HOME ENERGY GUIDE

TECHNIQUES TACTICS & TIPS

Home Heating

Minnesota Department of Commerce Energy Information Center

A comfortable and healthy home requires an efficient and sound heating system. You want a heating system that is energy efficient and equipped with safety features to protect your home's indoor air quality.

High efficiency furnaces

Electric heating systems

Furnace safety

ENERGY STAR PARTNER

Related Guides:
Home Cooling
Home Insulation
Combustion & Make Up Air
Wood Heat
House Diagnostics
Basement Insulation

It is critically important to recognize that all of the elements making up your home are interrelated. Making improvements such as adding insulation, caulking, replacing windows or remodeling your kitchen can affect the efficient and safe operation of flame-burning appliances. For example, simply adding a kitchen fan will alter the operation of a water heater and many furnaces.

This guide describes how to evaluate your present heating system and helps you decide if and when it should be replaced. If a new furnace is needed, this guide will help you decide what type of unit to install and what features to look for. It also describes how to maintain your furnace.

If you have not had your heating system checked within the past year, do it now. Do not wait until a crisis occurs. A cold night in January, with the furnace faltering or failed, is not the time to assess your heating system.

Is your present furnace good enough?

The best way to assess your present heating system is to compare it with new, improved systems. An old furnace, even when it's running well, may extract only 60 percent of the available heat from the fuel over the heating season. That means only 60 cents of your heating dollar is going into the house as heat; the rest is going up and out the chimney. In addition, furnaces use electricity– many consuming over 1200 kWh a year, which can cost between $100 and $300 or more a year, depending how long and how often the furnace fan runs.

In contrast, many new furnaces are so efficient that they waste less than a nickel of every dollar spent, and consume as little as 25% of the electrical energy your standard furnace may consume. Advances in technology have also brought major safety improvements. Furnaces now bring in air from outside of the home and supply it directly into the combustion chamber. It is vital to ensure that fuel-burning appliances such as furnaces and water heaters have an adequate supply of combustion air. The section on safety (page 7) can help you determine whether your present heating system poses a health threat.

Repair vs. replacement

Before deciding whether to keep or replace your present furnace, find out if it is operating properly. An annual professional check-up will assure you of safe, dependable operation. Furnaces have an average life expectancy of 16 to 20 years. Boilers have a life expectancy of thirty years. If your furnace is over ten years old or has a serious malfunction that will cost several hundred dollars to fix, it is wise to replace it now rather than to repair it. It is always best to start comparison shopping before your furnace breaks down. Shopping for a replacement furnace in an emergency does not allow time to get the best price. Even if the furnace is less than ten years old and would cost more than $500 to fix, it may be cheaper to replace than to

Money Isn't All You're Saving

Energy Star Standards:

Furnace: 90 AFUE

Boiler: 85 AFUE

Ground Source Heat Pump: 3.2 COP

Air Source Heat Pump: 7.6 HSPF

The term "furnace," as used in this guide generally refers to both furnaces (which distribute heated air) and boilers (which distribute heated water). Recommendations or descriptions that apply specifically to boilers are noted.

repair. If you decide to repair your furnace, look for a heating professional who has experience with your type of heating system.

Buying a new furnace

The primary factors to consider when buying a new heating system are: the kinds of fuel you have available, how the heat will be distributed throughout the house (forced air, hot water), the size of the system, and, most important, the furnace's efficiency rating. Keep in mind that the electrical power consumed by furnaces is not included in the furnace efficiency rating.

Fuel type. If you have a choice of fuels, evaluate which is the most affordable in the long run. See the table Comparing Fuel Costs on page 8. You should also consider how efficient each of the fuels are in turning energy into heat.

Heat distribution. The primary difference between 'furnaces' and 'boilers' is that a furnace uses air to distribute heat throughout the house and a boiler uses water. Forced air systems allow easy installation of traditional central air conditioning, since the same ductwork can be used to distribute warm or cool air. This makes a forced air systems more economical if you plan to install central air conditioning. With a forced air furnace it is also easier to add a mechanical ventilation system or air filtration system at some time in the future. With forced air furnaces, it is most important to pay attention to the efficiency of the fan motor.

Furnace size. Furnace size is as important as the efficiency rating. The most common mistake is buying a heating system that is too large for your home. Remember, the notion that 'bigger is better' does not apply to heating or air conditioning systems. If your heating system is oversized, it will cycle more frequently causing extra wear on the equipment and reduced comfort.

Unfortunately, there is not a simple "rule of thumb" for furnace sizing. Many municipalities require a heat loss calculation at the time the contractor requests a permit to install your heating system. The Energy Information Center strongly recommends that you receive a heat loss calculation as part of any proposal from a heating professional. The calculation is the only way to ensure that you are buying the right size. Ask for a copy of the sizing calculation as part of any bid before you accept the proposal.

A heat loss calculation includes factors such as the window area, thermal performance of windows, insulating properties of the walls, ceilings, foundation walls and the amount of heat lost through air leakage. It is important to discuss any remodeling plans with your contractor before determining the size of furnace you need. Require any contractor who bases estimates solely on the square footage of your house to do a true heat loss calculation. If you are considering buying a central air conditioner at the same time as a new furnace, be sure that the air conditioner is also sized properly. If your air conditioner is too large, it will not do a good job of dehumidifying.

Furnace efficiency. The Energy Information Center recommends that you purchase a furnace meeting EnergyStar® standards. Look for the EnergyStar label and logo. Furnaces should have an AFUE efficiency rating of 90 percent or higher and a sealed combustion or power vent system. Keep in mind that AFUE efficiencies do not include the electrical energy consumption of furnaces. Homeowners can save $70 to $300 a year by purchasing a furnace that features a variable speed blower with ultra-low power consumption. Boilers should have an AFUE of 85 percent or more.

If you think a high efficiency heating system is out of your price range, consider the unpredictability of energy prices. The price of heating fuels reached record highs over the winter of 2000–2001. Given the changing nature of energy prices, a high efficiency furnace or boiler will very well pay for itself in a short period of time.

Financial assistance is available throughout Minnesota from the Minnesota Housing Finance Agency's "Fix Up Fund," an affordable loan program for low and middle income Minnesotans. For information on this program and a list of participating lenders contact the Housing Finance Agency. (See page 12 for contact information.)

Shop for a good price

Updating or replacing a heating system can cost between $2,500 and $4,500, so it pays to comparison shop. It is common for bids to differ by as much as several hundred dollars. Only accept

written bids based on the cost of equipment and installation. To assure that you get a fair market price, get bids from at least four contractors. Have the contractor provide the names of customers who have had their heating system for a few years. When evaluating bids, look at prices but also pay attention to and compare the quality of installation, energy savings, and warranties. Examine and compare each item in all bids carefully. Verify that the contractor's staff has had training for the equipment proposed.

The problem with asbestos

Asbestos, often used in building materials through the late 1970s, is made up of very small fibers up to 1,200 times thinner than a human hair. When inhaled, these fibers become trapped in lung tissue. Medical research indicates that asbestos fibers can cause lung disease for up to 30 years after they have been inhaled. There's no known safe level of asbestos exposure. Anyone working on asbestos materials in your home should take the right precautions to stop the fibers from being released into the air.

Asbestos control can add to the costs of replacing heating systems in older homes. If you think your old heating system includes asbestos insulation, discuss this with the contractor ahead of time. It is extremely important that the proper asbestos removal procedures are followed carefully. (See page 12 for contact information.)

Proper installation is important

If your heating system is not installed properly, you could end up with higher energy costs and a less comfortable home. Furnaces and boilers should be tuned and a combustion efficiency test performed as part of installation. The installer should also "balance the air flow," meaning the setting on the furnace fan should be matched to the ductwork and furnace characteristics. Also, make sure your contractor is fully bonded and insured.

Features to look for

High efficiency furnaces with sealed combustion or a power vent not only saves you money over the life of the furnace (a 40 percent reduction in heating costs is common), it also reduces the chances of combustion gases – including carbon monoxide – entering your home, and contributes to a healthier indoor environment. Some of the features to look for in a new furnace are illustrated in Figure 1 (next page).

Direct vent or sealed combustion appliances are especially recommended. These appliances have a separate pipe bringing fresh, combustion air from the outside into the furnace itself. This feature dramatically increases safety and efficiency since there is no mixing of the air serving the furnace with the air in your house. Furnace exhaust is usually vented directly through another plastic pipe out the sidewall of the house, eliminating a traditional and possibly dangerous chimney connection.

Power vent. As an alternative to sealed combustion, "power vent" refers to the use of a fan to push the exhaust gases out of the home rather than relying on the draft of a chimney. Power vented appliances must have a dedicated exhaust pipe typically running from the furnace through an outside wall. Power vented appliances also need a combustion air supply to the immediate area.

Having a power vent or sealed combustion is necessary in today's furnaces, boilers and water heaters. As appliance efficiency increases, more heat is extracted from the combustion gases and the exhaust is less able to rise up the chimney. In addition, the exhaust of indoor air by other appliances such as kitchen exhaust fans, clothing dryers and bath fans compounds the problem. The interaction of all these fans contributes to the danger of an inadequate supply of air needed by combustion appliances. (See Figure 3)

If you are replacing just a furnace, a power vent module may be added to many water heaters permitting the water heater to exhaust to the outside. It is especially important to have your heating contractor assess and readjust, if necessary, the flue or vent serving the water heater and other combustion appliances to help safeguard against backdrafting. Recent studies indicate that fuel-burning water heaters are a significant source of backdrafting in Minnesota homes.

Variable speed motor. Variable speed furnaces use considerably less electricity–over 60 percent less–than other forced-air furnaces. This feature includes microprocessor controls, which automatically adjusts airflow to achieve maximum efficien-

Make Sure Your Contractor...

- is fully bonded and insured.
- has received training on the furnace you are buying.
- completes a heat loss calculation to determine furnace size.
- performs a combustion efficiency test.
- balances the air flow at the time of installation.
- gives you references of previous customers. (And make sure to call them!)

Ensure Safety!

Ensuring the safety of a home heating system is essential. Buying a furnace with a sealed combustion system and equipping your home with a carbon monoxide detector are two ways to protect yourself from carbon monoxide poisoning.

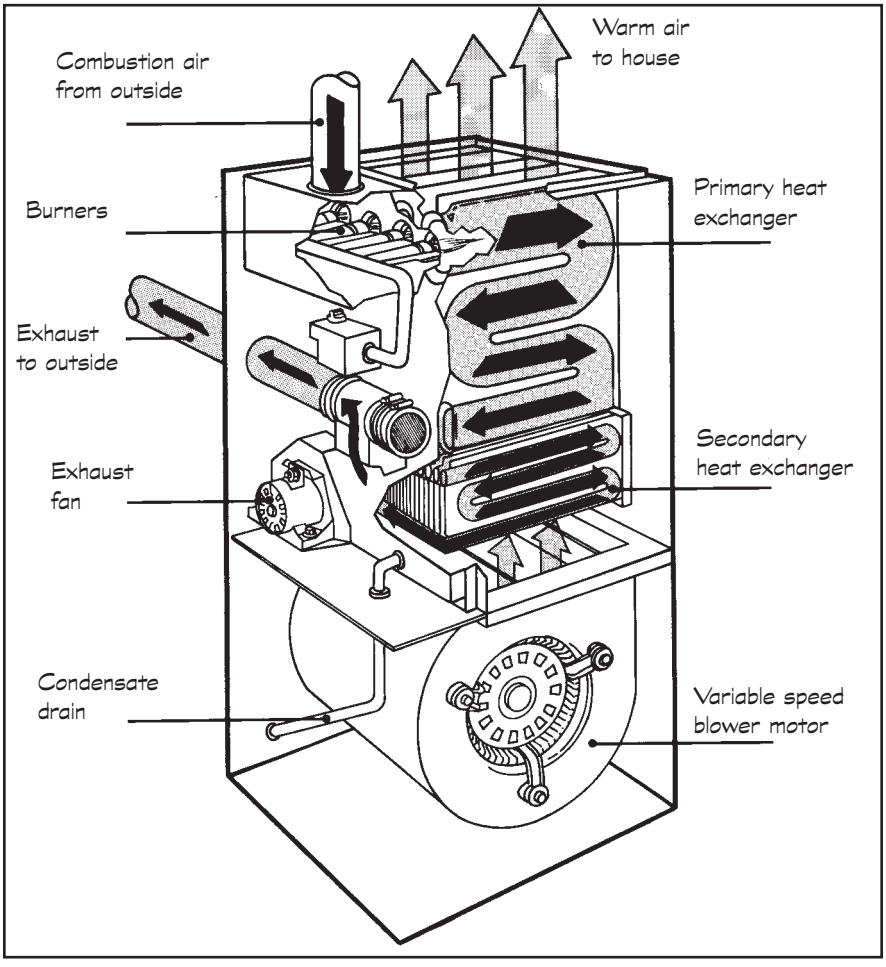


Figure 1
This typical high efficiency furnace has a second heat exchanger that extracts more heat from the combustion gases before exhausting them to the outside. It also has a sealed combustion chamber that allows for a consistent, reliable source of outside air for combustion and a means of venting the combustion gases directly out the side of the house.

cy. In addition to saving energy, these furnaces are quieter and increase comfort by eliminating the rush of cold air (cold shot) when the furnace cycles on.

Combined space and water heating units. You might consider a combination space heating/water heating system that combines water and space heating into a single unit. Although the cost of space heating remains about the same as with a high efficiency furnace, the cost of water heating is significantly reduced–up to 40 percent. There are combined systems available for both furnaces and boilers. If your household uses a lot of hot water (if you have teenage children, for example), this type of system could bring considerable savings.

Electric heating systems

The efficiency of electric heating equipment is measured in a couple of different formats, the most common being Coefficient of Performance (COP). A COP of 1.0 means that the heat energy the appliance delivers is the same as the electrical energy it uses. In other words, it operates at 100 percent efficiency. As an example, consider a baseboard electric resistance heater, which uses electricity to generate heat just as a toaster generates heat. This conversion of electricity to heat is virtually 100% efficient and is said to have a COP of 1. Ground source heat pumps can have a COP of 3.

Ask about discount rates

Despite their high efficiency, electric heating units–at current prices of electricity–may cost more to operate than oil, natural gas, or propane furnaces. Energy- and cost-saving options are available, however, that may make electric heating cost competitive. For example, many utilities offer a discount rate to customers willing to have a portion of their power cut off during periods of high demand, usually somewhere between 8 a.m. and 8 p.m. daily. To qualify for these rates usually requires having a back-up fuel source or a thermal storage system. Call your utility to see if discount rates are available.

A back-up fuel source such as fuel oil or propane can be used when electricity is interrupted. The main considerations are availability and cost of the back-up fuel as well as how the heat would be distributed throughout the house. Under this agreement, the customer's power may be inter-

rupted any time the utility experiences a high demand for power.

Types of electric heating systems

Baseboard resistance heaters are the least expensive to install, but they are the most expensive to operate. They usually do not allow you to take advantage of special low electric rates, since they lack the capacity to store heat.

Electric furnaces, in addition to supplying heat, also allow for air conditioning to be added, and some models can accommodate thermal storage devices. Since electric furnaces can lose a significant amount of heat through the seams in ductwork, make sure these points are well sealed.

Both electric furnaces and baseboard heaters have a COP of 1, meaning they operate at 100% efficiency.

Radiant heating, using electric heating cables, is now more often installed in floors rather than in ceiling or wall panels, as was done in the past. In-floor radiant heating also can be provided by water, heated by a boiler or ground source heat pump. The heated water circulates through plastic tubing fastened beneath a wood floor, in a cement floor, or in a lightweight cement overlay on an existing floor. In-floor radiant heating provides more constant heat than baseboard heaters. It is most easily installed during new construction or major remodeling and is appropriate for energy-saving zoned heating.

Electric thermal storage systems (ETS) operate by storing heat during the utility's off-peak hours, allowing homeowners to substantially reduce their heating costs by taking advantage of off-peak discount rates. ETS furnaces use either ceramic bricks or water to store heat and are available as a central furnace or room heater. If you are building a home, you can bury heating cables in sand or earth beneath concrete slab floors; however, if you choose this method you must insulate under the cables (R-10 is the recommended level) or you will lose a large amount of heat to the ground.

Heat pumps, unlike furnaces, do not burn fuel to produce heat. Instead, they transfer heat from one place to another, much like your refrigerator does. To accomplish home heating, a pump extracts heat from the ground, air, or water and distributes warm air to your house, usually through a forced air duct system. Heat pumps can be reversed to provide air conditioning in the summer. The heating performance of air source heat pumps is rated by the HSPF (heating season performance factor) and ground source heat pumps by the COP (coefficient of performance). The Energy Information Center recommends an HSPF of 8.5 or higher for air source heat pumps and a COP of 3.2 or higher for a ground source, closed loop heat pump. Look for the ENERGYSTAR label to be assured you are getting an efficient model.

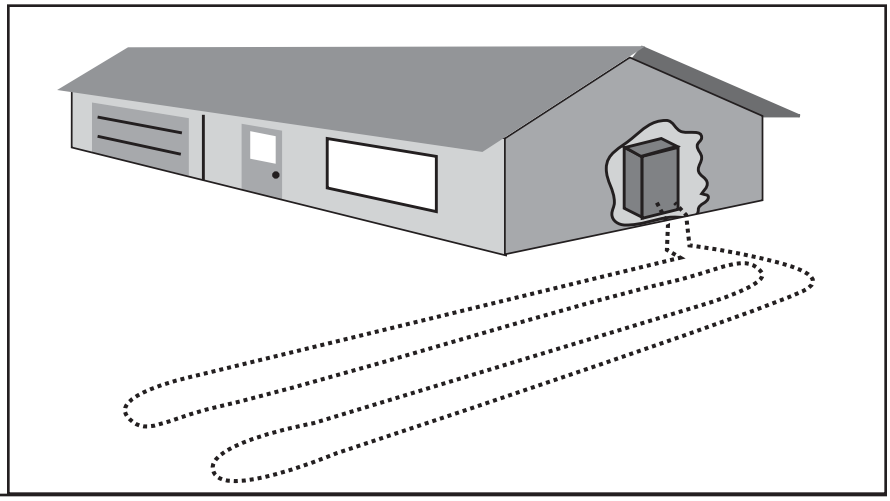
How a Furnace Works

The basic operating process is the same for all furnaces and boilers regardless of the type of fuel they use.

- *The thermostat calls for heat and starts the ignition and combustion process. Fuel is delivered to the combustion chamber, mixed with air, and ignited to produce heat in the form of hot gases.*
- *These hot combustion gases flow through and warm the heat exchanger. The combustion gases exit the furnace and are exhausted from the home.*
- *A control in the heat exchanger starts the fan which pushes the warm air through the distribution system and thoughout the house.*
- *This process continues until the room thermostat anticipates enough heat is left in the furnace to bring the house up to the temperature set by the thermostat. The thermostat then tells the burner to shut off. The furnace fan continues to run until the heat exchanger thermostat turns the fan off.*

Older "gravity type" furnaces and boilers depend upon the natural buoyancy of the hot air or hot water to distribute heat within the home. This same natural buoyancy is depended upon to exhaust gases from furnaces and boilers. Changes in efficiency of equipment and in the characteristics of homes require that furnaces manufactured today use fans to push the exhaust out of the home.

Figure 2
Typical home heat pump ground installation.



Understanding Efficiency Ratings

AFUE (annual fuel utilization efficiency) applies to gas and oil furnaces and measures efficiency over the entire heating season, telling you how much of your fuel dollar is converted into heat. Similar to a miles-per-gallon rating for your car, the higher the AFUE the more efficient the furnace. An old, poorly maintained gas forced-air furnace may have an AFUE of only 50 to 60 percent, while the most efficient of the new designs have ratings of higher than 90 percent. The AFUE does NOT include the electrical energy consumption. **We recommend an AFUE of 90 for gas or oil furnances and an AFUE of 85 for gas or oil boilers.**

COP (co-efficient of performance) measures the efficiency of electric ground source or geothermal heating equipment. A COP of 1.0 indicates 100 percent efficiency, meaning that the heat energy you receive from the furnace is exactly equal to the energy it consumes. Heat pump equipment usually has a COP of greater than 1.0 because it acquires heat energy from an external source and uses electrical energy to move that heat indoors in winter and outdoors in summer. **We recommend a COP of 3.2 for ground or geothermal source heat pumps.**

SEER (seasonal energy efficiency ratio) measures the efficiency of central air conditioning or heat pumps in the cooling mode. Like AFUE, SEER measures how efficiently the equipment operates over the season. **The most efficient models have SEERs of 13 to 14.**

HSPF (heating season performance factor) measures the heating efficiency of air source heat pumps. It is the ratio of heating energy produced to energy consumed. It is determined by dividing the seasonal heating output in BTUs by the seasonal power consumption in watts. The minimum standard for HPSF is 6.8, however **we recommend the EnergyStar minimum which is an HPSF of 7.6 for air source heat pumps.**

Although a variety of heat pumps are available, a horizontal closed loop ground source heat pump appears to be the most practical for Minnesota because deep earth temperature remains at a fairly constant 50° F. year around. (Figure 2) Heat pumps are more expensive to buy and install as a retrofit. Keep in mind that whenever your heat pump or air conditioner is serviced, the refrigerant should always be recovered and properly recycled and never vented into the air.

Ground source (or geothermal) heat pumps can also provide all of the domestic water heating by adding a "desuperheater." This energy saving device can either capture some of the heat from the heating cycle or recycle some of the waste heat from the cooling cycle to heat domestic water.

How to maintain your furnace

Heating systems require annual care by heating professionals. Just as you change the oil and care for your car, routine, regular maintenance is also needed for your furnace or boiler. Schedule an annual heating and cooling equipment tune-up if your furnace or boiler has not had one within the past year. Preventive care is cheap when compared to emergency service calls. All oil and gas furnaces should be tuned every year, unless the manufacturer directs otherwise.

Do-it-yourself maintenance measures include:

- Change the furnace filter once a month.
- Clean the blower at least once a year.
- Make sure registers and radiators are not blocked by furniture or draperies.
- Bleed radiators, baseboard heaters, and other hot water systems at least once a year.

Efficient operating tips

How you operate your heating system affects how much energy you use. Follow these suggestions to lower your heating bill:

- Turn down thermostats in unused rooms, at night, and when you are gone for more than four hours during the day. Automatic setback thermostats can do this for you (see page 9).
- Have your heating contractor adjust the fan thermostat for an efficient on-off temperature.
- Don't forget the ducts. Make sure the duct system is sealed well at all joints. Sealing ductwork

with aluminized duct tape or specialized mastic meeting the UL standard 181 can improve the efficiency of your cooling system and reduce heat loss. It may be a good idea to ask a heating specialist to balance the heating duct system–both the supply and return ducts. This is a key measure for your home if you experience uneven delivery of heat or cool air when air conditioning.

Safety is a number one concern

When fuels such as gas or oil are burned, the main combustion products are water vapor, carbon dioxide and nitrogen oxides. If these gases are not vented properly to the outside, serious problems can develop–problems that affect your personal health, your furnace, and your home.

The most publicized and most serious of these problems is CARBON MONOXIDE poisoning, which causes illness or death among Minnesotans every winter. If there is incomplete or improper combustion, chances are the appliance is producing carbon monoxide, a dangerous colorless, odorless gas that can quickly build up to toxic levels. Combustion also produces nitrogen oxides, formaldehyde, and other aldehydes. These combustion gases can and will cause serious health problems.

An indicator of a serious problem is the sudden build-up of moisture in the house. Backdrafting of combustion appliances such as a water heater or furnace, or a cracked heat exchanger, will inject additional moisture in the house. One hundred cubic feet of natural gas produces more than a gallon of water in the form of vapor. Sudden excessive condensation can serve as an indicator of serious problems with these appliances.

Because this moisture normally exhausts out of the chimney, excessive humidity in your house may be a warning sign that your gas furnace or other fuel-burning appliance is not venting properly. Other indicators of gas furnace problems are frequent headaches, a burning feeling in your nose and eyes, nausea, disorientation and other flu-like symptoms. With an oil furnace, warning signs are black chimney smoke, a fuel smell in the house, soot accumulation, and popping, rumbling, banging sounds, or puffs of smoke from the combustion chamber.

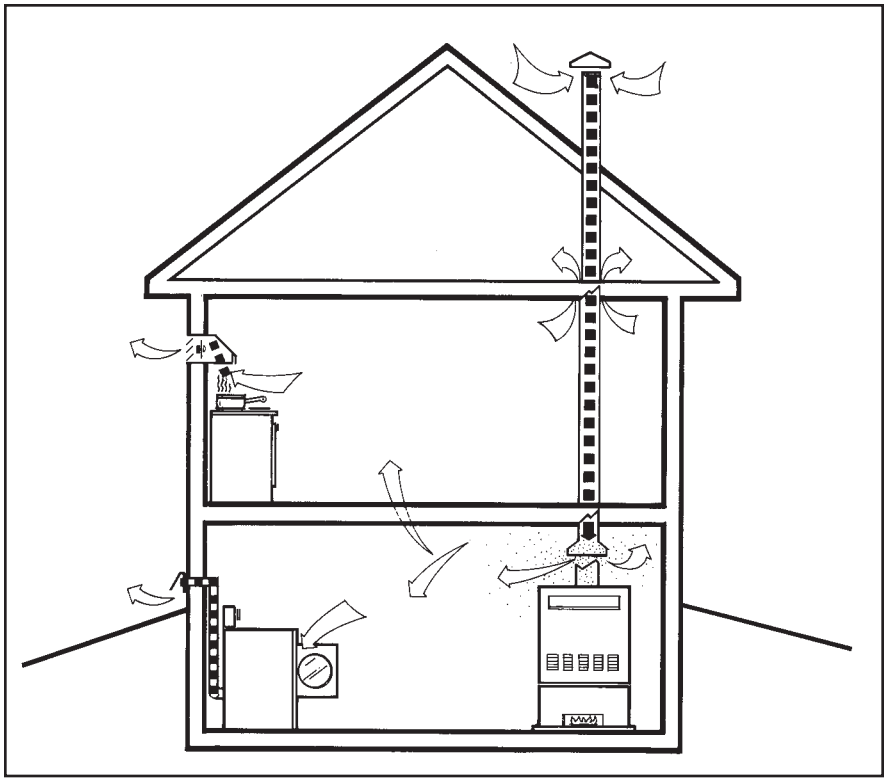


Figure 3

Arrows show how the operation of home appliances affect air movement. Exhaust fans for stove, clothes dryer, and other appliances reduce the amount of fresh air in the home and can result in the backdrafting of furnace exhaust gases. When you make a change in your furnace, you need to be sure the other appliances will continue to work properly.

Comparing Fuel Costs

When deciding which heating fuel to use it helps to compare costs of the different fuel choices. To compare costs, we first converted the fuels into a common unit–BTU, which is a measure of heat energy.

Amount of heating fuel needed annually

Fuel	Units of fuel to equal 1 million Btu	Units of fuel needed per year*
Natural Gas	10 mcf	1,000 mcf
Electricity	293 kWh	29,300 kWh
Propane	10.9 gallons	1,090 gallons
Heating oil	7.21 gallons	721 gallons

* The typical Minnesota home uses 100 million Btus annually.

The average Minnesota home uses 80 to 100 million BTUs annually for heating. Using statewide averages for fuel costs, the table below lists the cost per million BTUs of the various fuels and calculates the annual cost of producing 100 million BTUs of heat. It is important to note that only an electric heating system operates at 100 percent efficiency.

To determine the annual cost of providing 100 million BTUs of usable heat from all the other fuels, the efficiency factor of the heating system must be considered. For example, a natural gas furnace with an AFUE of 90 delivers 90 percent of the BTUs into the home as heat. To provide 100 million BTUs of usable heat, therefore, the furnace uses 111.1 million BTUs for an annual cost of $722.15. On the other hand, a ground source heat pump with a COP of 3.2 uses only 31.2 million BTUs of purchased electric energy to deliver 100 million BTUs of usable heat; the annual heating cost would be $640.

Annual heating costs for different fuels:

Fuel	Cost per unit	Cost per million BTU	Annual fuel costs*
Natural Gas	$1.004 per therm	$10.04	$1,004
(furnace with AFUE of 90)	$1.004 per therm	$11.15	$1,115
Electricity	$0.085 per kWh	$24.90	$2,490
(ground source heat pump with COP of 3.2)	$0.085 per kWh	$7.78	$778
Propane	$1.56per gallon	$17.00	$1,700
(furnace with AFUE of 90)	$1.56 per gallon	$18.88	$1,888
Heating Oil	$1.73 per gallon	$12.46	$1,246
(furnace with AFUE of 90)	$1.73 per gallon	$14.66	$1,466

If you suspect a problem, air out your house, open a window near the furnace room and immediately call your heating contractor, utility, or service technician.

For help in preventing combustion air problems, call the Energy Information Center. We recommend buying a furnace that has a sealed combustion system or, at a minimum, a power-vented furnace that forces the exhaust gases out of the home with a fan. **We also recommend that you install a carbon monoxide detector in your home.**

Modifying your furnace

Warning: Furnaces are designed with safety in mind. Changing the way a furnace operates may alter its operation, which can have dangerous repercussions.

If you decide not to replace your furnace, you might think about modifying it to improve efficiency. Over the years, interest in improving efficiency has spawned dozens of devices to modify existing furnaces. Beware of add-on devices that claim to save energy. Some of these products might work, but others will actually raise your fuel bill, damage your heating system, or pose a danger to your family. Whether or not a device is good or bad depends on the characteristics of your furnace. Therefore, it is important to consult a qualified heating contractor or service person before using any of these products.

If your furnace is more than 10 years old, it is better to put the money toward a new high efficiency furnace rather than modifying the old one. Because boilers have a longer life expectancy (30 years), the cut-off for adding improvements is between 15 and 20 years.

Following is a list of equipment and alterations that are known to be safe and effective in most situations.

Automatic setback thermostat. Lowering the thermostat at night or during the day while you are away will save one percent off your fuel bill for every one-degree-Fahrenheit per eight hours of setback. Manually resetting the temperature twice a day will not cost anything, but this can be inconvenient. Instead, you can get an automatic setback thermostat to do the work for you. Some are relatively inexpensive and pay for themselves in a very short time.

Chimney liners. An oversized chimney may waste heat, but most importantly, drafts poorly. If you install a chimney liner it is critical to install a correctly sized, acid resistant liner to assure proper draft. A liner also extends the life of masonry chimneys by preventing deterioration from the flue gases. Liners must be properly installed and tested by a qualified service person to make sure combustion gases do not spill into the living space. This is especially important if you are replacing your furnace but not the combustion water heater. If the liner has to be replaced, if may be worthwhile to switch to a power vented water instead of replacing the liner. Gas furnaces venting into a masonry chimney must have a metal liner. Have your contractor inspect for this.

Oil burner replacement. In most cases, replacing the old burner with a new high efficiency burner is an economical modification that can be made to an oil furnace. In fact, you can expect a new burner to increase the efficiency of your present furnace by about 15 percent. Have your heating contractor assess the possibility of making this improvement.

Be Wise: Weatherize

Whether or not you buy a new furnace it is a good idea to weatherize your home. Adding insulation and strategically caulking and weatherstripping will make your home more comfortable, save energy, and reduce the size of the furnace you need if you are going to purchase a new system. As your heating load decreases, the size and cost of a heating system required to meet that load also decreases. You might consider having a home energy efficiency analysis performed. Sometimes referred to as an energy “audit,” this detailed examination of your home’s energy use is often provided at no or low cost by utilities. Check with your gas or electric utility to see if it provides energy audits.

It is important to remember that if you tighten your home you must make sure that you have adequate indoor ventilation. Call the Energy Information Center for more information.

Combustion air test

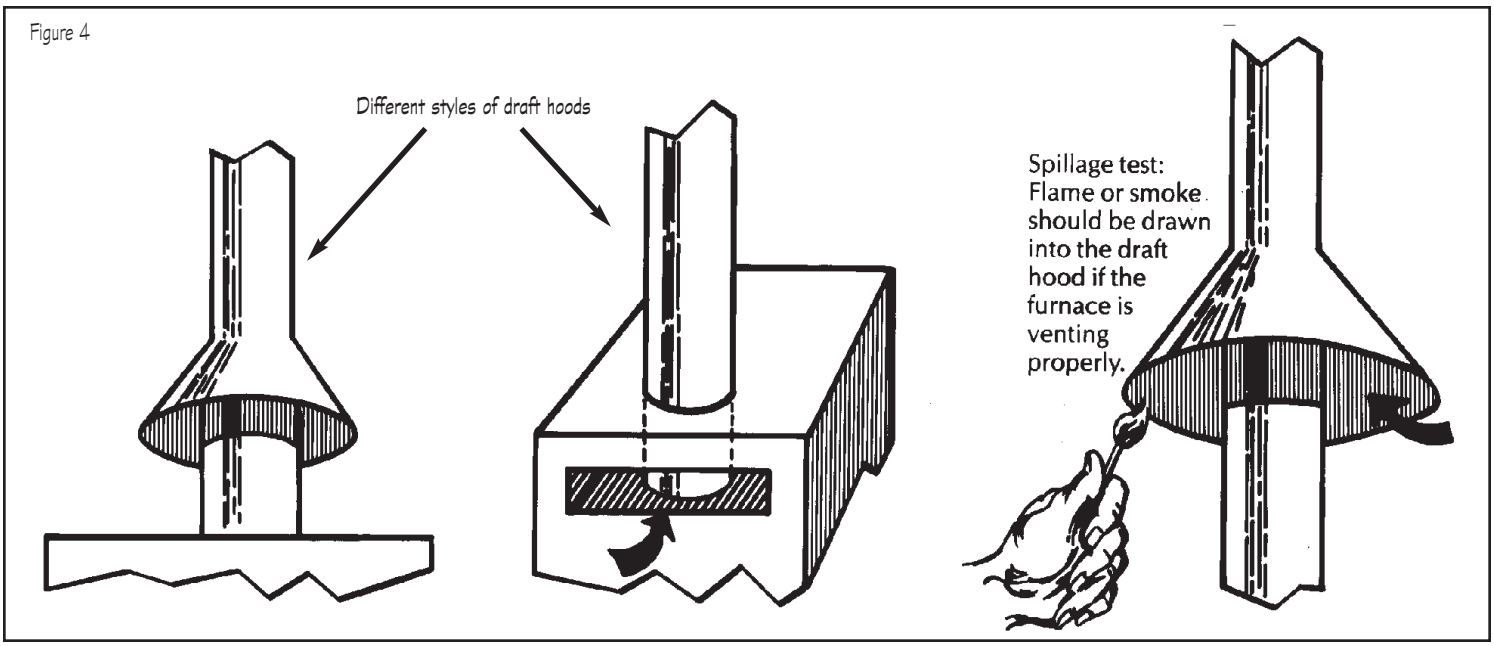
Perform this test if and only if there is a carbon monoxide alarm installed in the immediate area at the time of the test. Backdrafting of combustion appliances can generate dangerous levels of CARBON MONOXIDE in very short periods of time.

You can perform a simple "draft-hood test" yourself to see if your furnace is venting properly. Keep in mind this test will provide a snapshot of the appliance's performance only at the time of the test. Appliance performance may change with changes in wind conditions and alterations to the house. There are more details available in our Combustion & Make Up Air Guide.

To perform the test:

- Close all windows, exterior doors, and bedroom doors.
- Open all other interior doors.
- Turn on all exhaust fans, the clothes dryer, and water heater.
- Turn on the furnace and wait a minute for the draft to stabilize.
- Hold a smoking object (incense stick or match) about two inches from the draft hood opening at the top of your furnace. If the smoke is drawn into the hood, the furnace is venting properly. If the smoke is blown away from the hood, combustion gases are spilling out and you must correct the problem. Open a window a crack in the furnace room and call a heating contractor at once. (See Figure 4)

Figure 4



Does it make sense to buy the highest efficiency possible?

Consumers are often advised that it is not cost effective to buy a furnace with an AFUE rating of 90 percent or higher. Instead, they are told to stay with a standard model, with an AFUE rating in the low 80s.

The Energy Information Center staff recommends going with the 90 percent AFUE unit. As explained in this guide, the increase in efficiency comes in part from sealed combustion, which means a safer system. But safety is only one reason for our recommendation. In typical circumstances, the energy savings will "pay back" the additional cost in less than 5 years.

The following information was taken from the ENERGY STAR Web site and adapted for the Minnesota climate. It compares the purchase of an ENERGY STAR and non-ENERGY STAR furnace.

ASSUMPTIONS

	ENERGY STAR	Non-ENERGY STAR
AFUE rating	92.0	80.0
Btu/hr	75,000	75,000
Retail Price	$3,000	$2,000
Natural gas rate ($ Per therm)	$1.00	$1.00
Product Life	20	20

COSTS

	ENERGY STAR	Non-ENERGY STAR
Annual Energy Cost	$1,831	$2,106
Lifetime Energy cost	$23,183	$26,660
Purchase cost	$3,000	$2,000
Total Life Cycle Cost (Lifetime operating plus purchase cost)	26,183	$28,660

In this example, the additional $1,000 purchase price provides energy savings of $275 or a simple payback of 3.6 years. These savings are significant, and provide proof that energy efficiency can improve the bottom line.

Consumers interested in changing the assumptions to fit their exact situation should visit the Savings Calculator located on the Furnaces page of the ENERGYSTAR web site at: http:// www.energystar.gov*

* Directions to find Savings Calculator from www.energystar.gov: under "products" go to "appliances, lighting, heating and cooling, & more," then go to "heating and cooling," then to "furnaces," and finally, go to "savings calculator" (far right side of page).

Minnesota Department of Commerce

Suite 500
85 7th Place East
St.Paul, MN 55101-2198
www.commerce.state.mn.us

Energy Information Center

Twin Cities:
651-296-5175

TTY: 651-297-3067

Statewide toll free:
1-800-657-3710

E-mail:
energy.info@state.mn.us

This information will be made available, upon request, in alternative formats such as large print, Braille, cassette tape, CD-ROM.

This publication was produced with funds from a U.S. Department of Energy State Energy Program grant. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author and do not necessarily reflect the views of the Department of Energy.

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Resources: For further information

Home Energy Guides
Cooling, Home Insulation, Combustion & Make Up Air, Wood Heat, House Diagnostics, Basement Insulation and others from the Department of Commerce Energy Information Center. Single copies available free by calling 651-296-5175 in the Twin Cities area; 1-800-657-3701 from out-state Minnesota, or e-mail: energy.info@state.mn.us, or download from the web site: www.commerce.state.mn.us

For a list of energy efficient appliances
American Council for an Energy-Efficient Economy (ACEEE) 6th edition, The Most Energy Efficient Appliances 1995, available from bookstores for $8.95 or from 1001 Connecticut Avenue N.W. Suite 801, Washington, D.C. 20036, or phone 202-429-0063. The ACEEE also posts the 10 most efficient furnaces on its web site at www.aceee.org

For a list of furnaces and boilers that meet ENERGYSTAR **guidelines:** www.energystar.gov

For information on furnace installation
Consortium for Energy Efficiency, Inc. at One State Street, Suite 1400, Boston MA 02109-3529 produces two of the best publications available for homeowner and professional alike: "Specification of Energy-Efficient Installation and Maintenance Practices for Residential HVAC Systems," and "Supplementary Document, Duct Installation and Sealing Specification." Both are available free from the CEE web page at www.cee1.org

For more information on low-interest "fix up" loans
Contact the Minnesota Housing Finance Agency at: http://www.mhfa.state.mn.us/ Or, call the MHFA Consumer Information Line at 651-2967608 or 1-800-657-3769.

For more information about asbestos and asbestos work
Contact the Asbestos Unit of the Minnesota Department of Health at (651) 215-0900 or by mail: Minnesota Department of Health, Asbestos Unit, 121 East Seventh Place, PO Box 64975, St. Paul, MN 55164-0975.

Heating contractors may be licensed by your city, but are not licensed by the state. Your city or county may have a local licensing office. To locate qualified heating contractors contact:

- Sheet Metal Air Conditioning and Roofing Contractors Association (SMARCA), phone 612-593-0941 or on the web at: www.smacna.org
- Air Conditioning Contractors of America (ACCA) : 952/928-4660 or www.acca.org
- Consortium for Energy Efficiency, Inc.
  One State Street, Suite 1400, Boston MA 02109-3529
  617-589-3949 fax 617-589-3948 or www.cee1.org

For more information on selecting a contractor

Get a copy of "Hiring a Building Contractor" from the Minnesota Department of Commerce at 651-296-5175 or 1-800-657-3710, or www.commerce.state.mn.us.

Ask for a copy of "Hassle-Free Home Building and Remodeling" from the Minnesota Attorney General's Office, 651-296-3353, or 800-657-3787. The guide is also available at www.ag.state.mn.us.