

Tips and Secrets To Buying A New Heating and Cooling System

How To Pick The Best System, Save Money, And Be Sure You Get What You Pay For

Are you in the market for a new heating and cooling system? Authorities say, *be careful*. Many homeowners who have invested in new high efficiency heating and cooling equipment **didn't get the comfort and energy efficiency they paid for**.

Information is the key to making a wise decision. This report will teach you what you should know before talking to contractors, and it will let you in on some little known facts about heating and air conditioning. Unfortunately, even many contractors aren't aware of this important new knowledge.

This report is based on important new research undertaken by the federal Department Of Energy, the Environmental Protection Agency, and electric and gas utilities nationwide. It also draws on the training resources of heating and cooling equipment manufacturers and trade associations. And it shares advice from consumer protection groups, publications and TV investigative news stories.

This report will teach you the three common reasons most new heating and cooling systems don't work as well as they should. By knowing how to avoid common mistakes, you will get the best value for your money and enjoy years of trouble free service from your new system.

An Important Decision With Long Term Implications

Buying a new heating and cooling system is a very important financial decision. What you pay to buy and install the new equipment is only a small portion of your total costs. It is often just the proverbial "tip of the iceberg".

More important, you are essentially giving your utility companies permission to send you a bill each month for using the new system. You'll also have to maintain it, and pay to fix it when it breaks down, and replace it if it fails prematurely. **Over time, the combined costs of owning a system always far exceed the initial cost of buying it.**

The wrong system, improperly installed, could sentence you to over 20 years of excessive utility and repair bills. It may also not deliver the comfort you expect and deserve, and it may adversely affect your family's health and safety.

So the first thing you need to know is... **don't rush into your decision**. If you make the wrong choice, you probably won't be able to justify tearing it out and starting again. You'll literally have to live IN your decision for as long as you own your home.

"Save 50% On Your Utility Bills!" Truth or Fiction?

You may have heard that air conditioners, heat pumps and furnaces have come a long way in the last 10 years. The most energy efficient air conditioner of 10 years ago is the bottom of the line now. In fact, a 1992 Federal law forced the manufacturers to stop making extremely inefficient units.

You'll hear a lot of industry jargon while talking to contractors, like "SEER", "HSPF" and "AFUE". These terms basically describe how efficiently the equipment operates, like miles per gallon for a car. The higher the efficiency number, the lower your electric and gas bills are supposed to be.

Contractors and manufacturers will tell you that a new high efficiency system won't really cost you much, if anything, because the investment is offset by up to 50% savings on monthly utility bills. But does this really happen?

The Truth About Energy Savings

A few homeowners actually **do** save 25% to 50% on their utility bills after buying a new system. But an unfortunate reality is that most people see only **some** savings. And there are some people who haven't even saved a dime. Only a small fraction of newly installed systems reduce utility bills by the amount they are capable of, or that was anticipated.

There is simply a lot more to efficient operation than the manufacturers' ratings. Efficiency numbers are measured in a controlled, ideal laboratory setting. A lot can and does go wrong when a contractor takes the equipment out into the real world and installs it in your home. *Most homeowners are simply not getting the efficiency they are paying for.*

Modern Heating and Cooling Equipment Is Like A New Television

You may be wondering if we are saying that the new equipment isn't as good as the manufacturers claim. Not at all. In fact, today's equipment is very well made. Modern air conditioners and furnaces are similar to modern televisions. It's almost impossible to buy a bad TV nowadays. All the major brands make really excellent products that rarely break down. Like a TV, modern heating and cooling equipment is also very well made and dependable.

Unfortunately, the comparison stops there. When you buy a TV you can take it home, unpack it and plug it in. While a TV works right out of the box, a central air conditioner, heat pump or furnace must be very carefully selected and installed in order to work as the manufacturer intended. It can't be just plugged in. Unfortunately for consumers, the installing contractor is the **weak link** in the chain.

Many homeowners are getting shortchanged. Government and utility company research shows that new systems typically deliver as little as half of the heating or cooling they are capable of. In a recent utility study, **9 out of every 10 new systems had energy wasting mistakes** due to errors or oversights by the installing contractor. The EPA states:

"Newly installed heating and cooling systems that are under or over-sized, improperly charged, or connected to a poorly designed and installed duct system will not deliver the rated efficiency."

But aren't people buying new equipment all the time that's keeping their homes warm or cool? Sure, but there's a world of difference between a system that puts out some hot or cold air, and one that performs at the high efficiency, comfort and safety levels intended by the equipment manufacturers.

When Comfort Institute and other research groups test systems in the field, it's not uncommon to find three ton air conditioners that only deliver two tons of cooling to the living area. Or to find 12 SEER efficiency air conditioners that really only perform at a 7 SEER level. Or 90% efficient furnaces that really only deliver 60% of the energy bought from the gas company. Cool or warm air does come out of the vents, but not as much as there should be.

The Three Reasons Your New System May Not Work the Way It's Supposed To

1. Your new system may be the wrong size for your home.
2. Your existing air duct system may have major hidden deficiencies.
3. Your new system may be installed improperly.

1. Make Sure Your New Equipment Is The Right Size

When it comes to heating and air conditioning equipment, bigger is NOT better. Many contractors will readily sell you a bigger unit than you need. It costs you more to buy, and it can cost a lot more to operate and service. Even worse, an oversized system actually results in a less comfortable home.

A recent **Consumer Reports Magazine** article stated:

"Beware of being sold an over-sized unit. An over-sized air conditioner will cycle on and off more frequently, causing noticeable temperature swings and putting more wear on the equipment."

If your home has hot or cold spots, and your old system didn't keep you comfortable, don't just assume that a bigger one will. In fact, a larger unit usually worsens existing uneven temperature problems. In almost every case, the best solution is to fix problems with your **air ducts or house insulation**, not to install a bigger unit.

Another common problem is that the older system had lost much of its cooling or heating ability, mostly due to insufficient maintenance. Your old system may simply not have the output it had when it was new. Its heat transfer surfaces may be dirty; its refrigerant gas charge may be out of adjustment. A brand new, clean, larger system is then too large, and results in a less comfortable home.

An oversized system comes on, runs for only a few minutes and then shuts down. It won't evenly cool or heat all the rooms, will wear out sooner, and will almost never get up to its rated laboratory efficiency. Short run cycles are less fuel efficient, just like stop and go city driving.

An oversized system is especially inappropriate in the summer. The Consumer Reports magazine article also states:

"An oversized air conditioner may cool a space too quickly, then shut off before it has completed the slower work of reducing humidity."

There's nothing worse than feeling cool but damp inside a home in the summer. Researchers have found that the new generation of high efficiency air conditioners is particularly vulnerable to inefficiency and excess summer humidity problems caused by over-sizing.

A good contractor will want to thoroughly evaluate your home to determine the right size your new system should be. He will carefully measure and inspect your home, its insulation levels and which direction the windows face.

He will often recommend a diagnostic test using an instrument called an Infiltrometer blower door. This computerized device, originally invented by Department of Energy scientists, has been featured in many national magazines and TV programs, including National Geographic, This Old House, Better Homes and Gardens and all the network TV news. It precisely measures your home's "air infiltration" rate and identifies the major energy leaks: where hot or cold outside air enters and your conditioned air escapes.

Once all the information is collected, he will perform a

Computerized Heating and Cooling Equipment Sizing Calculation to pick the right size system for your home: not too big and not too small. He'll also guarantee that it will keep you comfortable on the hottest days or coldest nights.

However, even a perfect heating and air conditioning system won't be able to keep you comfortable if there are hidden, uncorrected house insulation problems. For example, a common comfort problem is having an upstairs that's never the same temperature as downstairs. Or a particular room that is always too hot, or too cold and drafty. While these 'hot or cold spot' problems can be solved, simply installing a bigger unit is rarely the answer.

During his inspection process, a good contractor will uncover and identify any areas where insulation and thermal seals are missing or deficient. He will then recommend improvements to your home that would make it more comfortable and even out temperatures. This allows you to buy a less expensive, smaller size heating or cooling system, that saves you money each month on your utility bills.

2. Make Sure Hidden Problems In Your Home's Existing Ductwork Are Diagnosed and Repaired

The second critical issue is your home's existing ductwork: the network of hollow pipes that carry the air to and from your furnace or air handler. Recent scientific research indicates that yours probably has a whole host of hidden problems that will degrade your new equipment's performance. A recent Department of Energy study states:



"Typical duct systems lose 25 to 40 percent of the energy put out by the central furnace, heat pump or air conditioner"

This wasted energy increases your monthly utility bills and causes hot and cold spots. It is not uncommon to find that over a third of the heating or cooling you pay for doesn't make it to your living area. Duct problems are often the real reason an old system couldn't keep up. The equipment was the right size for the home, but the ducts wasted much of the energy created.

There are four key duct problems that must be investigated and resolved. Research studies have found that over 90% of duct systems have two or more of these problems:

1. Unlike large commercial buildings, most residential duct systems were never engineered or adjusted to properly distribute the air where it's needed in the home. This makes some rooms too hot or too cold.
2. Duct systems also often have hidden restrictions and design errors that choke the air flow through the equipment. This reduces the heating or cooling produced by the unit, and often causes premature equipment failure. With furnaces, low airflow can create a dangerous fire hazard. Installing an even larger new furnace or air conditioner on the existing undersized duct work makes the problem worse. A recent electric utility study found that **over two thirds** of residential systems have restricted airflow.

3. Ductwork that passes through unconditioned spaces like attics, garages, crawlspaces or basements often doesn't have enough insulation. In winter, your just heated warm air cools down, and in summer the "air conditioned" air warms up as it passes through these spaces.

4. In many duct systems, the *single biggest problem* is that they leak *incredible* amounts of air.

In the summer, expensive cooled air leaks out of your supply ducts, and hot humid air from outside, your attic or garage often gets sucked in. In winter the reverse happens. This leakage reduces the heating and cooling to certain rooms, and also decreases the overall output of your system.

In addition to reducing comfort and wasting money, duct leaks can also bring in dusty, moldy, potentially contaminated air from places like your attic, garage, crawlspace or basement. This can affect your health, and also foul or damage internal components of your new equipment.

A recent study by a Department of Energy lab discovered one key reason for this leakage: gray duct tape quickly dries out and is virtually worthless for sealing ducts!

A common problem with heat pump systems is that they seem to blow cool air in the winter. Usually, the main problem is not the heat pump, but the duct system it is connected to. Repairs to the ductwork have in some cases doubled the amount of heat delivered by the heat pump.

A properly trained, conscientious and competent contractor knows that **up to half** your new system's efficiency and comfort will actually depend on the state of your ductwork. Before he gives you a price for a new system, he will at least visually inspect your ducts for common problems.

He will often recommend more advanced testing using special computerized test instruments such as an Infiltrometer blower door, static pressure gauges, smoke generators and an air flow capture hood. If problems are uncovered, he'll recommend repairs such as duct sealing, duct modifications and possibly zoning dampers to bring your duct system up to at least minimum performance levels.

If duct repairs are needed to ensure your new system will work properly, they are usually much more economical to perform while your new equipment is being installed. The Department Of Energy states:

"Duct repairs could be the most important energy improvement measure you can do."

New high efficiency equipment on a poor duct system is like having a fuel efficient car with under-inflated tires: the engine may be in perfect shape, but your mileage is awful. To get the performance you deserve from your new system, have any hidden existing duct problems identified and repaired.

3. Make Sure Your New System Is Installed Correctly

The final concern is how your new system is installed. Many poorly trained or careless technicians often create

problems during installation. For example, sloppy workmanship often creates duct leakage where your new equipment is connected to your existing ductwork.

It's also essential that your new air conditioning or heat pump system has the proper refrigerant gas charge (most commonly known as Freon™). Most contractors make no correction for the actual length and internal volume of the copper lines in your system. They just crack open the valves and use whatever refrigerant charge came in the new outdoor unit from the factory.

Because of this common mistake, a recent study by a major electrical utility found that 79% of newly installed systems had either significantly too much or too little refrigerant gas. This increases utility bills, reduces the amount of cooling created, and often causes premature failure of the new system.

It takes time and training to correct the refrigerant gas charge for each installation. Very few residential contractors know how to do it properly. And even if they do know how, many still don't invest the time needed. A good contractor will either precisely weigh in the proper charge, or adjust it based on careful temperature, relative humidity and refrigerant gas pressure measurements.

Another common shortcut is to salvage and continue using worn out or obsolete components of your old system. Almost all new high efficiency air conditioners and heat pumps need a new indoor "evaporator coil" to work properly. This is a big radiator that's hidden inside your ductwork or air handler. A negligent contractor may either not know the evaporator coil needs replacing, or he may not tell you about it, thinking you won't want to pay for it.

But he's doing you no favors. You'll end up paying for not replacing it because of higher utility and repair bills. The advertised efficiency of a new air conditioner or heat pump is based on the performance of both new outdoor and indoor components working together as a matched system. The EPA states: "...be sure your contractor replaces both indoor and outdoor coils for maximum efficiency."

The copper tubing that connects the inside and outside components of most air conditioners and heat pumps also has to be the right diameter. Many new high efficiency systems need bigger copper lines than you likely currently have.

Replacing all the old components of your system does initially cost more, but you do get more: lower utility bills, lower repair costs, improved reliability and warranty, and increased comfort.

And finally, the poisonous exhaust gases from gas and oil furnaces and water heaters must be vented properly out of your home. An uninformed or unscrupulous contractor may install a new system without making required upgrades to the chimney or venting system, literally threatening the lives of your family. Commissioning tests and measurements of gas pressure, chimney draft and Carbon Monoxide production must be performed.

A good contractor will almost always recommend replacing both the indoor and outdoor units of an air

conditioner or heat pump. He will be able to document whether or not such things as the copper lines or chimney vents need to be replaced or upgraded. He will be able to describe step by step how his technicians will install the new equipment, and how they then test and adjust it during start up to ensure safe and efficient operation.

Ask to see a copy of their quality assurance checklists that ensure the mechanical aspects of your new system work the way they're supposed to. He'll also be able to provide proof of attendance and ongoing continuing training for his technicians at vocational, association, industry and manufacturer trade schools.

Most Contractors Either Don't Know, or Don't Care

In conclusion, many if not most homeowners who buy new high efficiency heating and cooling equipment don't get what they pay for. Utility bill savings are often minimal, and comfort and unhealthy air problems can worsen. Researchers state this is due to improper sizing, pre-existing duct problems, and poor installation practices.

This is almost entirely due to contractor ignorance. Homeowners rely on contractors, but very few of them are even aware of *what they don't know* about comfort system performance. And even more sadly, we find that many contractors simply don't care. Many just want to sell you a new metal box, hook it up, get it running, and move on.

Needless to say, the most important part of your buying process is to **pick the right contractor**: one who has the knowledge, training, instruments and procedures to help you select your new system, install it properly, and also solve pre-existing problems with your duct system and house insulation. The EPA states:

"EPA believes that contractors who have participated in advanced training on diagnostic and installation practices will be able to install better performing systems that save money and produce less air pollution than many who do not."

A good contractor will invest the time to consult with you, and will also recommend that you have him perform a **Whole House Comfort Checkup**, typically consisting of:

- a Computerized Equipment Sizing Calculation,
- an Infiltrometer blower door test, and
- duct system air flow and leakage diagnostics.

Comfort Institute **Special Report # 3** *How To Identify A Good Heating and Cooling Contractor* explains step by step how you can identify a good one, and disqualify the bad ones.

Your local independent Comfort Institute member contractor is: