

SmartEnergy

Energy solutions for Colorado homeowners

LIVING

Heating System Maintenance Toolkit

WINTER SAFETY

How to determine if your home's heating system is safe by testing your furnace's heat exchanger.

By Rich Moore

As a responsible homeowner, you're going to have the old furnace serviced and checked for the season, right? If you never have, this is the year to start. Poorly operating heating equipment can introduce dangerous gases, like carbon monoxide, into the air your family is breathing. An annual tune-up will test something you may know little or nothing about... your heat exchanger.

If you are the owner of a forced air furnace (a vast majority of Colorado homes have them), you are also the owner of a heat exchanger. The heat exchanger is the heart of your furnace; it is the enclosed chamber where fuel burns and a key in transferring heat throughout your home. It also exhausts combustion byproducts, effectively separating the house air from the fire in the furnace. Because combustion does occur, installing carbon monoxide detectors is a good safety precaution. If the alarm goes off, call 911 and they may advise you to leave the house immediately.

Cracked Heat Exchangers

A furnace with a cracked heat exchanger means only one thing: replace it. There have been news reports exposing disreputable heating contractors who claim a heat exchanger is cracked in order to sell you a new furnace. While they may be in the minority, you won't necessarily be able to tell and ignorance on your part can be bliss for them. When interviewing a heating contractor, ask questions. It's your furnace, your home, and your money.

1. Beware the "free" or bargain service check. This can be used to make a sales pitch, while doing very little else. A better way to go is to pay for an annual maintenance call, which may run up to \$100 or more.
2. There are numerous ways to check for a crack in a heat exchanger. Find out which method your contractor uses, and have it explained to you.
3. Ask to see the results of safety checks. If you are told the heat exchanger is cracked, ask to see the crack. (Note: a positive carbon monoxide reading is not reason alone to replace a furnace, as it is often a repairable problem).
4. Not all cracks are visible because much of the heat exchanger is hidden behind the furnace housing. There are other tests that conclusively indicate the presence of a crack. Ask your contractor to perform the test again for you.

You can always get a second or third opinion if necessary. Ask for references and call the Better Business Bureau. A contractor may shut a furnace off if they feel it is unsafe, which can be for all the right reasons, or to scare you into buying new equipment. By educating yourself before contractors come into your home, you'll know how to evaluate their performance.

Your old furnace will never be as efficient as a new closed combustion model. If you are not ready to replace your furnace, keep the old model working in its top condition for your safety, comfort and pocketbook.

Rich Moore has worked in the field of residential energy conservation performing energy audits, weatherization services, training, and consultation for homeowners and builders since 1984. Moore is a regular presenter at numerous regional and national conferences.

DOES YOUR CONTRACTOR Know NATE?

by Harvey Black



You will probably talk to a number of contractors before having work done on your heating system. No doubt they all seem friendly, tossing around impressive terms. But how can you tell how good they are? One way is to hire contractors who are certified by NATE (North American Technician Excellence, Inc.).

A technician must pass a comprehensive exam to become NATE certified. According to Dave Schrock, executive vice president of Comfort Air Distributors, a NATE certification trainer, state licensing of installers and technicians is inconsistent. Some states require licensing, some don't. "Until NATE, there really wasn't any way for the consumer to know if their contractor really knew what they're doing," says Schrock.

The consumer should ask a contractor if the technician or installer has NATE certification. A company may be NATE certified, Schrock explains, without having every technician certified.

The NATE website (natex.org) allows you to locate contractors in your area who employ NATE certified technicians. You can also call to get information at NATE's toll-free number, 1-877-420-NATE. A NATE-certified technician carries a wallet card identifying him as such. Don't be reluctant to ask to see it. Remember it's your comfort and your home and money that is involved.

Harvey Black is a technical writer in Wisconsin.



Photo courtesy of Trane

Maintain Your Furnace

Your heating bills will be unnecessarily high if the furnace is poorly maintained. Simple tasks and a professional tune-up will ensure your furnace performs at its highest efficiency.

Regular maintenance

You can perform some of the necessary routine maintenance on your heating system.

1. Clean or replace air filters monthly during the heating season.
2. Vacuum register grilles and make sure they are unrestricted by furniture, carpet or drapes. Also, use the adjustable blades on registers to reduce heated air in unused rooms of the home.
3. To save energy, turn off the pilot light during the summer months.

Heating Tune-ups

Existing equipment can be upgraded to perform more efficiently. A professional contractor may be your best answer to realizing savings, before you're ready to replace your heating system. Xcel Energy recommends tuning up older systems every year or two, and newer systems every two to three years.

A tune-up should take two to three hours and cost between \$100 -150. In addition to the following steps, technicians should test the efficiency of your furnace before and after the tune up, and provide you with a copy of the results. The efficiency test measures flue temperature, percent carbon dioxide or oxygen, smoke number, carbon monoxide, and draft.

Furnace tune-ups

- Removing and cleaning burners.
- Cleaning and checking the heat exchanger for possible carbon monoxide leaks.
- Removing the blower and cleaning blower blades.
- Lubricating any parts that need it.
- Checking the evaporator coil if there is central air conditioning.

FURNACE BUYING GUIDE

There are proven strategies that illustrate how energy efficient heating systems are better for your bottom line and home comfort.

By Rich Moore & Kirstin Marr

A properly designed and installed heating system is as important as the choice of equipment you purchase. There are numerous benefits of a well planned, well laid out heating system that provides even delivery and good recirculation of conditioned air through the home.

Size It Correctly: Bigger Is Not Better!

When choosing a furnace, you shouldn't base the size of the furnace on the size of your existing furnace because it may very well be too big. Insist that your contractor takes the time to perform load calculations. These take into account all of the energy features of the home, from the insulation levels, to window and air leakage. Ideally, you should complete all cost-effective energy efficiency upgrades before the load calculations are completed. A properly sized furnace or air conditioner can operate at its peak performance and efficiently deliver the proper amount of heating without costing a fortune to operate.

Oversized heating equipment (an all too common occurrence) may short cycle and provide uneven temperature swings. Homeowners definitely notice this frequent on and off cycling. Incorrect sizing can also shorten the life of the equipment.

Seal the Ductwork

Contractors should seal ductwork during the installation if possible, using mastic or something similar (not duct tape). Installing a high efficiency furnace doesn't necessarily mean that all those BTU's you are paying for are being delivered. How efficient is that unit really when the ductwork has a 35 percent leakage rate (refer to pg. 24 for details)?

Test It

Your contractor should perform the following tests after installing a furnace:

- Temperature Rise & Fan Off
- Carbon Monoxide
- Draft (where applicable)
- Gas Manifold Pressure (input)
- Static Pressure

Rich Moore has worked in the field of residential energy conservation performing energy audits, weatherization services, training, and consultation for homeowners and builders since 1984. Moore is a regular presenter at numerous regional and national conferences. Kirstin Marr is Editor-in-Chief of *Smart Energy Living*.

Dollar Savings Per \$100 Annual Fuel Cost*

		AFUE of New System		
		85%	90%	95%
AFUE of Existing System	50%	\$41	\$44	\$47
	55%	35	38	42
	60%	29	33	37
	65%	23	27	32
	70%	17	22	26
	75%	11	16	21
	80%	5	11	16

Find the number in horizontal row that corresponds to your current, old furnace. Find the number in the vertical row that corresponds to a new system, and the dollar figure shows the projected savings per \$100 in existing fuel bills.

Source: Consumer Guide to Home Energy Savings, 8th edition, ©2003, American Council for an Energy-Efficient Economy.

Other tests and measurements may include a CAZ test (Combustion Appliance Zone — to ensure that the furnace room is not under excessive, especially negative, pressure), duct blasting (to test tightness of the ductwork), combustion efficiency, anticipator setting, and room pressures. These tests show you that the system is operating correctly, and provides you with the peace of mind that you purchased a quality product that has been installed properly, is operating safely and at peak efficiency.

Buying High Efficient Equipment

Home Comfort. A new heating system is not going to fix home comfort problems if there is insufficient insulation or leaky windows. By implementing home tightening and insulating measures you can be more comfortable and reduce the size of the heating system.

Safety. Closed combustion appliances, like a 90 percent or higher efficient furnace, are the safest on the market today. The most efficient gas furnaces are designed in such a manner that the possibility of carbon monoxide entering the home is eliminated. Combustion air is piped directly to the burner and exhaust flue gases are piped directly outside.

Return on Investment. With the technology available today, many heating contractors have software programs that show potential energy savings specifically for your home.

Condensing Furnaces

Wring Out the Water to Save Energy

by Harvey M. Sachs

While conventional natural gas furnaces have efficiencies (AFUE, the “Annual Fuel Utilization Efficiency”) that top out at about 80 percent, condensing furnaces start at 90 percent and go up to 96 percent or better. The difference is simple: burning natural gas (or propane) forms water vapor, CO₂, and minor amounts of contaminants. Conventional furnaces waste energy to keep the water vapor formed in combustion as steam, and prevent contaminants from corroding the furnace (or boiler). Condensing furnaces are designed to capture the latent heat that is released when the steam condenses. The small amount that condenses drains to a sanitary sewer.

Condensing furnaces use a corrosion-resistant secondary heat exchanger where the condensation takes place. After leaving this heat exchanger, the remaining exhaust gases are cool enough to vent with common PVC pipe through a side wall of the building. No chimney or metal atmospheric vent is needed. Indeed, many condensing furnaces feature sealed combustion systems. In these, air for combustion is drawn from outside the building, and then exhausted outside with fan pressure. This is a significant safety feature: In “tight” houses, conventional systems may draw enough air from the house to increase the likelihood of backdrafting other appliances, particularly the water heater. Backdrafting means that make-up air is actually drawn into the house through the chimney, and dangerous combustion gases from the water heater burner can be carried into the house.

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Combustion Chamber

Sealed combustion is unique to 90+ percent furnaces.

Primary Heat Exchanger

This is where heat is transferred to circulate air in the home.

Secondary Heat Exchanger

Unique to 90+ percent furnaces, this re-circulates flue products and removes heat which results in condensation.

Blower Motor

Circulates air in the home, some are variable speed.

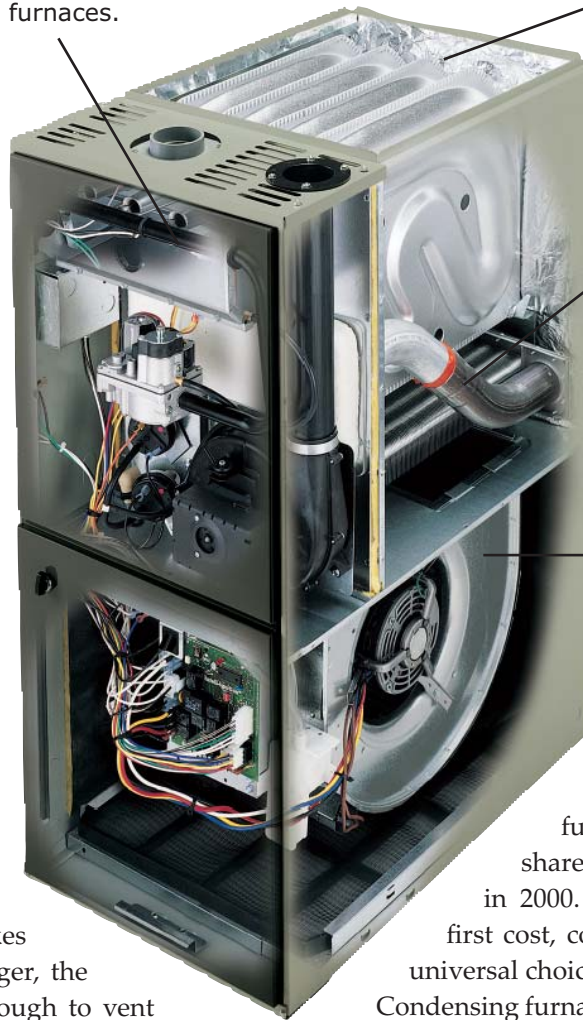


Photo courtesy of Trane

Nationally, over one million condensing furnaces were sold in 2003, almost one-third of all furnace sales that year, but market share in Colorado was only 10 percent in 2000. Despite their somewhat higher first cost, condensing furnaces should be the universal choice in Colorado.

Condensing furnaces come with a variety of options. From bare-bones 90 percent AFUE models to higher efficiency models with other premium features that are attractive for many consumers. Variable speed fans help match the furnace (and air conditioner) to the duct system, promise quieter operation, and save substantial amounts of electricity. Two-stage (or modulating) gas valves allow the furnace to run on low-fire for longer periods of time unless it is very cold, when high-fire kicks in. Longer firing times at low speed yield more comfort (less temperature fluctuation) and higher efficiency, and tend to compensate for the substantial over-sizing that is always found.