6

ENERGY SAVING GUIDE:
Energy saving solutions for home comfort

Heating systems

Manitoba Hydro

For more information:

Telephone: (204) 480-5900 in Winnipeg
Toll-Free: 1 888 MBHYDRO (1-888-624-9376)
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Publications in this series

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BOOKLET #6

Heating systems

Important Notice

Care has been taken to ensure the accuracy of this booklet. However, because of changing codes, standards and equipment design, you should seek professional advice before you modify or replace the heating system in your home. Manitoba Hydro cannot assume responsibility for injury, loss or damage that results from relying solely on the information contained in this booklet.

Contents

Introduction

Who should read this booklet

This booklet will help you save money and improve the comfort and safety of your home, whether you are a first-time or experienced homeowner.

Use this illustrated guide to learn how to:

- Maintain your home heating systems between regular servicing by a professional heating contractor;
- Make improvements to reduce home heating bills;
- Identify and correct combustion backdrafting and spillage, a potentially serious safety problem;
- Deal with a furnace or boiler that suddenly needs replacement; and
- Select and work with a contractor.

This booklet concentrates on the most common home heating systems used in Manitoba. These include forced-air and hot water heating systems fuelled by natural gas, propane, oil, and electricity. Baseboard electric heating systems are also covered, as well as geothermal heat pumps.

Although not included in this publication, alternative and renewable energy sources such as wood or solar energy can play an important role in home heating. To learn more about these energy options, contact Manitoba Hydro.

The importance of heating systems

Heating your home is likely the largest energy use in your home. An inefficient heating system wastes both energy and money.

Heating systems can have a major impact on the safety and comfort of your family. They can also fail with little warning. If this happens, you will be under pressure to make an important decision quickly. Be prepared, so that you don't make a poor decision that affects your household budget and home comfort for years.

Finally, your decisions also affect the quality of the environment. Producing, transporting, and using energy can harm the environment. Making your home more energy efficient reduces this impact to the environment.

How to use this booklet

As you begin to read this booklet or talk to a heating contractor, you may encounter unfamiliar terms or abbreviations. Use the **Glossary** at the back of the booklet for an explanation.

Before you undertake any maintenance discussed in this publication, read the instructions carefully. If you are unsure how to do something, ask your heating contractor to show you the correct procedure. Only perform tasks that are within your level of expertise.

If you want to modify or replace your home's heating system, consult a licensed contractor.

It pays to spend extra time to find and then stick with a good heating contractor. You'll probably need their services more often than any other type of home improvement contractor. Consult the section on **How to get the help you need** (page 28) for help in selecting and working with a contractor.

Home heating

Forced-air furnaces and hot water boilers should be cleaned and inspected once a year by a heating contractor. "Do-it-yourself-ers" can also perform a range of tasks to ensure the safe and efficient performance of these systems between service visits by a professional.

This section also provides tips on modifications that can improve the performance of forced-air furnaces and hot water boilers.

Because of their simple design, electric baseboard heaters do not require regular servicing by a heating contractor. However, these systems do require some simple do-it-yourself maintenance and can be modified to improve their performance.

Do-it-yourself maintenance

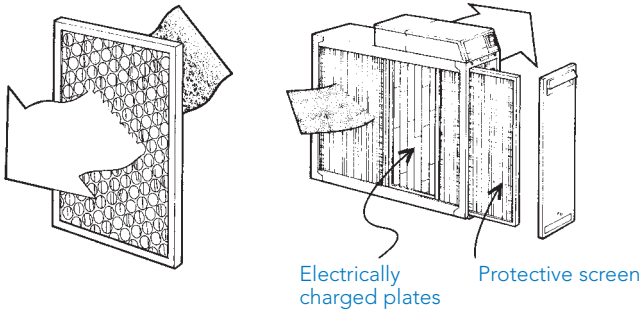
Forced-air systems

Keep the furnace air filter clean

It is important to clean or replace the air filter in your furnace regularly. A filter clogged with dust and dirt restricts air flow. This causes the furnace to run hotter and reduce its efficiency and life expectancy. It could even cause the furnace to shut off. A restricted air flow can also create comfort problems by making it difficult to heat rooms further away from the furnace.

Most furnaces have either an inexpensive, disposable air filter or a permanent, washable air filter (see **Figure 1**). Replace disposable filters or wash permanent filters as often as once a month during the heating seasons.

Figure 1 • Furnace air filters



Contractor checks

Note that a professional heating contractor should service and maintain your furnace annually. The contractor should also perform the following tasks during a routine check:

- check the venting system;
- check the combustion air intake and piping (if applicable);
- check the condition of the furnace heat exchanger and clean if necessary;
- inspect the burners and clean if necessary;
- check that all operating and safety controls are functioning properly;
- check the blower fan wheel and clean if necessary;
- check and lubricate all bearings, if applicable;
- inspect belt, if applicable;
- check air conditioner coil; if applicable, for blockage;
- check for loose or missing parts and fasteners;
- clean or replace air filter for forced air systems;
- once the inspection and cleaning is complete, check for proper furnace operation during a heating cycle;
- advise you of any deficiencies and what action is required;
- check and clean the flame sensor.

If your furnace has an electronic air cleaner (see **Figure 1**), wash the cells and protective screens about once every two months during the heating season. Check your owner's manual for specific instructions on cleaning.

The service frequencies recommended above are for an average home. Clean or replace the air filter more often if:

- there are several people living in your home;
- people smoke in your home;
- your home is in a duty area such as near a busy street or an industrial site;
- members of your household are sensitive to poor air quality;
- you have hobbies such as woodworking that produce a lot of dust;
- you are renovating your home;
- you use central airconditioning; or,
- your furnace fan runs continuously.

For more information about how to make your home healthier, refer to **Booklet #8: Indoor air quality & ventilation**. Contact Manitoba Hydro for a copy.

Don't restrict the air flow

The efficient operation of a forced-air heating system depends on an unobstructed flow of air. Avoid blocking supply-air registers and return-air grills with furniture, drapes, rugs or other objects.

Do not install filters in the return-air grills or supply-air registers, or change to a more efficient air filter, without consulting with your heating/air conditioning contractor.

Clean supply-air registers, return-air grills and ducts

Keeping the duct system clean reduces the need to clean or replace the furnace air filter. It also prevents the ducts from becoming a breeding ground for contaminants such as molds and dust mites.

Vacuum supply-air registers and return-air grills whenever you notice dust beginning to collect. Once a year, remove registers and grills and then vacuum inside the ducts as far as you can easily reach. If there is a heavy accumulation of dust and dirt, consider hiring a furnace and duct cleaning service to clean the entire system.

It is also a wise precaution to have the ducts professionally cleaned after a major interior renovation or when you purchase a new home. A surprising amount of dust and debris may have entered the ducts during construction.

Clean and adjust the furnace humidifier

Poor maintenance of furnace humidifiers can promote the growth of bacteria and fungi. This can lead to health problems, ranging from flu-like symptoms to serious infections.

If the humidifier's water reservoir is allowed to overflow, it may cause serious damage to the furnace.

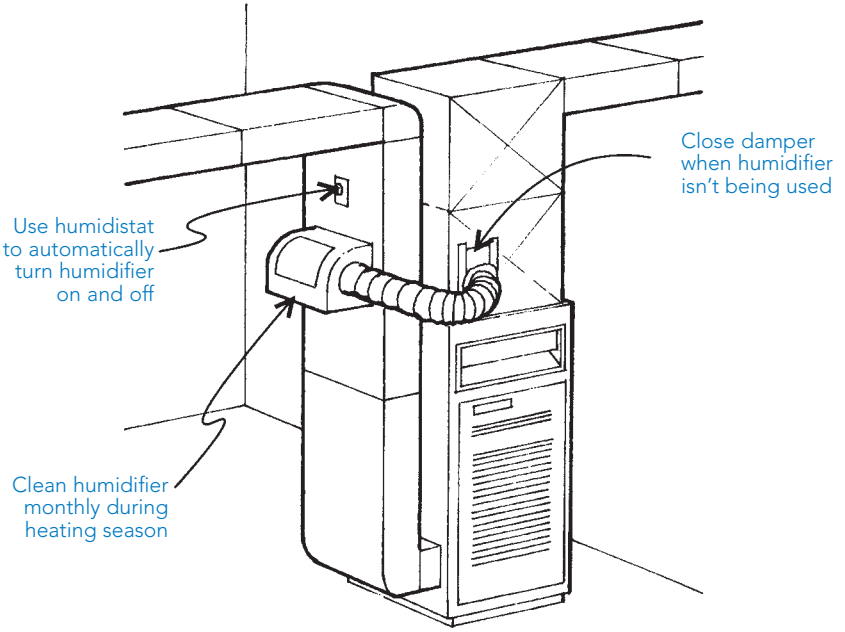
Follow the manufacturer's maintenance instruction in the owner's manual. If you don't have a manual, the instructions may be on the humidifier itself. If you can't find the instructions, follow these guidelines:

Drum-style humidifiers

- Turn off both the electricity and water supply to the humidifier.
- Open or remove the humidifier's access panel.
- Remove the evaporator pad from inside the unit.
- Thoroughly clean the evaporator pad in a solution of one part vinegar to three parts water. Rinse several times with clean tap water. If the pad is more than one year old, replace it.
- Remove the humidifier's water reservoir and clean it with a vinegar and water solution. Rinse several times with clean tap water.
- Reassemble the humidifier except for the access panel.
- Turn on the humidifier's electricity and water supply and increase the humidity setting on the unit to its maximum setting. Turn up the thermostat to activate the furnace fan.
- Look inside the humidifier to make sure that all moving parts operate freely.
- Adjust the float level so that the water reservoir doesn't overfill. A rule-of-thumb is to keep the water level 12 mm (1/2 inch) below the top of the reservoir.
- Turn down the thermostat for the furnace. If the humidifier keeps operating after the furnace fan stops, the wiring is incorrect and should be changed by your heating contractor.
- Finally, replace the humidifier's access cover and return the humidity control and furnace thermostat to their usual settings.

Clean and adjust the furnace humidifier once a month during the heating season. At the end of the heating season, clean the humidifier once again. Turn off the electricity and water supply until the fall. Also, close the damper that diverts air from the furnace to the humidifier (see **Figure 2**).

Figure 2 • Furnace humidifier – drum-style



Flow-through humidifiers

Flow-through humidifiers look much like drum-style humidifiers. The main difference is that flow-through humidifiers do not have a pan of standing water.

When your humidistat calls for moisture, a solenoid valve opens, allowing water to be distributed over the evaporator pad.

Some of the furnace air is re-circulated through the humidifier. The re-circulated air picks up moisture from the evaporator pad and distributes it to your home through your ductwork. Any excess moisture in the humidifier is carried to a drain.

Manufacturers recommend that you have your flow-through humidifier serviced annually by a qualified service person, and that the evaporator pad be changed annually.

Be aware of safety hazards

Furnaces that burn fossil fuels, such as natural gas, propane, or oil, need an unobstructed supply of air to operate safely. Keep the area around the furnace free from clutter. At least twice a year, vacuum the area around the furnace to remove dust and dirt. Be careful not to blow out the furnace's pilot light with the exhaust from the vacuum cleaner.

Don't store flammable liquids in your home. Vapours from these liquids can explode if ignited by the pilot light or burners. Also be extremely careful when using flammable liquids elsewhere in your home.

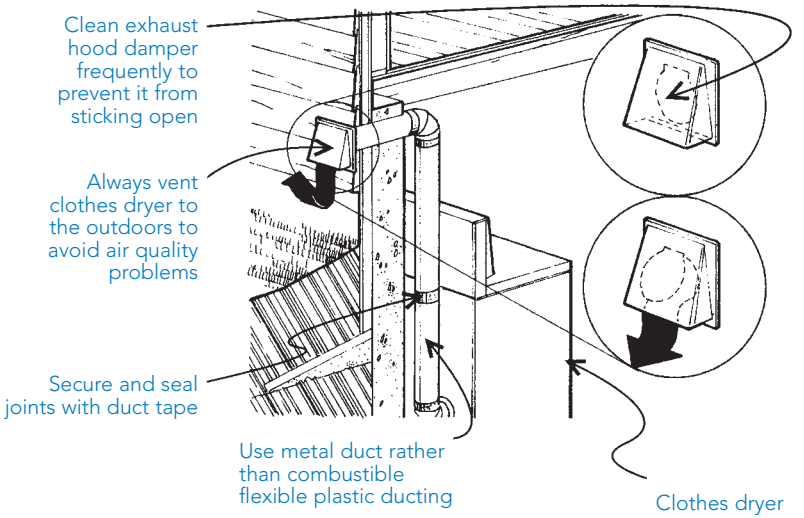
Do not operate the furnace with the fan access panel removed. It could cause combustion gases from the furnace or water heater to spill into the house rather than exit through the chimney. Removing the panel will also unbalance air flow in the system, leading to comfort problems. Newer furnaces usually have a switch that automatically shuts off the furnace fan if the access panel is removed.

Always vent your clothes dryer to the outdoors to avoid potential indoor air quality problems (see **Figure 3**). This is especially important with natural gas and propane dryers.

Never assemble a dryer exhaust duct using screws at the joints. The screw tips can trap lint, creating a fire hazard. Instead, secure joints with duct tape.

Since lint is combustible, inspect and clean the interior of the clothes dryer's exhaust duct at least once a year. Check and clean the damper in the exhaust hood frequently so that it opens and closes properly. Never install a screen over this exhaust outlet.

Figure 3



Do-it-yourself maintenance

Hot water systems

Don't restrict the flow of air around the radiators

Vacuum dust and dirt that collects on radiators. Avoid blocking the flow of air around a radiator with furniture. If you use a ventilated cover, make sure that it has enough opening to admit cool air at the bottom and release warm air at the top.

Oil the circulating pump and motor

If your heating system has a circulating pump, oil the electric motor and pump assembly (see **Figure 11**). Look on the motor or pump for a label that describes the recommended type and quantity of oil to use. In most cases, a few drops of SAE 20 grade non-detergent oil will be suggested.

Add the recommended type and amount of oil to the oil ports on the motor ends and pump bearings. If you are unsure of where to add the oil or how much, ask your heating contractor.

If there are no oil ports visible, the motor and fan bearings are probably permanently lubricated.

Be aware of safety hazards

Boilers and furnaces share similar safety concerns when it comes to the need for an unobstructed supply of air and not being exposed to flammable vapours. See the previous section, **Be aware of safety hazards**.

The insulation around older boilers and their piping may contain asbestos. If this insulation becomes damaged, asbestos fibres may be released, causing a health hazard.

Materials suspected of containing asbestos should be tested, repaired or removed only by qualified professionals.

Do-it-yourself maintenance

Electric baseboard systems

Electric baseboard heaters require minimal attention. Follow these suggestions to maintain their efficiency:

- Vacuum dust that collects inside and under the baseboard heaters. Use a soft bristle attachment that doesn't have metal parts to clean inside the heaters. This reduces the risk of an electrical shock if some of the wiring has been inadvertently left exposed.
- Do not block the heaters with furniture or drapes. Restricting the flow of air to the heater will make it more difficult to heat the room.
- Turn down the heat in seldomly used rooms.

Keep a maintenance record

Keep a maintenance record. It may help your heating contractor solve problems more quickly and at less expense to you.

If your heating system is newer, a maintenance record may also help you if you make a warranty claim. The record can act as proof that the required maintenance was performed.

Make a copy of the blank Maintenance Record shown at the end of this publication, and post it in an easy-to-read location near the furnace or boiler. Keep track of the routine maintenance that you and your heating contractor perform. Ask your contractor to record the details of any repairs or modifications.

Identify and correct the danger of backdrafting and spillage

Combustion gases from fuel-burning heating equipment can sometimes escape into a home rather than exit through the chimney. This situation is called either backdrafting or spillage. Regardless of the name, it can be a serious health and safety concern.

Research has shown that many Canadian homes have the potential for a backdrafting or spillage problem. Use this section to learn why it occurs, how to recognize it and what to do about it.

Why backdrafting or spillage occurs

There are many common devices that exhaust air from a home. Examples include fireplaces, bathroom fans, kitchen range hoods, clothes dryers and central vacuum systems. These devices lower the indoor pressure relative to the outdoors. The amount of this pressure difference depends on the number and size of exhaust devices and how tightly the house is sealed.

As the indoor pressure decreases, the chimney becomes less capable of overcoming this force. If the indoor pressure becomes low enough, the flow in the chimney is reversed. Outdoor air will begin to flow down the chimney and into the house. This results in all of the combustion gases from the heating system escaping into the home rather than out the chimney.

There are many situations that can cause combustion gases to escape into a home even when the flow in the chimney hasn't reversed or "backdrafted." For example, a blocked chimney, a cracked heat exchanger, a corroded vent, or a loose connection to the chimney may allow combustion gases to spill into the house.

The two greatest concerns about backdrafting and spillage are that they increase exposure to nitrous oxides and carbon monoxide:

Nitrous oxides High concentrations can cause shortness of breath and irritate the eyes, nose and throat. Repeated exposure to elevated levels may also increase the risk of respiratory infection or the development of lung disease.

Carbon monoxide Carbon monoxide is a colourless and odourless gas. At low concentrations, carbon monoxide can cause fatigue. People with chronic heart disease may suffer episodes of increased chest pain.

At higher concentrations, it causes headaches, dizziness, weakness, nausea, confusion, and disorientation. The symptoms of carbon monoxide poisoning are sometimes confused with the flu or food poisoning. At very high concentrations, carbon monoxide can cause loss of consciousness or even death.

CO safety

If you are burning a fossil fuel such as heating oil, diesel, propane, kerosene, natural gas, wood, or coal in your home, or if you have an attached garage, we recommend that you install at least one carbon monoxide detector in your home.

For further details, visit our web site at hydro.mb.ca.

How to recognize if your home has a backdrafting or spillage problem

A suspected backdrafting or spillage problem should be investigated by qualified personnel. Use these indicators to help you decide whether it is necessary to call for help:

- Check fuel-burning furnaces, boilers, water heaters, fireplaces and wood stoves for combustion odours, especially when they start up (see **Figure 4**).
- Look for soot or signs of overheating at the draft hoods such as discolouration or melted plastic grommets on water heaters (see **Figure 4**).
- Check for condensation or rust on the exterior of vent pipes that connect to the chimney (see **Figure 4**). Condensation is more likely during cold weather, especially if the boiler or water heater hasn't operated for several hours. Chimneys located on exterior walls are more prone to condensation from backdrafting.
- Keep track of whether symptoms fade or go away when your family members are away from home and then reappear when they return. Also, track whether symptoms are reduced during summer when only the water heater is operating and not the furnace or boiler.

Other warning signs of carbon monoxide include the following:

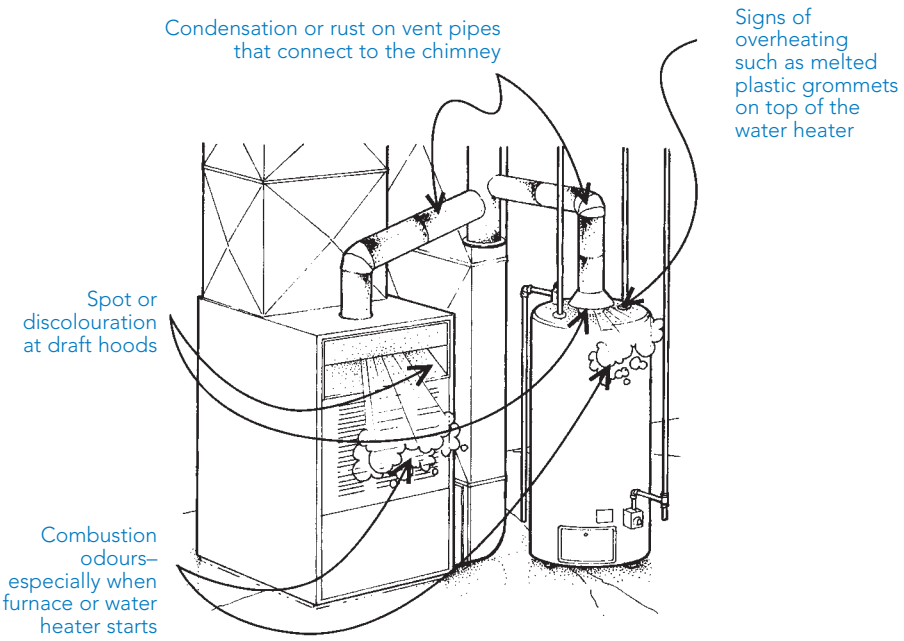
- stuffy, stale, or smelly air;
- condensation on your windows;
- backdrafting of your fuel-burning equipment;
- a yellow flame instead of the normal clear, blue flame;
- a pilot light that keeps going out; or
- an unfamiliar or burning odour in your house.

Immediately contact your fuel supplier or heating contractor for assistance if you suspect a backdrafting or spillage problem.

Be aware that there are considerable differences in the abilities of contractors to diagnose and solve backdrafting and spillage problems. Ask potential contractors whether their personnel have received special training in this field.

You can also contact Manitoba Labour, especially if the source of the problem is faulty equipment or an unsafe installation.

Figure 4



Symptoms of carbon monoxide poisoning

If carbon monoxide is inhaled, it depletes the amount of oxygen in your red blood cells, resulting in specific symptoms. Depending on the amount inhaled and the length of time you have been exposed, your symptoms could include the following:

- Low exposure — slight headache and/or shortness of breath during moderate physical activity.
- Higher Exposure — severe headache, dizziness, nausea, vomiting, mental confusion, weakness, vision and hearing impairment, collapse or fainting during exertion, loss of muscle control, and/or drowsiness.
- Extreme exposure — unconsciousness, brain damage, or death.

If you suspect carbon monoxide poisoning, call your local Emergency Services by dialling 911.

How to prevent or correct a backdrafting or spillage problem

Here are some of the more common strategies for preventing or correcting a backdrafting or spillage problem.

Have a qualified heating contractor

- Check and clean your heating system regularly to ensure that it is operating at peak efficiency regardless of the fuel it uses.
- Inspect furnaces and boilers for cracked or corroded heat exchangers as part of their annual service visit. Also ask the heating contractor to inspect the chimney for deterioration or blockage.
- If necessary, install an insulated combustion-air duct to provide outdoor air to all natural gas, propane, or oil-fired furnaces, boilers and water heaters (see **Figure 5**). If you already have combustion-air vents in place, make sure they are secure.
- Install an insulated fresh air intake duct (WETT[1]- certified) to supply combustion air to fireplaces and woodstoves. If that is not possible, be sure to leave a window open when the fireplace or stove is burning.
- Have a wood heating specialist frequently inspect and clean chimneys for wood-burning fireplaces and woodstoves.
- Have a contractor install an insulated fresh-air duct to replace some of the air exhausted by bathroom fans, the kitchen range hood, clothes dryer, or central vacuum system (see **Figure 5**). Or consider installing a heat recovery ventilator. See **Booklet #8: Indoor air quality & ventilation** for details.

You should:

- Consider installing furnaces, boilers, or water heaters with sealed-combustion models that are more resistant to backdrafting and spillage.
- Use tight-fitting ceramic glass doors on wood burning fireplaces (see **Figure 6**). Open fireplaces exhaust a large quantity of air from a home. They are a frequent cause of backdrafting and spillage problems from furnaces, boilers and water heaters.
- Ensure that all external vents, such as fresh air intake vents, exhaust vents, and chimneys are clear of snow, insulation, leaves, birds' nests, lint, debris, and any other obstructions.
- Never idle your vehicle or operate other gasoline powered equipment (mower, chain-saw, snow blower, trimmer, or generator) in an attached garage even if the garage door is open.
- Never operate a barbecue, camp stove, or lantern in your home or garage.
- Ensure that the blower (fan) compartment door on your furnace is closed properly.

- Buy equipment that bears the seal of an approved certification. Recommended carbon monoxide detectors are labelled CAN/CSA 6.19-M. They are your assurance that the equipment was manufactured in accordance with all national safety standards.
- Keep area around fuel burning equipment open and clear. This is particularly important around your furnace, which needs air to operate properly.

Figure 5 • Preventing backdrafting and spillage from a furnace

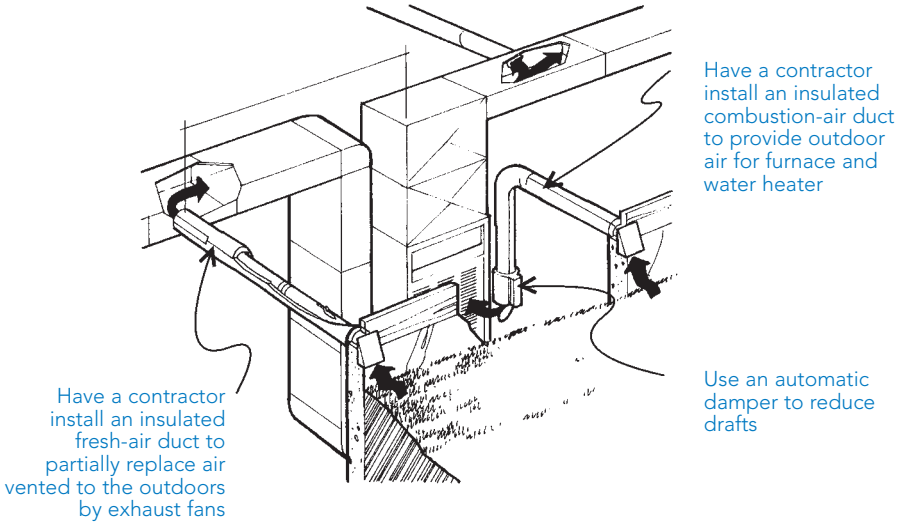
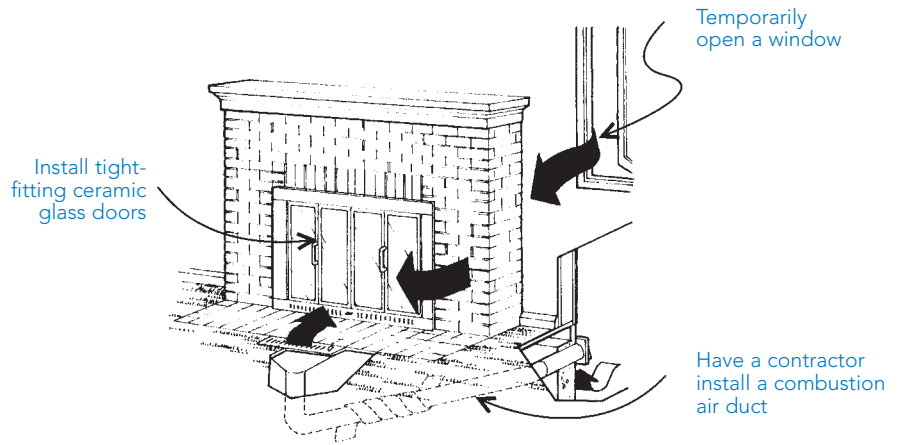


Figure 6 • Preventing backdrafting and spillage caused by an open fireplace



Install a carbon monoxide detector

If you have a fossil-fuel-burning appliance, or even an attached garage, install a carbon monoxide (CO) detector for an added measure of safety (see **Figure 7**).

These devices will sound an alarm if the CO exposure inside your home reaches a dangerous level. Although CO detectors are not a substitute for the proper use and upkeep of appliances in your home that can produce CO, they do provide a second line of defence.

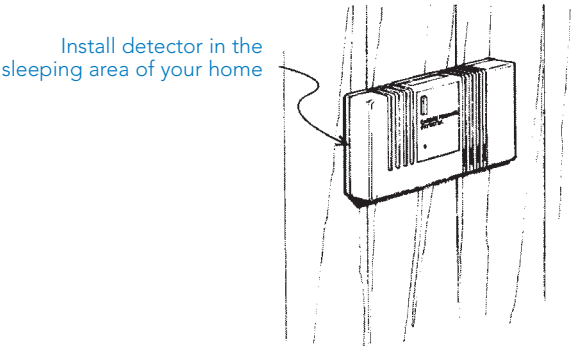
When shopping for a CO detector, look for models certified to the Canadian Standards Association (CAN/CSA 6.19-M).

Install CO detectors as explained in the manufacturer's instructions.

Never ignore an alarm from a CO detector. If the detector sounds, immediately move to fresh air either outdoors or by an open window or door and call your emergency services (fire department or 911). You should also call Manitoba Hydro's 24-hour Emergency Response number at 1-888-624-9376.

Maintain and test your CO detector in accordance with the manufacturer's instructions. An occasional light vacuuming will keep the detector's air vents clean. If you have a battery-powered unit, check to see that the battery is in place, connected, and not corroded.

Figure 7



How to reduce your heating bills and improve comfort:

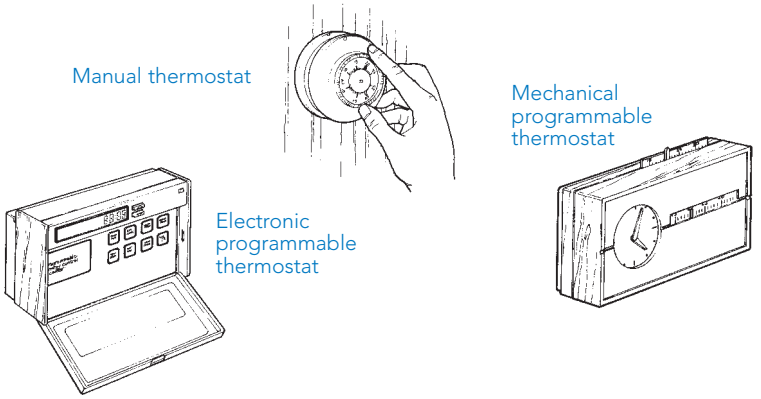
Forced-air systems

Install a programmable thermostat

Perhaps the least expensive way to save heating dollars is to lower the thermostat manually so that your home is cooler overnight and when no one is home. A way to accomplish this consistently is to install an electronic programmable thermostat to adjust the temperature automatically (see **Figure 8**).

With a programmed thermostat, you'll never forget to turn the temperature down or wake up to a cold house. As a rule of thumb, reduce the temperature whenever your home is unoccupied for at least four hours. How much you lower the temperature depends on your personal preference and how quickly your heating system can re-heat the home. Try different settings until you find one that best suits your needs.

Figure 8



Rebalance the distribution of heated air

Some rooms in your home may be uncomfortably cool. The cost of turning up the heat for an entire home can be avoided by rebalancing the distribution of heated air.

You can change the amount of heated air supplied to a room by adjusting the thumbwheel on the register that controls the air flow into the room.

Wait a few hours for the temperature in the room to stabilize. If the temperature is still too warm or cool, adjust the thumbwheel again.

If your home has central air conditioning, you may have to repeat this process during the summer. This is particularly true of basement and second floor rooms.

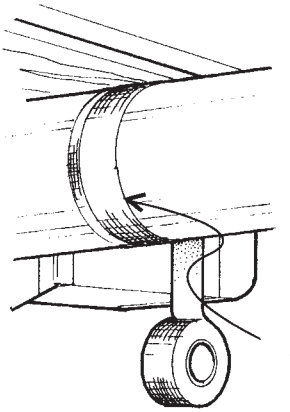
Seal joints in ductwork

Much of the heated air flowing through ductwork may never reach its intended destination because of leakage along seams and at joints. You can improve the efficiency of the ductwork by sealing these leaks with duct tape or mastic.

Follow these guidelines for a proper job:

- Seal both supply and return ducts to avoid unbalancing the air flow in the system.
- Clean the surfaces to be sealed. Duct tape sticks poorly to dusty or oily surfaces.
- Limit how much the joints in the ducts can move. Ensure they are crimped tight or secured with screws or rivets.
- Seal the joints with duct tape (see **Figure 9**). For added durability, use aluminum duct tape rather than cloth backed tape and apply a double thickness.

Figure 9



Keep your furnace air filter clean

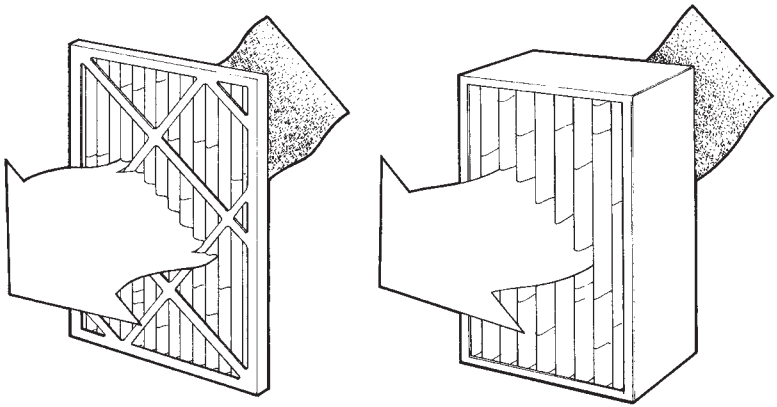
Besides improving the quality of air in your home, a clean air filter may reduce heating and cooling costs.

Most furnaces have a standard disposable fibreglass filter or a permanent, washable type made of coarse fibres or expanded metal. Disposable, pleated filters, which are more effective than the fibreglass type, are also available.

If you are thinking of installing a more efficient air filter, consider waiting until your annual furnace maintenance. Your heating contractor can install it and confirm that the furnace is still working properly.

Larger, high performance, extended surface filters are even more effective but less widely available. They feature an even greater surface area and much finer filter material (see **Figure 10**). Their larger size requires modifications to the ductwork of most furnaces. Consult your heating contractor for details.

Figure 10



Replacement for standard disposable filters

High performance filter (Requires modifications to ductwork and more powerful furnace fan)

Electronic air cleaners use washable protective screens to trap larger particles and a series of electrically charged plates to collect smaller particles (see **Figure 1**). They are about 20 to 40 times more effective at cleaning the air compared with standard disposable fibreglass furnace filters. If you decide to install an electronic air cleaner, talk to your heating contractor.

If you are thinking of installing an electronic air cleaner because someone in your household has allergies, asthma, or other respiratory problems, consult your doctor first to confirm that the device will be effective for your situation.

Furnace noise – causes and remedies

Excessive noise from a forced air heating system can be caused by:

- an unbalanced fan;
- worn bearings on the fan blower, blower motor, and induced draft fan motor
- vibration transmitted from the furnace to connected ductwork, piping, and supports;
- restricted air flows;
- undersized ductwork;
- loose or cracked belt (if applicable).

All forced air heating systems create some noise. Talk to your mechanical contractor to find out if there is a problem. If the noise is created by worn fan or motor bearings, replace the fan bearings. Motor bearings cannot be replaced. If the fan is unbalanced it should be adjusted or replaced.

Vibration noise can be reduced by:

- repairing sources of excessive vibration (such as an unbalanced blower);
- ensuring duct work is not strained;
- installing flex connectors on the return air and supply air plenums on the furnace;
- altering supports;
- ensuring separation from other vibrating devices or piping.

Blocked return and supply registers, a dirty filter, or obstructions in the ductwork can cause restricted airflow. This can be avoided by ensuring that your furnace filters are kept clean, registers are not blocked, and your ducts are kept clean.

Undersized ductwork generally requires replacement of a portion of the ducting system and installation of new ductwork. Contact an HRAI certified residential air system designer to determine if your ducting system is undersized and to provide a new design if it is.

Duct noise can be minimized when you are replacing your furnace by making sure your furnace is not over-sized. Generally, the larger the furnace, the more air flow it will deliver and the more duct noise it will produce.

Hot water systems

Install a programmable thermostat

Most hot water systems will save energy if the heat is reduced either manually or by a programmable thermostat. Compared to forced-air systems, hot water systems respond more slowly to changes in temperature settings. Plan your setback schedule accordingly.

Another important difference is that some older hot water heating systems may not be able to cope with the stress of repeated temperature cycling. Ask your heating contractor whether your system is a suitable candidate for temperature setback.

See **Installing a programmable thermostat** in the section on **Forced Air** for more information.

Install an outdoor reset control

Have your heating contractor install an outdoor reset control for your hot water heating system. The device changes the temperature of circulating supply water depending on outdoor temperature, for energy savings. For example, the controller can be set to adjust the temperature of circulating supply water to 71˚C or 160˚F in fall and spring, then increase it to 82˚C or 180˚F during the winter months.

Install a circulating pump

Many older systems use gravity rather than a pump to circulate water to the radiators. Adding a circulating pump (see **Figure 11**) to a gravity system can increase efficiency and improve the distribution of heat. Ask your heating contractor if this is practical for your system.

Figure 11

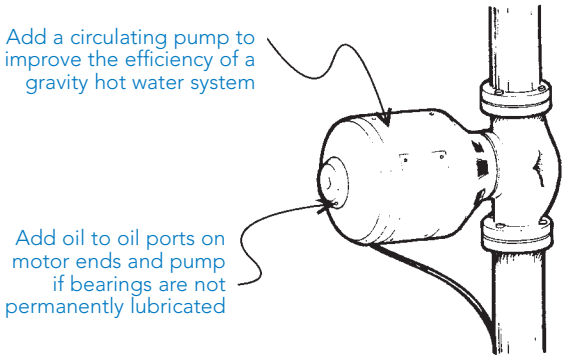
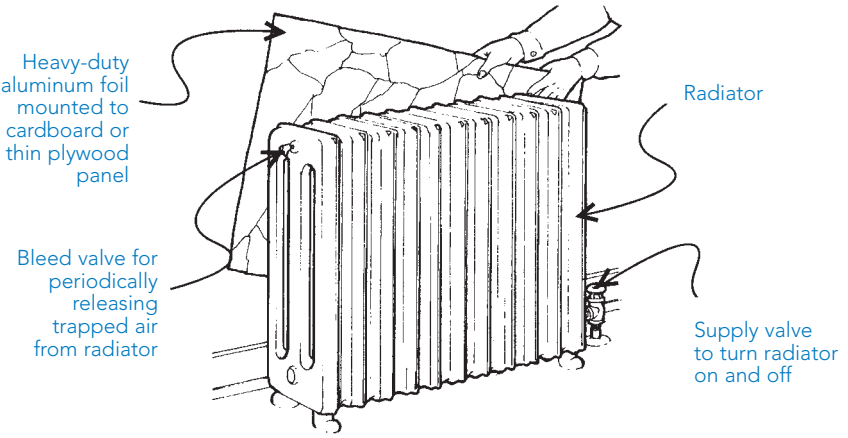


Figure 12



Have your distribution system zoned

The distribution system for a hot water heating system can be set up to allow different areas of a house to be heated independently. Each area or zone has a thermostat controlling an electrically activated flow valve.

This can be an expensive retrofit and is often practical only with newer systems. However, it may be worth pursuing if your home suffers from wide temperature variations from room to room that can not be solved by less expensive means. Consult your heating contractor for advice.

Install reflectors behind radiators

Increase the amount of heat a radiator emits into a room by fastening a sheet of heavy-duty aluminum foil to the wall behind it. The foil should be about the same width and height as the radiator. See **Figure 12**.

Repaint radiators finished with metallic paint

Shiny, metallic paint significantly reduces the heating ability of a radiator. Cover the metallic paint with a dark, matte paint to restore the radiator's effectiveness.

Electric baseboard systems

Install an electronic line-voltage thermostat

The simple design of electric baseboard heaters limits the changes that can be made to these systems. However, one worthwhile improvement is to install an electronic line-voltage thermostat.

The precise control afforded by these thermostats can save energy and increase comfort. Recent advancements in design allow the latest versions of these thermostats to be priced well below earlier models.

Contact Manitoba Hydro for more information.

Options for replacing a furnace or boiler

Have your furnace or boiler professionally inspected each year to be sure it is in good operating condition.

In most cases, a natural gas, propane or oil furnace will operate for 15 to 25 years before it must be replaced. Electric furnaces can last longer since they are generally easier to repair.

The service life of boilers is difficult to predict. Some may require replacement after 15 to 20 years, while others may last 50 years or more.

There are several situations where replacement of the furnace or boiler will become desirable, or even a necessity:

- It may become impossible or very costly to obtain parts to repair some types of older equipment. This can also occur with equipment of any age where the manufacturer has gone out of business.
- You may want to improve the efficiency of your furnace or boiler.
- If you plan to remodel or build an addition, the existing furnace or boiler may not have enough capacity.
- An inspection may reveal a serious safety problem such as a failed heat exchanger or rusting of structural components.

Get a second opinion

If you are told by a heating contractor that your furnace or boiler must be replaced, get another opinion from at least one other contractor.

You can also call Manitoba Hydro at (204) 480-5900 in Winnipeg or 1-888-624-9376 for more information when it comes time to replace your heating system, or visit our web site at hydro.mb.ca.

Compare heating energy costs

We routinely update our Home heating Cost Comparison Chart to reflect current energy prices and technologies for an average home in Manitoba. To obtain the most current energy cost comparison chart, please visit Manitoba Hydro's website at hydro.mb.ca or contact Manitoba Hydro at (204) 480-5900 (Winnipeg) or 1-888-624-9376. There is also other information provided on this website that should be reviewed if you are thinking about replacing your heating system.

How to care for a new furnace or boiler

Complete the warranty card and return it to the manufacturer to register your warranty. This will also ensure that you are notified if a safety notice is issued.

Review the owner's manual that comes with your new furnace or boiler. Keep the manual with your other important household papers and leave it with the next occupants if you sell or rent the home.

Ask the contractor installing the furnace or boiler to show you how to shut off the electricity and fuel supply in the event of an emergency.

Have the furnace or boiler serviced by a heating contractor once a year. Between these visits, maintain and operate the system in accordance with the owner's manual and the tips described earlier in this booklet.

How to get the help you need

Choosing an experienced and reliable contractor

As a homeowner, you are likely to hire a heating contractor more often than any other type of contractor. It pays to spend extra time to select a contractor you can rely upon, not only for routine servicing but also for emergencies.

How to find and select a contractor

Compile a list of potential contractors. Ask friends, relatives or neighbours who have recently had work done in their home for recommendations.

Be selective. It is usually better to choose contractors who promote the quality of their service and products at reasonable rates rather than just low prices.

Look for contractors that are members of the Heating, Refrigeration and Air Conditioning Contractors of Canada (HRAC), a division of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI). This industry association conducts training on the design, installation and servicing of heating, ventilation and air conditioning systems.

HRAC members demonstrate that they comply with regulation regarding valid trade qualification, valid provincial fuel license(s), municipal business licenses (where applicable), Workers Compensation Board coverage and liability insurance coverage. They also sign and agree to conform with the HRAC Members' Code of Ethics. However, HRAC membership solely does not guarantee high quality work.

After you have compiled a list of at least three or four contractors and their addresses, contact the Better Business Bureau (BBB) and inquire about their business performance records. Not all contractors are BBB members. However, all BBB members are committed to respond to customer concerns and to make adjustments when necessary. The BBB reports on all firms in its database regardless of membership status and does not endorse or recommend any product, service or company.

If you are approached by a door-to-door salesperson, exercise caution. This method of marketing is rarely used by reputable heating contractors in Manitoba.

Ask to see their direct seller's licence issued by the Provincial Government's Consumer Protection Office. Read the license carefully and check the date to see that it is still valid. Write down the name, address and telephone number of the company being represented and the name of the salesperson.

Most companies operating on a door-to-door basis are required to be licensed and bonded. You can verify that a company is properly licensed and bonded by contacting the Consumer Protection Office.

What a quote should say

If you are hiring a contractor for a routine service visit, a written quote is not necessary. You should, however, ask for a written list of what the contractor will do.

For convenience, consider entering into a service agreement with your heating contractor. This will spell out ahead of time what the contractor will do to service your heating system each year and what it will cost.

Shop carefully. The coverage of service agreements vary between contractors. Ask for a written quote that details what maintenance or repair work the agreement includes. Have the contractor explain, in writing, the limits to your coverage. Finally, ask whether your service agreement will give you priority service if a breakdown occurs.

If you are having your heating system upgraded or replaced, a written quote is strongly recommended.

Important information that should appear in the contract's written quote include:

- the name, street address and telephone number of the contractor;
- the cost and details of equipment or materials to be used (e.g. brand name, model number, size or capacity, etc.);
- the total cost of the job including whether PST and GST are being charged
- the estimated start and completion dates for the work;
- a statement that everyone the contractor has working on your home is licensed by Manitoba Labour and covered by the Workers Compensation Board;
- a statement that the contractor will obtain all permits and request any required inspections by the utility or local building authority;
- a description of how much liability coverage the contractor carries and the name of their insurance broker so you can verify their coverage;

- a statement that responsibility is placed on the contractor for clean-up upon completion of the work;
- the details of warranties or guarantees, including whether they are transferable if you sell your home;
- a description of what you are expected to do (e.g. make the work area accessible) or a list of old parts you would like to keep (e.g. electric motors).

When evaluating proposals from contractors, the lowest price may not be your best choice. Make sure the proposals you receive cover the same work. If they differ, ask the contractors to explain why.

An unusually low price may simply mean that the contractor has made a mistake or does not know enough about the work to estimate properly. In these cases, the contractor may cut corners or add unjustified extras to the bill to avoid losing money. In extreme cases, the contractor may simply abandon the job.

Be fair to the contractors by not requesting an excessive number of proposals. For most jobs, at least two but not more than four or five proposals is considered reasonable.

Signing the contract

The next step is to ask for the contractor you prefer to prepare a contract based on their quote.

Do not sign the contract until you have read it carefully. Never sign an incomplete contract. Check all standard terms and conditions. Read the fine print. If you need help, contact the Consumer Protection Office or seek the advice of a trusted family member, friend or neighbour.

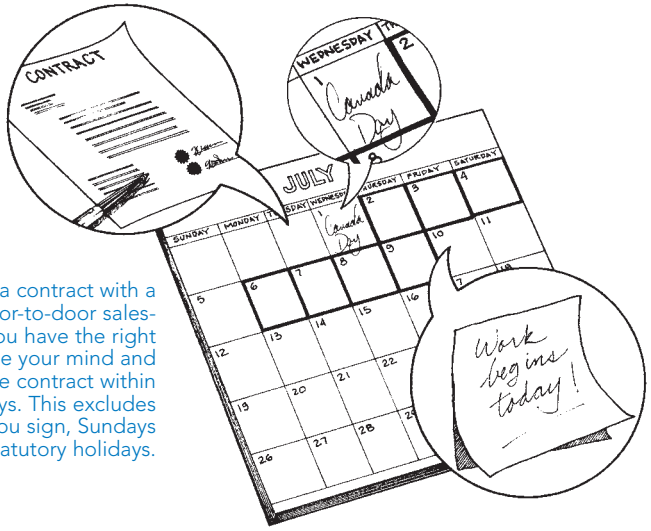
Cross out and initial any standard terms which you are not willing to accept. Ask the contractor to also initial any changes. Make sure that everything in the contract matches the original proposal.

If you sign a contract with a licensed door-to-door salesperson, you have the right to change your mind and cancel the contract within seven days (see **Figure 13**). This excludes the day you sign, Sunday, and statutory holidays.

You can cancel the contract by registered letter or by delivering a written letter of cancellation in person.

Door-to-door sellers must provide you with written information about your right to cancel a direct sales contract. Upon cancellation, the company must return any money you have paid. For further information on your cancellation rights, contact the Consumer Protection Office.

Figure 13



If you sign a contract with a licensed door-to-door salesperson, you have the right to change your mind and cancel the contract within seven days. This excludes the day you sign, Sundays and statutory holidays.

Paying for the work

A down payment is normally not required for routine service or repair work. However, if your contractor has to order special equipment or materials, a nominal down payment to show your "good faith" may be requested.

Since most work on heating and ventilation systems takes no more than a day or two, only one payment is usually required. However, it is common practice to make progress payments on larger jobs. In these instances, only pay for the work that has been completed.

For major jobs, you have the right to withhold some money from all payments to protect yourself against liens. A lien can be placed on your home by suppliers or workers who were not paid by your contractor. The lien holds your property as security for the contractor's debts, even if you paid the contractor in full.

In Manitoba, the law limits your liability to 7.5 per cent of the contract price. The correct procedure is to withhold this amount from all payments for 40 days. This period is the time limit that creditors have to place a lien on your property.

Do not make a final payment or sign anything that releases the contractor from further responsibility until everything promised in your contract is done. Check that the make, model and capacity of equipment you ordered was actually installed.

It is advisable to pay down payments and progress or final payments by cheque rather than cash. This will give you a record of the transaction. For added protection, ask the contractor for a signed receipt each time you make a payment.

Be fair to your contractor by promptly paying bills you legitimately owe. If a member of the contractor's staff went out of their way to help you, let them know you appreciate it.

How to handle problems with your contractor

If you have a disagreement with your contractor, carefully review your contract. Listen to what the contractor has to say and be reasonable. If you remain dissatisfied, seek another opinion before taking action. Contact the Consumer Protection Office for advice at (204) 945-3800 (Winnipeg), 1-800-782-0067 or email consumers@gov.mb.ca

Glossary

The glossary will help you understand unfamiliar abbreviations and terms used by this booklet or your contractor.

Abbreviations

AFUE Annual Fuel Utilization Efficiency

AGA American Gas Association

Btuh British thermal units per hour

CGA Canadian Gas Association

CSA Canadian Standards Association

GAMA Gas Appliance Manufacturers' Association

GPH gallons per hour

HRAI Heating, Refrigerating and Air conditioning Institute

kW kilowatt

ULC Underwriters' Laboratories of Canada

Common Terms

Annual Fuel Utilization Efficiency (AFUE) A rating of the seasonal energy efficiency of furnaces and boilers. The higher the AFUE, the more efficient the furnace or boiler.

Aquastat A thermostat that controls the temperature or water heated by a boiler.

Backdrafting The situation where combustion gases escape into a home because an indoor-outdoor pressure difference causes the flow in a chimney to reverse.

Barometric damper A device that allows a variable amount of air into an oil furnace's venting system to stabilize the flow of combustion gases.

Boiler The main heating unit in a hydronic heating system.

British thermal units per hour (Btuh) A unit of energy used to rate the heating capacity of natural gas, propane and oil furnaces and boilers.

Combustion air The air required for the complete burning of the fuel in a natural gas, propane or oil furnace, boiler or water heater.

Combustion gases The by-products resulting from burning of fuel.

Conventional furnace or boiler A natural gas or propane furnace that has a continuously burning pilot light and a draft hood. Typically, these units have a seasonal efficiency of only 55 per cent to 65 per cent.

Damper A plate regulating the flow of air or combustion gases.

Dilution air Additional air not needed for combustion that is required to maintain a steady draft in a fuel-burning furnace, boiler, water heater, fireplace or stove.

Draft hood A device built into natural gas and propane furnaces, boilers and water heaters to introduce dilution air into the venting system.

Ductwork Round, square, or rectangular sheet metal sections used to transport air in a heating or ventilation system.

Fresh-air intake A device used to bring fresh, outdoor air into a home to replace stale air exhausted from the home.

Furnace The main heating unit in a forced-air system.

Forced-air system A heating system which uses a blower to circulate air from a furnace through a network of ductwork to the various rooms in a house.

Heat exchanger The part of furnace that transfers the heat from combustion gases to the circulating household air or, in a boiler, to circulating hot water.

High-efficiency gas furnace A natural gas or propane furnace with a seasonal efficiency typically of 90 per cent or more. It includes an extra heat exchanger to remove additional heat from combustion gases by condensing them.

Hydronic system A heating system that uses hot water circulated by gravity or a circulating pump through a network of pipes to radiators.

Induced draft An exhaust fan used to remove combustion gases in mid- and high-efficiency furnaces and boilers.

Kilowatt (kW) A unit of power used to rate the heating capacity of electric furnaces, boilers, baseboard heaters, and water heaters.

Make-up air Air that is provided to a home to replace indoor air exhausted to the outdoors by mechanical or natural ventilation.

Mid-efficiency furnace or boiler A natural gas or propane furnace or boiler with a seasonal efficiency typically in the range of 78 per cent to 82 per cent.

Programmable setback thermostat An energy-saving thermostat that you can program to automatically reduce the temperature at night or when your home is unoccupied.

Return air Air removed from a room to be recirculated within the home or exhausted to the outdoors.

Sealed combustion A fuel-burning furnace, boiler, water heater or fireplace in which the combustion process is completely isolated from the air in a home. This reduces the problem of backdrafting and spillage.

Seasonal efficiency A measurement of a heating system's performance over an entire heating season. The seasonal efficiency is normally lower than the steady-state efficiency.

Spillage The situation where combustion gases escape into a home because of a faulty furnace, boiler, water heater, fireplace, woodstove, or blocked chimney.

Steady-state efficiency A measurement of a heating system's performance over a short period. It indicates how efficiently the system performs after it warms up to a normal operating temperature.

Supply air Air delivered to a room for ventilation, heating, or cooling.

Heating System maintenance record

Date	Description of Work	By
Nov. 1/11	Furnace annual service	XYZ Heating Co.
Jan. 1/12	Washed electronic air cleaner	self

Metric Conversion Factors

A. Converting Imperial Units into Metric Units

Unit	Conversion	Multiply By
Thermal Resistance	R values to RSI values	0.1761
Length	inches to millimetres inches to centimetres feet to metres	25.40 2.540 0.3048
Area	square feet to square metres	0.09290
Volume	gallons to litres cubic feet to cubic metres	4.546 0.02832
Mass	pounds to kilograms	0.4536
Density	pounds/cubic feet to kilograms/cubic metre	16.02

B. Converting Metric Units into Imperial Units

Unit	Conversion	Multiply By
Thermal Resistance	RSI values to R values	5.678
Length	millimetres to inches centimetres to inches metres to feet	0.03937 0.3937 3.281
Area	square metres to square feet	10.76
Volume	litres to gallons cubic metres to cubic feet	0.2200 35.31
Mass	kilograms to pounds	2.205
Density	kilograms/cubic metre to pounds/cubic foot	0.06243

If you are uncertain of, or have any question or concern regarding, any subject matter herein or the safety and/or proper handling of any material(s) and/or product(s) that you may encounter in your undertaking, please consult resources such as Health Canada (Health Links) @ 1-888-315-9257, the Manitoba Department of Labour @ 1-800-282-8069, or Canada Mortgage & Housing Corp. @ 1-800-668-2642.

Manitoba Hydro

July 2014