Selecting a Home Heating (and Cooling) System

The largest portion of the utility bill for a typical Oregon home is for heating and cooling. How do you know what to look for in a system for your home? What can you do to ensure you are getting the most for your money?

STEPS to selecting a heating and cooling system:

STEP 1 - Reduce your heating and cooling needs
STEP 2 - Buy the most efficient system you can
STEP 3 - Size your system properly
STEP 4 - Seal your ducts, if your home uses a system with ducts
STEP 5 - Properly maintain your system

The Oregon Department of Energy offers tax credits for residents who invest in premium efficiency furnaces, boilers, central air conditioning systems and heat pumps. There is also a tax credit for having your ducts properly sealed. For more information, check the Web site: www.oregon.gov/energy or call toll-free 1-800-221-8035 or (503) 378-4040 (Salem).

Remember, there is not one "right" heating system that can be universally recommended. Each home has different circumstances that must be considered. A new home has more options available, of course. The Oregon Department of Energy advises you to discuss your situation and heating needs with a professional or to call our for assistance in selecting your system.

Step 1: Reduce your heating and cooling needs

The Oregon Department of Energy recommends reducing your heating and cooling needs before selecting a heating and cooling system. This is the cheapest way to lower your bills. It will also reduce wear and tear on your heating system and ensure that it is used most efficiently.

Recommendations:
Insulate and weatherize your home to keep heat in during the winter. Heating a poorly insulated home is like pouring water into a leaky bucket — you're just throwing the heat away.

The Oregon Department of Energy recommends programmable thermostats for all central heating systems. They can be used with most types of heating systems, and allow the temperature to be automatically reduced at night or when no one is home. Each one degree Fahrenheit you can set your daily temperature back (for 8-10 hours) can save you about 2 percent on your annual heating bill. Set your thermostat to 68 degrees F. during the day and 60 degrees F. at night or when you are not at home.

Shade your home on the exterior to keep the sun out during the summer. Turn your air conditioner thermostat to 78 degrees F. when you are at home and to 85 degrees F. when you are away from home.

Step 2: Choose an efficient system

Type of Fuel
To select an efficient heating system, you must first determine which fuels are available to you. Most new homes in Oregon heat with natural gas where it is available. Where natural gas is not available,

homeowners may choose electricity, oil, or propane for space heating. Air-to-air heat pumps provide cooling as well as heating and are the second most common heating system in Oregon.

Because fuel rates vary considerably by utility service area, geographic location and/or season, it is important to know your own local rates when comparing your heating system options. Look at your current utility bills or call your current or prospective fuel provider for this information.

If want to have a system with cooling, you can choose a heat pump or add air conditioning to your furnace by installing an outdoor compressor unit.

No matter which heating fuel you choose, the Oregon Department of Energy recommends using it as efficiently as possible.

Natural gas furnace

Recommendation:
If you choose a natural gas (or propane) heating system, the Oregon Department of Energy recommends a condensing furnace with:

- An AFUE rating of 90 percent or higher
- An air handler that has an electronically commutated variable speed motor (ECM)

A natural gas furnace is by far the most common in Oregon. The efficiency of a natural gas furnace or boiler is measured in a standardized federal test procedure and is expressed as an Annual Fuel Utilization Efficiency or AFUE. These ratings run from the federal minimum standard AFUE of 78 percent to as high as 96 percent. They use ambient air (garage or house air) for combustion and they must be vented through a metal or masonry flue. The Oregon Department of Energy recommends a condensing furnace with a 90 percent AFUE or higher.

In order to qualify for a tax credit, a condensing furnace must also have an electronically commutated variable speed motor (ECM or ICM) in the air handler. These motors allow a furnace to provide multiple stage (e.g. high- and low-fire) operation very efficiently. The result is not only energy savings, but also a quieter and more comfortable heating cycle. Annual electricity savings may be 500 kWh or more.

A central air conditioning system can be added to a furnace by installing an outdoor compressor unit. Many systems also incorporate more extractive filter systems (such as electrostatic systems) and humidifiers.

Air source heat pump

Recommendation:
If you choose an electric heating system, the Oregon Department of Energy recommends a split-system, air source heat pump with:

- Heating Season Performance Factor (HSPF) of 9.0 or higher
- Energy Efficiency Ratio (EER) of 12 or higher

Heat pump systems provide both space heating and cooling. Air source heat pumps are the most common and least expensive of the heat pump systems. They come as a "split system" consisting of an outdoor

unit (with a compressor, condenser coil and fan to move air through the coil), an indoor unit (with an evaporator coil, air handler and back-up resistance strip heaters), a refrigerant line set connecting these two, and a combination heating and cooling thermostat.

Heat pumps have several measures of efficiency. In the heating mode, efficiency is rated by a Heating Season Performance Factor (HSPF). The minimum federal standard is 6.8 HSPF, and the best systems range up to about 9.5 HSPF. For cooling, efficiency is rated using the Energy Efficiency Ratio (EER). The instantaneous EER rating is measured at 95 degrees F.

To qualify for a tax credit, a heat pump must meet the efficiency levels listed in (HSPF of 9 or higher and EER of 12 or higher) and be installed by a certified contractor. The most important feature of a good heat pump installation is the refrigerant charge. Undercharging or overcharging can significantly reduce the efficiency of the system, and in more extreme cases, can shorten the life of critical components such as the compressor. For this reason, heat pump and air conditioning systems eligible for a tax credit in Oregon must be installed in accordance with a specified set of procedures performed by specially trained and certified technicians.

Oil furnace

If you choose an oil heating system, the Oregon Department of Energy recommends a furnace with the highest Annual Fuel Utilization Efficiency (AFUE) rating you can find.

Oil-fired furnaces are very similar to gas furnaces. The AFUE ratings for oil furnaces, however, typically range from 80 to 84 percent. They need regular maintenance to function properly and to maintain efficiency.

Oil furnaces currently do not qualify for a tax credit.

As with gas and propane furnaces, central air conditioning, air filtration systems and humidifiers can be added. As with other furnaces, change the air filters at signs of discoloring and at least twice per season.

Air Conditioning Systems

Recommendation:
Passively cool your home with exterior shading and nighttime ventilation.

If you still need air conditioning, make sure the air-conditioning unit you buy has an Energy Efficiency Ratio (EER) of 13 or greater.

Western Oregon's climate does not create major cooling needs. The cheapest way to cool your house is prevention — keeping your house from getting hot in the first place. By having external shading and ventilating at night or in the early morning, you can, in most cases, keep your house comfortable without air conditioning.

Windows should be shaded on the outside by trees, overhangs, awnings or exterior shades to keep the sun's rays off the window. Interior curtains and blinds don't work as the solar heat is already inside the room. Let in cool air over night or in the early morning to cool down your house. Consider a whole house fan approximately 1000 cfm to pull air in quickly. Then, close the windows during the day to keep the heat out. Make sure your home is well insulated and caulked.

If you still need an air conditioning system, you can get a heat pump or add an air conditioning unit to your furnace. Make sure the unit you buy has an Energy Efficiency Ratio of 13 or greater.

Very efficient central, split-system air conditioning systems with an EER of 13 or higher qualify for the tax credit. The tax credit for these central air conditioning systems is the amount listed on the Department of Energy qualifying equipment list or 25 percent of the net purchase price, whichever is less. Work must be performed by a technician certified by the Oregon Department of Energy to qualify for the tax credit.

Hydronic system

This type of system is fluid-based, with hot water being the most commonly used working fluid. The hot water may be pumped through tubing in or under the floor (in-floor radiant), through a heat exchange coil in an air handler (hydronic forced air), to individual fan coil units in each room (hydronic zonal), to baseboard units in each room (hydronic convection), or any combination of these.

If you choose a hydronic heating system, the Oregon Department of Energy recommends you purchase the most efficient boiler or water heater available. The most efficient qualify for a tax credit.

Electric resistance

Historically, low electricity rates and the relatively low installation costs of some types of electric resistance systems have made them popular for many years. In areas where natural gas service is not available, they are still common. These include zonal electric (baseboard and fan-type), ceiling and floor radiant, and electric forced air furnaces. Zonal electric may be cost effective in highly efficient homes and where electric rates are low. Electric forced air furnaces are one of the most expensive and inefficient ways to heat your home. All of these use a series of electric resistance elements, and use natural convection, radiant transfer or a fan to move heat into the living space.

Ground source (geothermal) heat pump

Ground source heat pumps (GSHPs) can be very energy efficient, delivering as much as four times the energy they use. However, they are very expensive and design and installation can greatly impact their performance. The Oregon Department of Energy strongly recommends customers read the ground source heat pump Web page for more information on what to look for in design and installation if you are seriously considering a ground source heat pump.

Ground source systems most often use a ground loop, consisting of about 500 linear feet of tubing per ton of capacity, to obtain energy from the relatively warm earth. The tubing is generally buried in trenches, arranged in such a way as to optimize the volume of earth the system can draw energy from. Proper design and installation of the ground loop is critical to the operation and longevity of the system. The Oregon Department of Energy has guidelines, drawn from industry standards, that must be followed to assure proper system operation over many years.

Ground source heat pumps that meet certain standards do qualify for an Oregon energy tax credit.

Step 3: Size your system properly

Before a contractor provides you a bid for a heating system, he or she should calculate a peak-hour heat loss estimate for your home. This is the amount of energy that your home will lose, and must be made up by the heating system, during the coldest hour of the year. You should insist on this calculation from each contractor who provides a bid for your work.

The Oregon Department of Energy recommends the size of the heating system you need (in Btu/hour output capacity) should be 125 to 150 percent of the heat loss number your contractor provides.

If a contractor is using old "rules of thumb" for estimating the required size of your system, the likely result is a significantly oversized system. This is a situation to avoid, for several reasons. Oversized heating systems cycle on and off more frequently. Short-cycling degrades system efficiency and shortens the life of electrical components. It also prevents the chimney (or flue) from fully warming up. Condensation may form in the upper parts of the flue and run back down into the furnace, which can corrode the heat exchanger and the flue. Oversized systems are louder and more costly than smaller ones.

Step 4: Seal your ducts

As much as 25 percent of the heat from a forced-air heating system may be lost through leaks in the ductwork. Signs of leaky ducts show up as:

- High heating (or cooling) bills
- Drafts at registers when the heat is off
- Musty odors and condensation on windows
- Rooms that are too hot or too cold

Leaky ducts pose health risks, too. They can pull dust, insulation fibers and fumes inside your home from crawlspace, attic or garage. And, they can cause fireplaces, wood stoves, furnaces,or water heaters to backdraft, pulling combustion gases into your home.

The Oregon Department of Energy recommends you seal your ducts using mastic designed for this purpose. Using duct tape is not a durable solution. A technician trained to use specialized diagnostic equipment and appropriate duct sealing materials can locate the leaks and repair them safely and effectively. If you use an Oregon Department of Energy certified technician you may be eligible for a tax credit for 25 percent of the cost, up to $250.

Step 5: Maintain your system

Natural gas, propane and oil furnaces incorporate an inexpensive replaceable filter element, which should be changed upon discoloring and at least twice each year. If your furnace is used for cooling, change the filter at least once each season.

Natural gas furnaces should be maintained every two to three years by a professional service. Oil furnaces need annual maintenance by a professional service. Heat pumps need even more regular maintenance by a professional service.