

## 24 Tips & Secrets To Make Your Home Cleaner, Healthier & More Comfortable ... and Also Save Money On Your Utility Bills

Do you have . . .

- § Hot or cold rooms?
- § Excessive dust?
- § High utility bills?
- § Air that is too dry or too humid?
- § Concerns about the air quality in your home?

If you do, you are not alone. Over 90% of homes have hidden air control problems. The good news is there's a lot you can do to achieve a cleaner, healthier, more comfortable and more affordable indoor living environment. Some are do-it-yourself projects, others are best implemented by trained professionals. This report will get you started in the right direction.

However, since every home is different, not all of the suggestions here will be applicable in your home. "A Prescription, Without An Examination and Diagnosis, Is Malpractice." At Comfort Institute, we encourage homeowners to consult with a local Comfort Institute HVAC contractor member to accurately diagnose the true causes of problems in your home. Ask for information on the unique *Whole House Health and Comfort Checkup* service.

### Six New Solutions To Hot and Cold Spots

Industry studies consistently find that over 50% of homes have at least one room that is too hot or too cold when the rest of the house is comfortable. Summertime comfort problems are very common, such as individual rooms, or even entire floors, that are just too hot and stuffy. Many say their home seems muggy, especially early in the morning, or on rainy days, and the only way they can be comfortable is by turning the thermostat way down.

In many northern, basement style houses it is common to find large summertime variations in temperature from the frigid basement to the stifling top bedroom floor ... a spread of 15 degrees is common (65° in the basement and 80° in the bedrooms). In winter, cold spots and cold drafts are common complaints.

Many people mistakenly assume that this is unavoidable, since every home they ever lived in had uneven temperatures. Others say they can understand why they have the problem, since the problem area is the farthest from the furnace or air handler.

*You don't have to put up with these problems.* New government, industry and utility company research on the causes of uneven temperatures has been performed in the last few years, and the results are clear: there are economical permanent solutions that virtually eliminate large room to room variations in temperature. Here are some common causes, and solutions:

**Identify Your Duct Leaks and Have Them Sealed:** The Department Of Energy states that the typical duct system loses an astounding 25% to 40% of the energy put out by the central furnace, heat pump or air conditioner. In addition to putting a strain on your monthly budget, this energy waste causes discomfort. If the conditioned air is leaking out of the ducts, it is not getting to where it's needed.

To determine if your duct system leaks, and how badly, ask your HVAC contractor for an Infiltrometer blower door test. This is a new computerized diagnostic instrument, invented by the Department Of Energy, that measures air leakage (see photo next page). The test is something like an X Ray or MRI for your home that finds hidden leaks. It sets up in an outside doorway, and creates a temporary pressure similar to a 15 mile per hour wind on all sides of your home. It typically takes an hour to perform. The result is an exact measurement of the home and duct system air-tightness. The precise location of the leaks are pinpointed.

The Infiltrometer test instrument has been featured in National Geographic magazine, Popular Science, and on This Old House and other TV shows. Many heating and air conditioning contractors offer the test as part of a “**Whole House Health and Comfort Checkup**” that also checks insulation levels and overall duct system performance.

If your ducts are leaking, the answer is to have them thoroughly sealed, using special paint-on fiber-reinforced elastomeric sealants, not duct tape. Simply sealing duct leaks usually makes a dramatic improvement in evening out temperatures – and pays for itself through lower utility bills.



### **The Infiltrometer test pinpoints air leaks in your house and duct system**

**Have Your Duct System Tested and Air Balanced:** Very few duct systems were properly engineered or adjusted when the home was built. The “engineer” was usually the lowest paid worker of the lowest bid heating and cooling contractor the builder could find. Retain your CI Member HVAC contractor to check the “static pressure” in your ducts. Just as with blood pressure, the pressure in your air ducts must not be too high.

Renovations to the duct system may be needed to add balancing dampers and eliminate restrictions.

Also ask your contractor to perform what is called a heating and cooling load calculation. This determines the correct amount of cool or warm air that should be delivered out of every register. Factors like room size, height, amount of windows, insulation and air infiltration rates are taken into account. Once this is done your contractor can use a diagnostic instrument called an air flow capture hood to measure and adjust each register to the proper air flow. Booster fans may be needed in some cases.

**Make Sure You Have Returns In Every Room:** While almost every room has a supply register, many do not have return air grilles. This would not be a problem if we never shut any of our doors, but let’s face it, we cannot live that way. Shutting a door to a room that has a supply vent but no return is like blowing air into a coke bottle. The pressure in the room builds up. This cuts down on the amount of air that can get into the room that we are trying to heat or cool. It also redirects more air into the main part of the house where the thermostat is located. This causes the equipment to shut off too quickly, before the problem area is made comfortable. Your Consultant will check to see if this is happening in your home. Adding new return ducts or transfer grilles can make a huge difference.

**Correct Missing Insulation and Thermal Bypasses:** Proper air flow is only part of the challenge. Insulation also plays a key role in making each room comfortable. In many homes, the insulation is simply not doing its job. Missing insulation or not enough insulation is very common. This is especially a problem with rooms adjacent to attics, or over garages. As part of a Whole House Checkup, your contractor will inspect insulation levels and also check for Thermal Bypasses (hollow wall cavities in the home behind sheet rock walls). While hard to detect from below, these bypasses are like having doors or windows open all year round. Insulation over the top of them does little to reduce heat transfer. Having these bypasses pinpointed and sealed saves energy and makes individual rooms much more comfortable.

**Consider A Zoning Damper System:** After implementing the above recommendations, if the temperatures are still not even enough, or seem to vary over the course of the day, ask your contractor for a proposal for a zoning system. Motorized dampers are installed in the ducts, tied to thermostats in all areas. If one area needs more cooling or heating, the dampers to it stay open and others close off.

**Consider A SMALLER Furnace Or Air Conditioner:** Many homeowners (and most contractors) assume that if there are uneven temperature problems, a larger unit is needed. In fact, the exact opposite is true. If your current system is oversized, it comes on, runs for only a short period and then shuts off. The blast of heating or cooling from an oversized unit typically satisfies the thermostat before the farthest reaches of the home are

heated or cooled. A properly sized unit runs gently for longer periods, resulting in more even temperatures, much greater summertime humidity removal, and lower utility bills.

If your system is over 10 years old, and turns out to be oversized, comfort will improve if you install a new smaller high efficiency unit. Ask your contractor about new variable speed fans and two speed furnaces and air conditioners that adjust their output as needed to extend the run times. Although a new unit is a big investment, done properly the comfort levels will greatly improve, and lower utility bills will pay for it over time.

## Six Methods To Reduce Dust, Invisible Air Contaminants, and Allergy & Asthma Suffering

Unhealthy indoor air is another concern. The Environmental Protection Agency says most of us spend over 90% of the time indoors, and that the indoor air is usually far more polluted than outdoor air. Some homes have mysterious black stains, lingering musty odors, visible mold, or even chronic low levels of poisonous carbon monoxide gas. Respiratory problems such as allergies and asthma plague many families. Their suffering is often made worse by the air in their home. Excessive dust on the furniture is another common concern. In many homes it seems to reappear just a few days after house cleaning. Here are some proven ways to reduce dust and help your family breathe easier:

**Test For Contaminated Air Infiltration From An Attached Garage, Crawlspace, Attic Or Underground:** Are you breathing good air or bad air? Window and door leaks are usually less than 20% of a home's air leaks. Many others bring in contaminated air instead of fresh air. Building scientists have recently discovered that in the typical home, well over half the incoming air first passes through the attached garage, crawlspace, basement or attic. Air pollutants such as mold spores, carbon monoxide, automobile exhaust, radon gas, crawlspace moisture, insulation fibers and volatile organic chemicals can contaminate this incoming air, and negatively affect your family's health and safety.

The Infiltrometer test pinpoints where the bad air leaks are, and provides guidance on how to fix them. Many can be easily repaired by homeowners as weekend projects. Others such as duct leaks are better left to professionals. Finding and fixing the leaks that let in bad air will make your home healthier, less humid in the summer, less dusty, more comfortable, and even pay for itself through lower heating, cooling and repair bills.

**Identify and Reduce Pressure Imbalances In Your Home:** Pressure imbalances can be caused by closing bedroom doors that have no returns in them, large exhaust

fans such as attic powered ventilators, and duct leakage. All of these can cause the home to go to a negative pressure which sucks air in through dirty and dust areas such as attics, garages, crawl spaces and unconditioned or unfinished basements. They can also back-draft gas appliances if the negative pressure is great enough, causing poisonous carbon monoxide to spill into the home.

Your HVAC member consultant can evaluate if pressure imbalances are occurring in your home and make recommendations on how to fix them. It may be possible to put your home under a slight positive air pressure, which helps keep contaminants from entering. The Infiltrometer test will give your contractor the information needed to see if this is possible in your home.

**Repair Leaky Recessed Can Lights:** Recessed can lights are very popular, however most are not sealed. They typically allow dirt, dust, insulation fibers and very hot or cold air to be brought into the home. Luckily most of these lights can be repaired at a reasonable cost. During the Infiltrometer test, ask your contractor to inspect your recessed can lights to see if they are a problem and if they can be repaired.

**Have A Central High Efficiency Air Filter Installed:** Typical throw away furnace filters do not even adequately protect your equipment from getting fouled up, let alone protect you from invisible respirable particles. Ask your contractor for recommendations on installing a new high efficiency filter at the equipment. The best are pleated media filters, typically four to six inches thick, that only need to be changed once a year. Note however that even the best filter can't totally eliminate visible dust in the home, simply because visible dust is heavy and often settles before it gets to the filter.

**Upgrade Your Home's Mechanical Ventilation:** The Infiltrometer test precisely measures how tight or leaky your home is and whether your family is getting enough fresh air. Some houses, especially newer ones, are very air tight and clearly need improved mechanical ventilation. Older homes which have new airtight windows also often have poor indoor air. Ask your contractor for recommendations. Quiet, powerful bathroom exhaust fans are now available which do a much better job of removing moisture and odors. Another option is a Heat Recovery or Energy Recovery Ventilator, which pre-heats or pre-cools the incoming air with the stale air it exhausts. Another is a whole house ventilating dehumidifier, that brings in outside air and filters it before putting in your home.

**Install A Low Level Carbon Monoxide Monitor and Alarm:** Carbon Monoxide (CO) is a very real health hazard. Unfortunately, many homeowners who have a CO alarm are not actually protected. The typical CO alarm's sensor only lasts 2 to 4 years, and the test button only checks the battery and the horn, not the CO sensor. Ask your HVAC contractor to test your alarm with actual CO test gas to ensure it is still working. Another problem is that standard CO alarms do not warn you of chronic low



levels in your home that can cause permanent neurological damage. Low levels of CO are especially hazardous for infants, unborn babies, the elderly and those with chronic illnesses. Ask your contractor for information on a new Low Level Health Monitor device which will give you early warning.



**Have your CO Alarm tested, and look into an alarm that monitors chronic lower levels of Carbon Monoxide**

## Four Solutions To Control Indoor Humidity Levels Year-Round

Indoor humidity has a direct impact on health and comfort. Dry air causes sore throats, dry sinuses, increased risk of infections, static electric shocks, and cracks in wood trim and furniture. In most homes, the humidity levels vary substantially from week to week, depending largely on outdoor weather conditions. There are many steps you can take to better control humidity.

**Tighten Up Your Home And Ducts And Use A Central Humidifier To Reduce Winter Dryness:** If winter dryness is an issue, excessive dry outdoor winter air is the culprit. Outdoor air in the winter is actually drier than the Sahara desert. Tightening up the home and ducts, and using a central humidifier will bring humidity up to a healthy level. The Infiltration test will help your contractor determine the right size of humidifier for your home.

On the other hand, some houses are actually **too humid**, causing excessive moisture to drip off the windows in the winter, or to be damp and clammy in the summer.

Controlling excessive indoor moisture and humidity is the key to controlling allergy causing mold and dust mites. The American Lung Association, the American Medical Association, the Environmental Protection Agency, the Centers For Disease Control and many other authorities recommend keeping the relative humidity level in your home between 30% and 50% year round. Higher levels encourage allergy causing dust mites, mold growth and musty odors. High levels of indoor mold can cause serious health problems, including allergic reactions, toxic reactions, asthma episodes, infections and respiratory damage. High indoor humidity levels in the summer cause discomfort.

**Reduce Moisture Sources If You Have Excessive Humidity:** Excessive indoor humidity is a complex subject, depending on whether it is a winter or summertime problem. After completing your Whole House Health and Comfort Checkup, your contractor will be in a better position to make recommendations. Possible solutions include: added wintertime ventilation, covering dirt floors in crawlspaces, capping open sump pits and basement wall air leaks, improved foundation drainage, and better exhaust fans in bathrooms. Don't store firewood indoors. Cover pots when cooking.

In much of the country, for most of the spring, summer and fall, the primary source of moisture is the outdoor air leaking into the house. It contains very high levels of humidity in the form of invisible water vapor. Too much outside air raises summertime indoor humidity to unhealthy levels, and can overcome the dehumidification capacity of the air conditioner. Tightening up duct and house leaks reduces the amount of humid outside air.

**Consider A New Air Conditioner With Enhanced Dehumidification Features:** Air conditioners reduce summer humidity as a byproduct of cooling the home. If you are planning to buy a new AC unit, be careful. Not all systems are the same in regards to moisture removal. Many "high efficiency" systems are less able to remove humidity than the older units. Ask for a unit with a *TXV valve*, and be sure the contractor doesn't intentionally pick an excessively large indoor evaporator coil just to claim a higher SEER rating. Some units have advanced humidity sensing controls, variable speed fans or two speed compressors that help wring out more moisture.

Ensure your new AC system is the right size. When it comes to air conditioning, **bigger is not better, because you'll end up wetter**. An oversized unit quickly cools the house and then shuts off before it does the longer job of removing humidity. Have your contractor perform a computerized equipment sizing calculation conforming to the industry standard "Manual J". When commissioning the new system, a good contractor will adjust the "deadband" or differential on your thermostat to minimize

short-cycling, and also adjust the airflow across the indoor coil. Both these steps maximize dehumidification.

**Consider Investing In A High Capacity Ducted Dehumidifier:** Even the best air conditioner can't keep the house dry and comfortable during cloudy or rainy weather. There are now high efficiency, high capacity dehumidifiers available that supplement the air conditioning system, delivering the ultimate in indoor comfort and indoor air quality. They can be installed out of sight using ductwork, and connected to a condensate drain so that you never have to empty the reservoir. This equipment dehumidifies the whole house and also cleans the air 24 hours a day, 365 days a year. Some models even provide filtered fresh outdoor ventilation air. Ask your contractor for recommendations.



**A whole house ducted dehumidifier delivers the ultimate in comfort and healthy indoor air**

## Four Tips To Cut Your Winter Heating and Summer Cooling Bills and Save Money

**Implement The Recommendations To Improve Comfort and Indoor Air Quality:** Almost all the previous recommendations in this report will also reduce your utility bills. The first step is to have your contractor perform a Whole House Health and Comfort Checkup to find out what your priorities should be.

**Install A Programmable Set-Back Thermostat:** Turning down the thermostat 8 degrees for eight hours a day will save 8-10 percent on home heating costs. An easy way to take advantage of these savings is to lower the thermostat temperature while away from home or sleeping. Ask your contractor about new models which are much easier to program.

**Have Your Heating and Cooling Equipment Cleaned and Checked:** A pre-season tune up and filter change (both winter & summer) is a good investment. It reduces the chances of breakdowns in the middle of winter, improves safety, and pays for itself through more energy efficient operation. Maintaining your heating and cooling equipment is no different than maintaining your automobile, except that we often use our heating and cooling equipment much more.

**Consider Replacing Your Old Furnace, AC Or Heat Pump:** Just like a car, heating and cooling equipment doesn't last forever. If your system is over 12 years old, and you are planning to stay in your home more than a few years, many authorities recommend considering replacing it before it fails permanently. A new system is safer, more dependable, more comfortable, and can pay for itself through energy savings as they are up to twice as energy efficient.

## Four Mistakes to Avoid When Buying a New Furnace or Air Conditioner

**Don't Believe Everything You Hear:** 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.

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? 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. Some buyers of new high efficiency air conditioners found that they are less comfortable with their new unit, and some found that it contributed to unhealthy mold growth in their homes.

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, or comfort, they are paying for.

**Take Your Time and Do Your Homework:** 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.

Ask your local CI member HVAC Contractor for the CI Special Report: "Tips and Secrets To Buying A New Heating and Cooling System"

**Don't Buy An Oversized System, Or Ignore Pre-Existing Duct Problems:** As described elsewhere in this report, most homes have equipment that is actually too big, and performance suffers. New high efficiency AC equipment is much more sensitive to over-sizing, and to pre-existing duct problems. Have your contractor perform an equipment sizing calculation, and a Whole House Comfort Checkup, before quoting a price for a new system. Many of the recommendations are more economical to perform if done at the same time as a new system.

**Take The Time To Pick The Right Contractor:** The most important thing to do when buying a new comfort system is to invest the time to pick the right contractor. Here's a summary of some of the key recommendations from the CI Special Report "How To Identify A Good

Heating And Cooling Contractor", available from your local CI member contractor:

- Don't Assume That All Contractors Are "Pretty Much The Same"
- Don't Choose A "Fly-By-Night" Contractor
- Don't Assume A "Name Brand" Dealer Is Automatically A Good Choice
- Don't Choose A Contractor Who Quotes A Price Without Any Diagnostic Testing
- Don't Be Misled By The Many Who Will Only Offer To Replace Equipment
- Don't Choose A Contractor Who Doesn't Ask A Lot Of Questions
- Don't Put The Learning Burden All On One Spouse's Shoulders
- Don't Try To Evaluate Your Options When You Are Tired Or Distracted
- Don't Choose A Contractor Who Doesn't Explain Your Options
- Don't Make A Rushed Decision
- Don't Focus Only On Initial Costs
- Don't Assume The Lowest Price Company Is The One You Should Hire
- Don't Put Up With High Pressure Salespeople
- Don't Try To Buy A New System Over The Phone



**The most important step to buying a new heating and cooling system is to pick the right contractor**