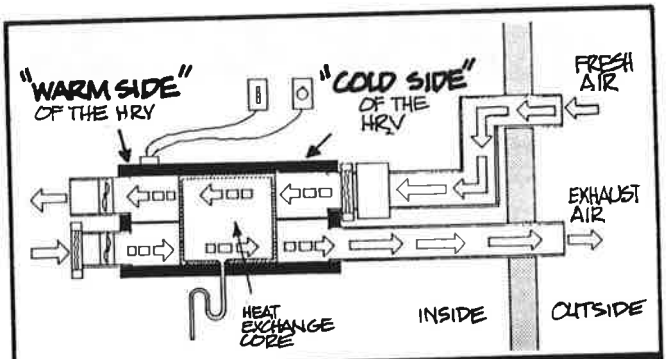


FIGURE 13. **WARM SIDE/COLD SIDE OF AN HRV**

You may wish to check that your system has been installed as outlined below. If your HRV was purchased prior to the development of the CSA guidelines, your installation may be different from that described in this booklet. If so, contact your installer to discuss the differences. Some of the earlier installation practices can be easily modified to provide you with improved HRV system performance.

"COLD SIDE" EXHAUST AND FRESH AIR DUCTS

On the cold side of the HRV a pair of ducts runs through the wall to the outside. These ducts should be relatively short and must be covered with a minimum of RSI 0.7 (R 4) insulation. A continuous, sealed air/vapour barrier must be wrapped around the outside of the insulation to prevent condensation on the duct surface or in the insulation. The barrier must be well sealed at the HRV and at the exterior wall.

To prevent exhaust air being drawn back into the home, the two duct openings on the exterior wall should be separated by a minimum distance of 2 metres. There should be at least 450 mm from the bottom of the ducts to ground level. The ducts should be equipped with rain hoods on the exterior wall, and with a 6 mm wire screen to prevent entrance of small animals, leaves, grass, and so on.

The fresh air inlet should **not** be located near driveways, carports, garages, bushes, tall grass, garbage, exhaust outlets, oil fill pipes, gas regulators, or anything else that might affect the quality of the air drawn into the house.

"WARM SIDE" EXHAUST DUCTS

The warm side exhaust collection system typically consists of rigid ducts running through wall and floor cavities. The ducts are usually run from areas such as bathrooms, kitchens, utility areas, workshops, and other locations where moisture and contaminants are generated.

Range hoods should **not** be connected to the HRV exhaust ductwork. In the case of a gas stove, the hood should be vented directly to the outside, with provision made for "make-up" air as discussed in Chapter 4. In the case of an electric stove, the recirculating type of range hood should ideally be used, backed up by an HRV exhaust duct elsewhere in the kitchen (at least 1.2 metres from the stove).

Similarly, clothes dryer exhausts should **not** be connected to the HRV exhaust ductwork. **In the case of gas dryers, venting directly to the outside is mandatory.** In the case of electric dryers, the moisture and contaminants in the exhaust make it preferable to vent directly to the outside.

If your dryer exhausts to the outside, care should be taken to allow for "make-up" air, as discussed in Chapter 4. If, on the other hand, your (electric) dryer exhausts to the inside, it should be connected to a secondary lint filter and the laundry area should be provided with an HRV exhaust intake.

"WARM SIDE" FRESH AIR DUCTS

Distribution of fresh air from the HRV can be accomplished using the air circulation system of the forced air furnace, or using a separate duct system.

If the furnace is used, there should **not** be a direct connection between the HRV and the heating system ductwork. Instead, the HRV should dump its fresh air about 300 mm from a cold air return inlet (see Figure 14). The furnace fan will then draw this fresh air into the heating system ductwork and distribute it throughout the house. For best results, the furnace should have a two speed fan that operates at high speed when the furnace is on, and at low speed at all other times.

For homes without a forced air heating system, the HRV must have its own separate duct system to deliver fresh air throughout the house (see Figure 15). It should be remembered that this fresh air will be warmer than outside air — but it will still be cooler than room temperature. The result can be cold drafts in the home.

To avoid this problem, a duct heater is sometimes added to the fresh air distribution system. As a preferable option, drafts can also be avoided by the use of special grilles to diffuse the fresh air and by careful positioning of fresh air outlets (at ceiling level and in out of the way places).

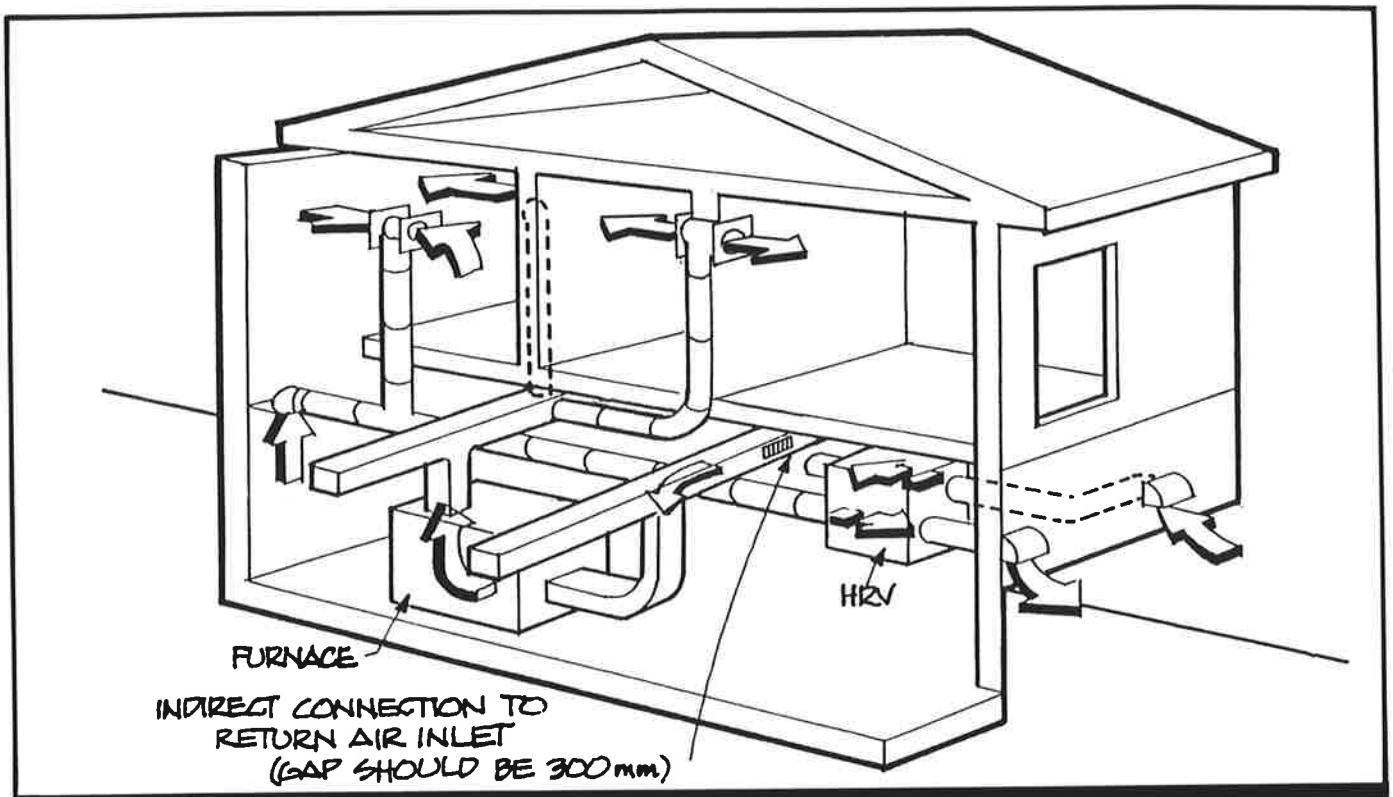


FIGURE 14. **EXAMPLE OF AN HRV DUCT SYSTEM RELYING ON THE FURNACE FOR FRESH AIR DISTRIBUTION**

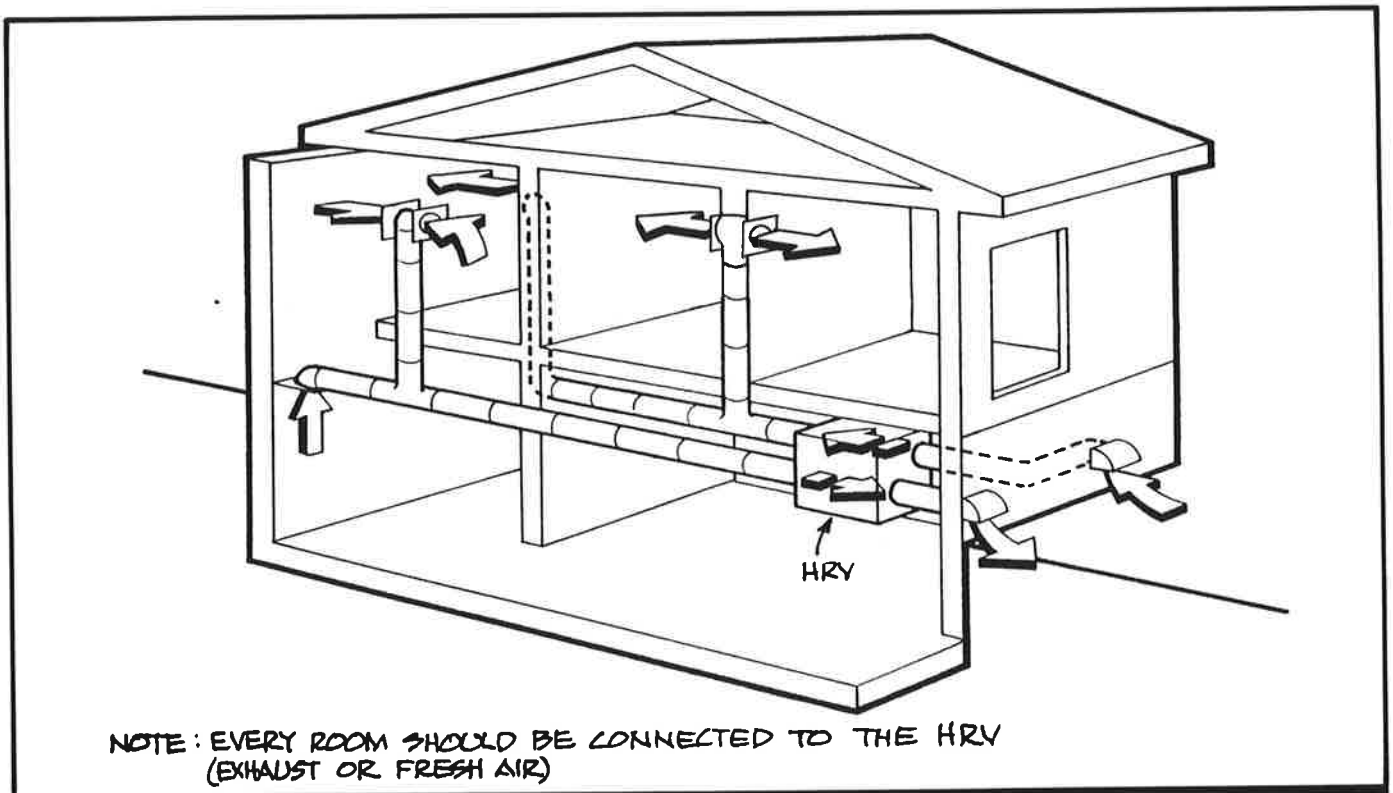


FIGURE 15. **EXAMPLE OF AN INDEPENDENT HRV DUCT SYSTEM**

OPERATING YOUR HRV

Once your HRV is installed and functioning, operation is relatively easy. The following general points, and the manufacturer's instructions, should help ensure safe and reliable performance.

KEEP YOUR SYSTEM OPERATING

During the heating season, the HRV should operate continuously. During the rest of the year, you should also operate your HRV at all times, unless you conscientiously allow for continuous house ventilation by some other means (such as open windows).

If your HRV doesn't work, get it fixed! If you have turned it off to reduce noise or eliminate cold drafts, turn it back on (and see Chapter 5 for advice on how to solve these problems).

Don't be tempted to leave the unit off to save money: the very small savings you achieve will be at the expense of good air quality. R-2000 program energy targets for your home are based on **continuous** operation of the HRV.

HOW MUCH VENTILATION?

Air quality varies in a home, as does the sensitivity of individuals to various pollutants. Given this, how much ventilation should your HRV provide? As discussed in Chapter 2, the HRV has two modes of operation:

- **Low speed operation**

  If properly designed and installed, low speed operation of your HRV system should provide **at least 5 litres per second of fresh air to each room of your house,** and 10 litres per second to the basement. If you run the unit continuously as recommended, and if there is no extraordinary source of pollution inside the home, this level of ventilation is considered adequate for **basic** requirements. Note, however, that in special circumstances (households with heavy smokers, large families, etc.), a greater low speed ventilation rate may be required.

  If you have any doubts about your low speed ventilation, check with your HRV installer. By measuring actual airflows at the HRV, he/she can determine whether or not enough fresh air is being provided. If not, on some units the low speed ventilation rate can be adjusted (see Figure 16). Remember that it is better to provide somewhat **more** than adequate ventilation instead of less than adequate.

  Even if your HRV is providing enough fresh air to the house as a whole, it may **not** be providing enough to some rooms. Each room in the house should receive the required 5 litres per second. Again, if you have any doubts, check with your HRV installer.

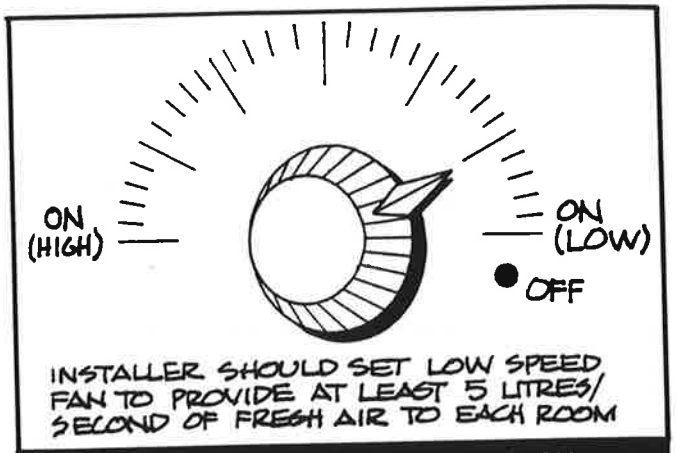


FIGURE 16. **VARIABLE SPEED SWITCH CONTROLLING LOW SPEED FAN OPERATION**

- **High speed operation**

  Generally, the HRV should be able to provide extra ventilation by temporarily switching into high speed operation. At high speed, the HRV should be able to exchange at least half the volume of house air each hour — a quantity referred to as 0.5 air changes per hour. To determine whether your system has adequate high speed capacity, refer to **Is the High Speed Capacity of Your HRV Sufficient?** on the opposite page.

  High speed operation will be required at various times in the kitchen, bathroom(s), and workshop. It may also be required during a party; when various household chemicals are being used; when the house air seems stale, contains odours, or is too humid; etc. You should also operate your HRV at high speed more often during the first year after house construction, since the building materials in new houses give off excess humidity and vapours during this initial period.

  As discussed in Chapter 2, high speed operation may be triggered by a simple switch or by automatic controls, depending on the installation. For details on the most common automatic control — the humidistat — see **Setting the Humidistat** on the opposite page.

SPRING, SUMMER, AND FALL OPERATION

Continuous ventilation is important year-round. Therefore, if your house is air conditioned, or if for any reason you keep the windows and doors closed during spring, summer, and fall, then you should operate the

Continued on page 12 . . .

IS THE HIGH SPEED CAPACITY OF YOUR HRV SUFFICIENT?

It is easy to do an approximate calculation of whether or not your HRV has sufficient high speed capacity to provide 0.5 air changes per hour:

1. Calculate the volume of your house in cubic metres by multiplying the total floor area (including basement) times the ceiling height. If different parts of the house have different ceiling heights, calculate the volume for each part separately, then add the parts together.
2. Multiply the volume by 0.14. The result is the minimum required high speed capacity of your HRV system, in litres/second.
3. If your installer provided a **Ventilation Installation Report**, look up the actual capacity of the HRV system in litres/second and compare this to your required capacity. If the Report is unavailable, compare your requirements to the HRV capacity claimed by the manufacturer. Note that the unit **may** deliver 10%-50% **less** fresh air than the manufacturer's rating, because of resistance to air flow in the ducts and other factors.

If the HRV is the only ventilation system in your home, and if your ventilation requirements seem higher than the HRV can supply, discuss the situation with your installer.

Example: 200 m^2 house with 2.4 m ceilings and an HRV system tested at 55 litres per second capacity.

1. Volume = 200 m^2 x 2.4 m = 480 m^3
2. Required high speed capacity = 480 m^3 x 0.14 = 67 litres/second
3. HRV system has been tested at just 55 litres/second capacity. The HRV installer should be consulted.

Note that one litre/second is equivalent to approximately two cubic feet/minute (cfm).

SETTING THE HUMIDISTAT

Day to day living adds moisture to the air. Your HRV should normally be capable of removing excess indoor humidity while operating in its low speed mode. High speed should only be necessary intermittently, primarily during periods of heavy moisture generation.

To provide high speed operation at such times, some HRVs are equipped with a humidistat (sometimes called a dehumidistat) which switches the unit to high speed when the humidity levels in the home reach a set level. **The lower the humidistat setting, the more the unit will operate at high speed.**

In winter, individual circumstances will determine the most appropriate humidistat setting. For instance, if you notice high humidity in the house or excessive window condensation, then lower the humidistat setting. On the other hand, if you notice dry static air, you may have too high a rate of ventilation. You can increase your humidistat setting in order to reduce the amount of high speed ventilation — but only if you are confident that your low speed ventilation is sufficient to meet your basic fresh air needs (as discussed in the main text). **In general, your humidistat setting during the winter should not exceed 30 to 40%** relative humidity (see Figure 17).

During the spring, summer, and fall, and in winter in some parts of the country, the humidity levels in the outside air may be high. At these

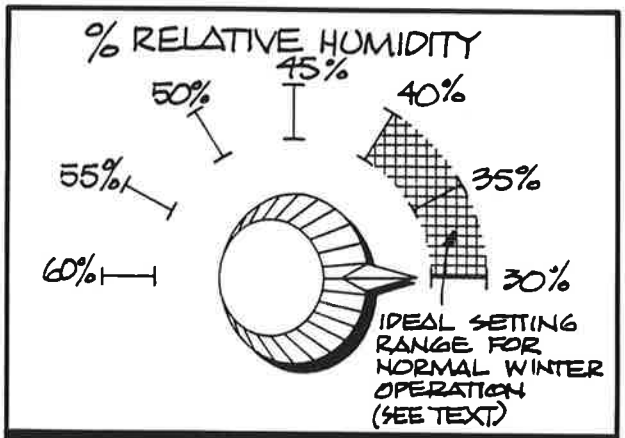


FIGURE 17. **HUMIDISTAT CONTROLLING HIGH SPEED FAN OPERATION**

times, replacing inside air with fresh outside air will not significantly reduce indoor humidity levels. As a result, a low humidistat setting will cause the HRV to operate continuously at high speed. To avoid this, **during spring, summer and fall the humidistat must be turned up** to a level above the house humidity levels. Manual switches can be used to provide high speed ventilation, when required.

If you do not achieve satisfactory results by adjusting your humidistat as described here, contact your builder/installer for assistance.

HRV continuously at these times. Except for the humidistat setting, your method of operation should be essentially the same as during the heating season. Compared to open windows, you may find that the HRV keeps the home cooler and quieter, provides better security, cuts the amount of pollen and dust entering the home, and keeps the rain out.

If you do keep windows open day and night, you can still leave your HRV on all summer. The result will be better ventilation than the windows alone could provide. If you prefer, however, the low speed of the HRV can be switched off, leaving high speed to be used occasionally to remove kitchen and bathroom odours. Make sure the windows you open provide good air movement through the house.

When your HRV is operating, you must keep summertime contaminants away from the fresh air intake. For instance, don't use pesticides and herbicides nearby, and be sure to keep your barbecue downwind.

AIR FOR COMBUSTION

Oil or gas furnaces, fireplaces, wood stoves, and other combustion appliances "consume" air for combustion. It is important that the necessary air be readily available. If it is not, the appliance may "backdraft", releasing unhealthy and potentially dangerous combustion gases into the house.

In a well-sealed R-2000 house, three conditions should be met in order to avoid a backdrafting situation:

- **Combustion appliances must have a separate air supply:**
  Oil or gas furnaces, fireplaces, wood stoves, and other combustion appliances must have a separate air supply. This is especially true for fireplaces or open wood stoves which can consume large amounts of air. Your builder should be aware of this requirement and should have addressed the problem. However, any combustion systems (such as fireplaces) installed after the home was constructed must also have a separate supply of outside air for combustion. **Your HRV does not provide combustion air.**
- **"Make-up" air should be provided for other exhaust fans:**
  Any exhaust systems in the house which are vented directly to the outside can compete with the combustion appliances for the air they need. For instance, directly-vented exhaust fans, central vacuums, dryers, and vented cooking stoves can all cause combustion air problems (and can affect HRV performance).

  To avoid this situation, when appliances such as those mentioned are operating, outside "make-up" air must be available to replace the "lost" house air. Because **your HRV is not designed to provide this make-up air,** some kind of separate fresh air inlet is required.

  Builders should be aware of this requirement and should have taken appropriate steps. However, if you have any doubt, or if any type of exhaust system has been installed since the house was built, contact the R-2000 Program for information on how to supply make-up air. In the meantime, you can avoid problems by slightly opening a nearby window while any exhaust system is operating (though care should be taken if windows are prone to freezing open).
- **Your HRV should be "balanced":**
  It is important that your HRV be "balanced" so as to provide approximately as much incoming fresh air as there is outgoing stale air. Otherwise, in some situations the HRV could "rob" the combustion appliances of the air they need for safe operation.

  In fact, a balanced HRV is desirable even in houses without combustion appliances. In part this is because an HRV operates at its maximum efficiency when the flows are balanced. In addition, a number of apparently unrelated problems, such as freezing doors and increased air leakage, can be caused by an imbalanced HRV.

  Balancing of the HRV requires special equipment to measure air flows, and so is normally done by a qualified HRV installer. Your HRV should have been balanced when installed. You should **not** attempt to adjust the relative speeds of the two fans, or reposition the main dampers in the duct work, because such adjustments could imbalance the system.

  If you suspect your system is out of balance, clean the filters and eliminate any blockage of the air intake or exhaust hoods. If you still suspect that your system is imbalanced, contact your HRV installer.

  Note: On newer HRVs, the defrost cycle should not imbalance the system to any significant degree. However, on some **older** units where the defrost mechanism operates by shutting down the inward flow of fresh air, the effect of defrost on overall system balance can be more pronounced. Though serious problems are unlikely, if your unit is of the type described, and if you have combustion appliances in your home, you should contact your installer. He or she should be able to advise you whether difficulties could arise and, if so, what changes can be made. Installation of a "make-up" air duct may be all that is required.

If you have met all the above requirements, you are unlikely to have a backdrafting problem. If you have any doubts, contact a heating contractor or the R-2000 Program for further information.

PROBLEMS AND SOLUTIONS

As with any appliance, problems can develop with your HRV, even if operated properly. Some of these problems will be very simple to remedy; others may require professional servicing. This chapter provides a "Trouble Shooting Guide" which should help you to separate simple problems from complex ones, and will indicate to you when a specialist should be called in. **For more specific information, consult your HRV owner's manual.** Always disconnect the power supply before working on your unit.

HRV TROUBLE SHOOTING GUIDE

Problem	Action
1. HRV not operating	• Check HRV controls, circuit breakers/fuses, electrical outlet, and electrical cord. Adjust as appropriate. • Call installer if problem persists.
2. HRV operating, but little or no airflow in one or both air streams	• Check exterior hoods for blockage. Clean or remove frost, if required. • Check filters. If required, clean or replace. • Examine core for blockage. If required, manually clean or defrost. Call installer if frost blockage recurs. • Check ducts for leakage. Tape loose joints if required. • Call installer if problem persists.
3. HRV with high and low speed capability running on one speed only.	• Check all switches for malfunction by varying settings. If unit remains on same speed, call installer. • If switches function properly, adjust to provide adequate ventilation (Chapter 4).
4. Unusual noise and vibrations	• Oil fan motors if not self-lubricating. • Tighten any loose screws, fittings, etc. • Clean fan blades and core if required. • Have unit serviced if problem persists.
5. Excessive noise in living quarters	• Ask installer to move unit or to install vibration isolators, additional inlets/outlets, larger ducts, or soundproofing, as appropriate. • In most cases, noise levels can be easily reduced to acceptable levels.
6. Cold drafts in living quarters	• If unusual problem, check for blockage of **exhaust** air stream (Problem #2 above). • If continuing or recurring problem, ask installer to provide diffusers, relocate fresh air outlets, add additional outlets, or add duct heater, as appropriate.
7. Poor air quality/ excess moisture in **parts** of house only	• If house has forced air heating, ensure that furnace fan is operating continuously and that the duct system provides adequate airflow to the parts of the house with problems. • Undercut doors if there is no gap for air circulation from affected rooms to hallways. • If problem area is a source of moisture or pollutants, eliminate the source, if possible. • If problem persists, have installer upgrade air circulation system and/or HRV controls.
8. Poor air quality/ excess moisture **throughout** house	• Ensure that HRV is operating properly (Problems #1 and 2 above). • If problem persists, minimum continuous ventilation rate may be inadequate. Review Chapter 4 of this booklet. Adjust system or contact HRV installer, as appropriate.

ROUTINE MAINTENANCE

With routine preventative maintenance, you can avoid may of the problems just discussed, improve the effectiveness of your HRV, and prolong its useful life.

The summary below indicates the major HRV maintenance requirements. For more specific guidance, refer to the instructions provided by the manufacturer of your HRV. **Be sure to disconnect the electrical power before servicing your system.**

1. **Clean or replace air filters**
   - If the HRV has filters, these should be cleaned or replaced regularly (see Figure 18). Dirty, clogged filters can result in decreased ventilation efficiency and unbalanced air flows.

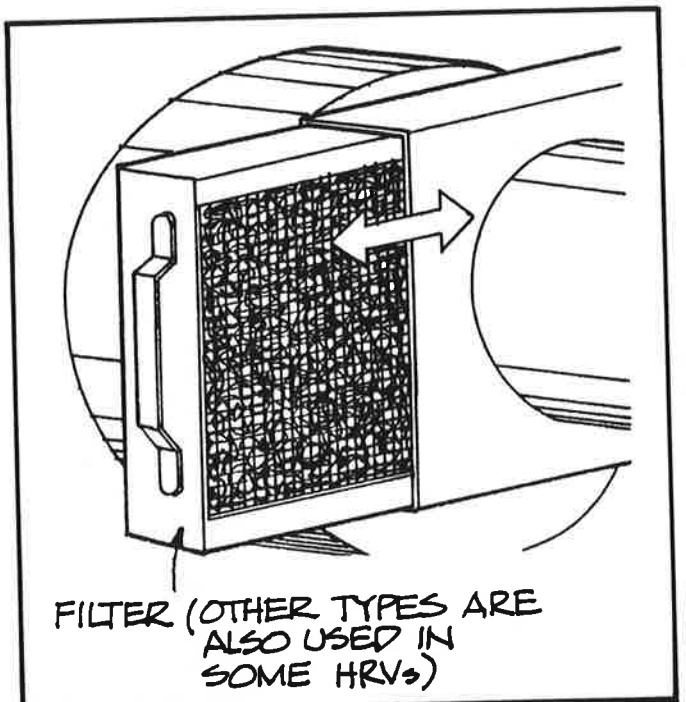


FIGURE 18. **REMOVING FILTERS FOR CLEANING**

2. **Inspect exterior intake and exhaust hoods**
   - Regularly check outside vents to ensure that the screen openings are not restricted with grass, leaves, spider webs, debris or any other forms of obstruction (see Figure 19). During winter, ensure that snow or frost build-up does not block the openings. (If the openings are continually clogged or blocked, consider raising the vent openings higher up the wall.)
   - Check to ensure that no sources of odours or contaminants are located near the fresh air inlet.

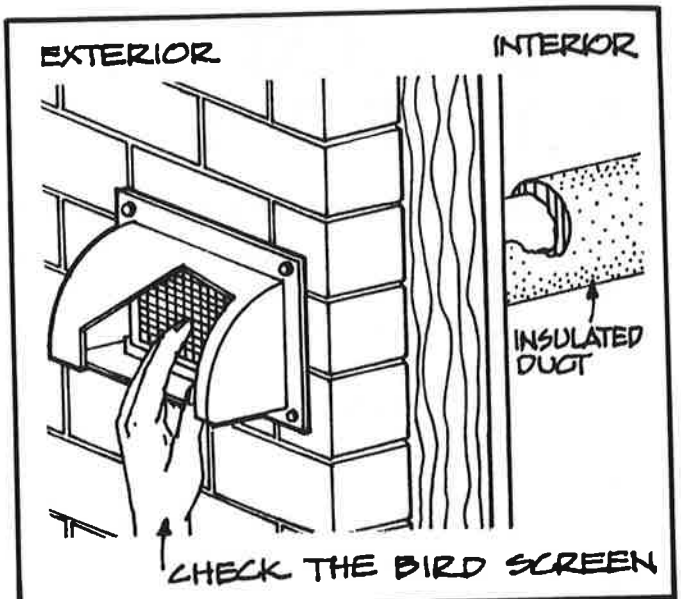


FIGURE 19. **CHECKING DUCT INLETS AND OUTLETS**

3. **Clean the heat exchange core**
   - Inspect the HRV core regularly and clean when required. A build-up of dust and dirt can reduce HRV air flow and efficiency.
   - Depending on the manufacturer, the core should be either removed from the HRV for cleaning, or cleaned in-place. Consult your owner's manual for instructions.

4. **Inspect the condensate drain**
   - Periodically check that the drain line from the HRV is open and free flowing. Clean if required.

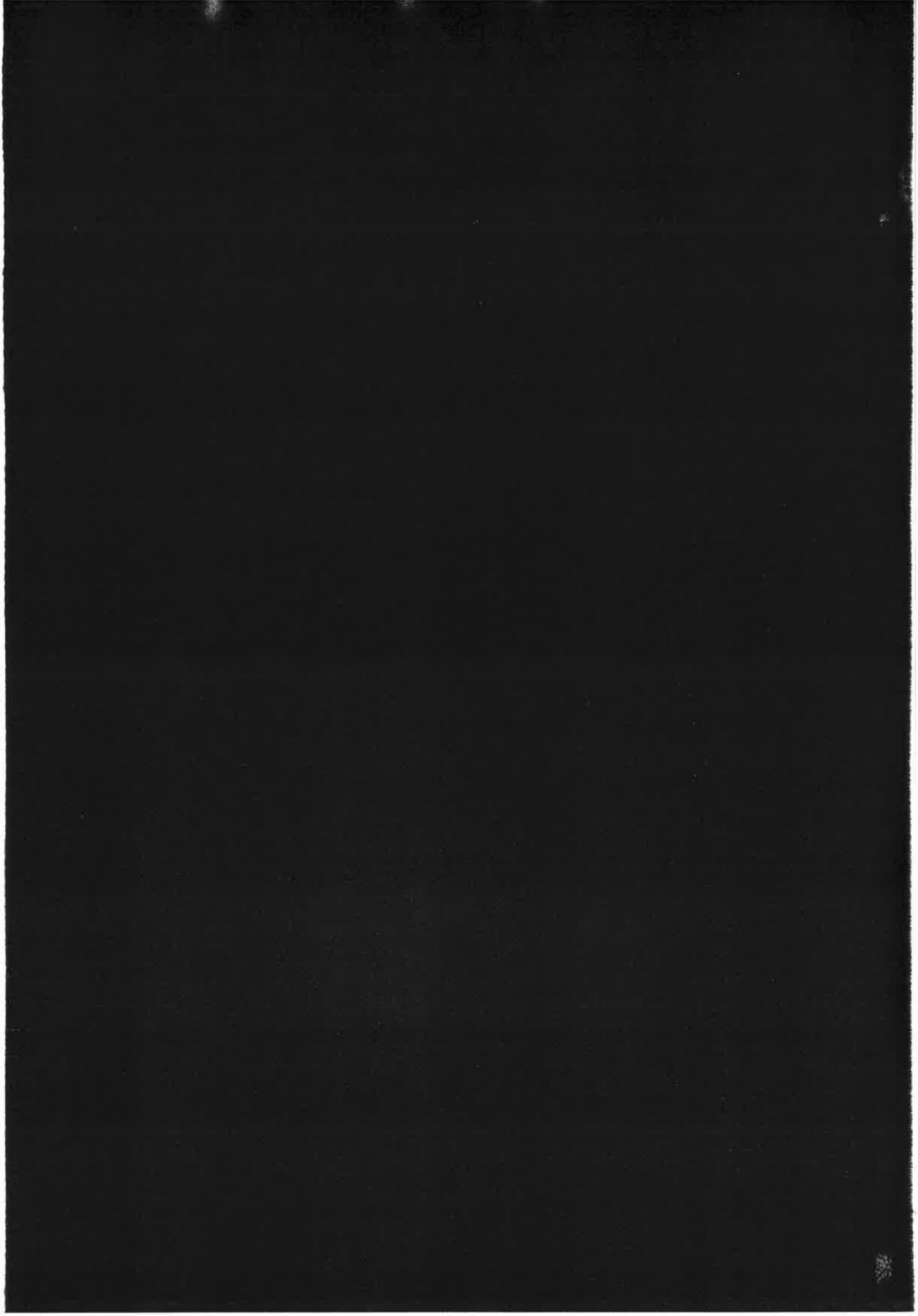
5. **Service the fans**
   - Fan motors on many HRVs are designed to operate continuously without lubrication. Check your owner's manual to determine if motor lubrication or service is necessary.
   - Fans should be inspected periodically for dirt accumulation on the blades. If necessary, remove any dirt by gently brushing the fan blades.

6. **Clean the duct work if required**
   - Duct work leading to and from the HRV will accumulate dirt over time. These air passages

should be periodically inspected by removing grilles and duct ends where accessible. If an accumulation of dirt is present, the ducts can be partially cleaned with a vacuum cleaner. Many heating contractors can provide a more thorough cleaning using special equipment.

7. **Provide an annual general servicing**
   - As with a furnace, it is beneficial to have an HRV service contract that provides an annual general servicing by an HRV technician. Ensure that the technician is accredited by the Heating, Refrigerating, and Air Conditioning Institute of Canada (HRAI) and that he/she has been trained by the manufacturer of your HRV.
   - The annual servicing should include a general check for proper operation. Controls and electrical connections in the HRV should be inspected, particularly those located inside the exhaust and fresh air streams. The defrost system should be tested.
   - The system should be checked for proper balance of air flows and, if necessary, the HRV should be rebalanced. Actual airflows should be measured, and the results should be marked on a label affixed to the HRV.
   - The annual servicing should also include maintenance items 1 to 6 (above), plus any special requirements of the particular HRV.
   - At the completion of the service call, the technician should provide a written report on the condition of the HRV.

To help you remember when maintenance is due on your HRV, an HRV Maintenance Chart is provided on the inside back cover of this booklet. This chart suggests a reasonable service schedule (for use if the manufacturer's recommendations are unavailable) and includes spaces to permanently record all maintenance performed.



Heat Recovery Ventilator Maintenance Chart

INSTRUCTIONS

1. With the assistance of your HRV owner's manual, enter the manufacturer's recommended service schedule in Column 2. Use the extra spaces in Column 1 for any additional servicing items.
2. Make a copy of this chart, post it on your HRV, and record all the servicing that you do. This chart will then provide both a record of past service and a reminder of service due.
3. If information on the manufacturer's recommended service schedule is not available, service your HRV in accordance with the following schedule:

Monthly:
- Check air filters, outside hoods and screens; clean or replace as required

Every 3-6 months:
- Check heat exchange core; clean as required
- Check condensate drain; clean as required
- Oil and service fan motor, if applicable; clean fan blades as required

Annually:
- Inspect ductwork; clean as required
- Arrange for annual general servicing by qualified technician

MAINTENANCE CHART

1. Maintenance Required (see Chapter 6 for for details)	2. Manufacturer's Recommended Service Schedule	3. Date Maintenance Performed					
Clean or replace air filters							
Clean or unblock outside hoods and screens							
Clean the heat exchange core							
Clean condensate drain							
Service fans							
Clean ductwork							
General servicing by qualified technician							
Other:							
Other:							
Other:							

Note: Not all HRVs will require all the servicing identified.
CAUTION: DISCONNECT ELECTRICAL POWER BEFORE SERVICING

For More Information

For further information on R-2000 homes and on HRVs, contact Energy, Mines and Resources Canada:

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