Benefits of a Home Energy Audit

Save Money on Your Energy Bills

A certified home energy professional is trained to pinpoint the areas of your home where energy is being wasted and used inefficiently. More importantly, the report will prioritize cost-effective improvement opportunities that will pay financial dividends every time your utility bill arrives.

Increase Your Comfort

When you implement home improvements recommended by a certified professional, you will literally feel the difference. Air sealing the building shell, sealing leaky air handler ducts, adding insulation, or replacing that old furnace or air conditioner will make your home a more pleasant place to be.

Increase Your Home's Resale Value

For every $1 decrease in annual energy costs, the market value of a home increases by $20, according to a study published in the Appraisal Journal. If you decrease your energy costs by $300 per year, the value of your home increases by $6,000. Certified professionals can verify measurable results of the improvements performed.

Improve Your Home's Marketability

With rising fuel costs, home buyers are seriously considering the house's operating expenses. Measures to lower utility bills are valuable home improvements that reap dividends month after month. A home buyer will also have confidence that the house has been optimally maintained when you show it was audited by a certified professional and retrofitted by a qualified EnergySmart contractor. You're more likely to make a faster sale for a higher price.

Uncover Hidden Problems

A home energy audit involves a thorough inspection of your home, which can uncover hidden structural and safety problems before they cause major damage. For example, improper ventilation can cause mold or mildew growth, which you may not discover until it becomes severe and costly repairs are required. A certified professional can prevent problems before they affect your health or damage your home.

Help the Environment

By using less energy, you reduce the amount of pollution and greenhouse gasses that are created in the production of electricity and the fuels we burn. You can feel good about the energy (and money) you're saving because you're doing your part for the environment.

Take Advantage of Government Incentives

While you don't necessarily need a home energy audit in order to take advantage of government tax incentives and rebates, your certified professional can show you which cost-effective improvements make the most sense for your home. With the recommendations from your energy audit report and tax incentive information, you can make the right decisions as to which measures will pay the biggest return on your investment - and have the government help you do it.

Invest in a Sure Money-Maker

Investing in your home's energy efficiency takes money. Fortunately, your return on investment is around 16% per year, after taking into account the money you spent on the improvements. As energy prices rise, so will your return on investment. It will likely be your most successful investment, without any risk. A certified professional could help put more money in your pocket than your stock broker!

What is a Home Energy Audit?

A home energy audit (or survey) evaluates an existing home to determine where and how energy is being lost, what systems are operating inefficiently and what cost-effective improvements can be implemented to enhance occupant comfort, make the home more durable and lower utility costs.

RESNET (Residential Energy Services Network) has defined three types of energy assessments for existing homes which range in complexity from a simple but effective walk-through survey to a performance audit using diagnostic equipment and computerized data analysis to a comprehensive home energy rating utilizing the most sophisticated modeling software to produce a home rating score on the HERS Index. These options, listed from least complex to most complex are explained below.

Home Energy Survey

A Home Energy Survey is a visual inspection and does not include the use of diagnostic testing equipment. Its purpose is to assess the general energy performance of an existing home including:

* Building envelope features (windows, doors, insulation, ducts) and ages
* Heating, cooling and ventilation equipment types, characteristics and ages
* Appliance and lighting characteristics
* Comfort complaints
* Visible moisture issues
* Visible health and safety issues

The Home Energy Survey Professional (HESP) will request a review of utility use and billing history to better understand potential opportunities for savings. A report of the complete assessment is provided, including basic recommendations for improving the home's energy efficiency, as well as low-cost do-it yourself tasks. It also includes information on relevant utility-based programs that may incentivize the homeowner to take action. A Home Energy Survey takes approximately one hour to complete.

Building Performance Audit

A Building Performance Audit includes all of the inspections provided in the Home Energy Survey and also includes diagnostic testing using specialized equipment such as a blower door, duct leakage tester, combustion analyzer and infrared camera to determine:

* The amount and location of air leaks in the building envelope
* The amount of leakage from HVAC distribution ducts
* The effectiveness of insulation inside walls and ceilings
* Any existing or potential combustion safety issues

A Building Performance Auditor (BPA) conducts a whole-house evaluation and performs computer software analysis to identify and prioritize proposed treatments for improvement. The detailed report will provide suitable retrofit recommendations and specifications and guide the homeowner to the appropriate RESNET Qualified Energy Smart Contractors who can perform the work. A Building Performance Audit takes 3-4 hours depending on the size of your home.

Comprehensive HERS Rating

A Comprehensive HERS Rating is the most in-depth performance audit of an existing home. It consists of the evaluation, diagnostic testing, cost-effective recommendations and work specifications contained in a Building Performance Audit.

In addition, a Comprehensive HERS Rating includes a computerized simulation analysis utilizing RESNET Accredited Rating Software to calculate a rating score on the HERS Index. The report will also contain a cost/benefit analysis for the recommended improvements and expected return on investment. Comprehensive HERS Ratings of existing homes will be required to qualify loan applicants for certain federally sponsored mortgage products.

For more information on accessing a Comprehensive Home Energy Audit, visit www.resnet.us/home-energy-ratings.

Your House as a System

Just like the engine of an automobile, your house works as a system of independent parts. Every part has an impact to the operation of many other parts. A typical home has over 10,000 parts. What happens when all the parts work together in the most desirable, optimal way? You are rewarded with a house that is durable, comfortable, healthy and energy-efficient.

Much as one is more than the sum of their arms, legs, heart, and brain, so too is a house more than the sum of its parts. Everything is connected in both "systems," and often in unexpected ways!

Having a dark roof will make air conditioning bills higher. Putting in a beefier kitchen exhaust fan can starve a distant water heater of air and cause dangerous pollutants to flow down (rather than up) the flu or make a fireplace dump smoke into the living room.

There are often telltale signs when a home is not properly acting like the system it was intended to be. For example, ice dams are evidence of excessive heat loss, which make pretty icicles on the eve but can cause severe roof damage and danger on the ground. Moisture damage or bad indoor air quality are usually dead give-aways of some deeper problem (or multiple problems!).

The art of bringing a home back into "balance" frequently involves finding sources of air leakage. Often, an important (but out of sight) location of leaks is in the heating and cooling ducts. Providing enough air for combustion equipment like furnaces, water heaters, and gas dryers is also crucial. Tools like blower doors can be used in worst-case tests to see how the home system performs when stressed.

The story of a home-as-system is also told through the many benefits (in addition to energy savings) that can be had by fixing performance problems. These take the form of a quieter living environment, higher comfort, and elimination of safety hazards.

How To Prioritize Actions

Ease into the process of making your home more efficient. If you're new to this, or you're on a very tight budget, start with the lowest-hanging fruit like double-checking your water heater's temperature setting.

The next easy steps are simple things that will fit into your shopping basket: maybe a few compact fluorescent lamps or a roll of weatherstripping.

When it's time to replace that old fridge, or other appliances, take time to shop smart. At a minimum, look for the ENERGY STAR rating. There are detailed lists of products that will take you even farther. Remember: you're not simply spending money, you're investing for profit and comfort.

Redoing your kitchen? New roof? Finally adding that in-law unit? Creating successful projects can take some work. Take the time to find a home performance specialist to help you think thru all the options ahead of time, and then find the right contractor with the skills to do the job right.

Not only will these upgrades pay for themselves many times over, there are all kinds of financial incentives to help you trim the cost. And many of the "non-energy benefits" will be worth more than money can buy.

The Lowest-Hanging Fruit

The following information you will read about dozens of no-cost tips for things you can do to start saving energy immediately, many of which can be done without even opening your wallet!

Insulation

First, check the insulation in your attic, ceilings, exterior and basement walls, floors, and crawl spaces to see if it meets the levels recommended for your area. Insulation is measured in R-values—the higher the R-value, the better your walls and roof will resist the transfer of heat. DOE recommends ranges of R-values based on local heating and cooling costs and climate conditions in different areas of the nation. The map and chart below show the DOE recommendations for your area. State and local code minimum insulation requirements may be less than the DOE recommendations, which are based on cost effectiveness. For more customized insulation recommendations, check out the Zip Code Insulation Calculator. This tool provides insulation levels for your new or existing home based on your zip code and other basic information about your home. Although insulation can be made from a variety of materials, it usually comes in four types; each type has different characteristics.

Rolls and batts—or blankets—are flexible products made from mineral fibers, such as fiberglass and rock wool.

They are available in widths suited to standard spacings of wall studs and attic or floor joists: 2x4 walls can hold R-13 or R-15 batts; 2x6 walls can have R-19 or R-21 products.

Loose-fill insulation—usually made of fiberglass, rock wool, or cellulose in the form of loose fibers or fiber pellets, it should be blown into spaces using special pneumatic equipment. The blown-in material conforms readily to building cavities and attics. Therefore, loose-fill insulation is well suited for places where it is difficult to install other types of insulation.

Rigid foam insulation—foam insulation typically is more expensive than fiber insulation. But it's very effective in buildings with space limitations and where higher R-values are needed. Foam insulation R-values range from R-4 to R-6.5 per inch of thickness, which is up to 2 times greater than most other insulating materials of the same thickness.

Foam-in-place insulation—this type can be blown into walls and reduces air leakage, if blown into cracks, such as around window and doorframes.

Insulation Tips

- Consider factors such as your climate, building design, and budget when selecting insulation R-values for your home.
- Use higher density insulation on exterior walls, such as rigid foam boards, in cathedral ceilings and on exterior walls.
- Ventilation helps with moisture control and reducing summer cooling bills. Attic vents can be installed along the entire ceiling cavity to help ensure proper airflow from the soffit to the attic to make a home more comfortable and energy efficient. Do not ventilate your attic if you have insulation on the underside of the roof. Check with a qualified contractor.
- Recessed light fixtures can be a major source of heat loss, but you need to be careful how close you place insulation next to a fixture unless it is marked IC—designed for direct insulation contact. Check your local building codes for recommendations. See Lighting for more about recessed cans.
- As specified on the product packaging, follow the product instructions on installation and wear the proper protective gear when installing insulation.

Long-Term Savings Tip

One of the most cost-effective ways to make your home more comfortable year-round is to add insulation to your attic.

Adding insulation to the attic is relatively easy and very cost effective. To find out if you have enough attic insulation, measure the thickness of the insulation. If it is less than R-30 (11 inches of fiber glass or rock wool or 8 inches of cellulose), you could probably benefit by adding more.

Most U.S. homes should have between R-30 and R-60 insulation in the attic. Don't forget the attic trap or access door.

If your attic has enough insulation and your home still feels drafty and cold in the winter or too warm in the summer, chances are you need to add insulation to the exterior walls as well. This is a more expensive measure that usually requires a contractor, but it may be worth the cost if you live in a very hot or cold climate. If you replace the exterior siding on your home, you should consider adding insulation at the same time.

You may also need to add insulation to your crawl space or basement. Check with a professional contractor.

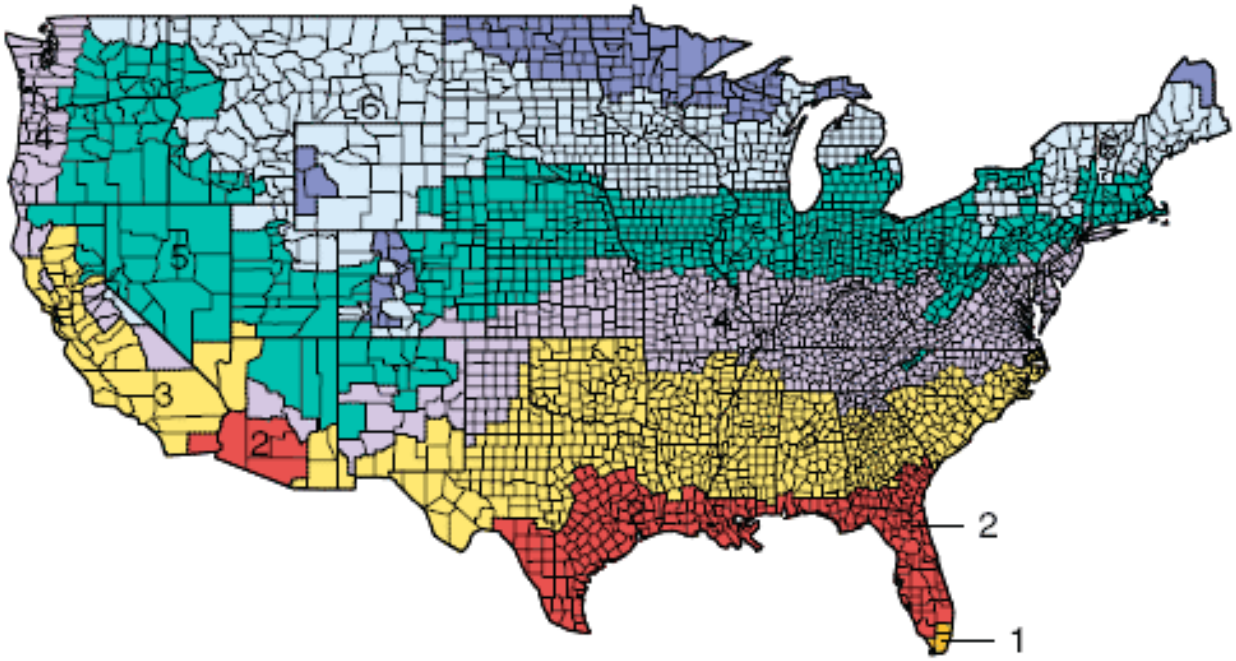
New Construction

For new homes in most climates, you will save money and energy if you install a combination of cavity insulation and insulative sheathing. Cavity insulation can be installed at levels up to R-15 in a 2 in. x 4 in. wall and up to R-21 in a 2 in. x 6 in. wall. The insulative sheathing, used in addition to this cavity insulation, helps to reduce the energy that would otherwise be lost through the wood frame. The table below shows the recommended combinations. For example, in Zone 5, you could use either a 2x4 wall with R-13 or a 2x6 wall with R-21. For either of those two walls, you should also use an inch of insulative sheathing that has an R-value of R-5 or R-6.

Today, new products are on the market that provide both insulation and structural support and should be considered for new home construction or additions. Structural insulated panels, known as SIPs, and masonry products like insulating concrete forms are among these. Some homebuilders are even using an old technique borrowed from the pioneers: building walls using straw bales. Check online at www.energysavers.gov for more information on structural insulation.

Radiant barriers (in hot climates), reflective insulation, and foundation insulation should all be considered for new home construction. Check with your contractor for more information about these options.

U.S. Department of Energy Recommended* Total R-Values for New Wood-Framed Houses



Proper Levels of Insulation

U.S. map showing recommended insulation levels for the home based on climate regions and heating type.

Zone	Gas	Heat Pump	Fuel Oil	Electric Furnace	Attic	Cathedral Ceiling	Wall		Floor
							Cavity	Insulation Sheathing	
1	✓	✓	✓	✓	R30 to R49	R22 to R38	R13 to R15	None	R13
2	✓	✓	✓		R30 to R60	R22 to R38	R13 to R15	None	R13
2				✓	R30 to R60	R22 to R38	R13 to R15	None	R19 - R25
3	✓	✓	✓		R30 to R60	R22 to R38	R13 to R15	None	R25
3				✓	R30 to R60	R22 to R38	R13 to R15	R2.5 to R5	R25
4	✓	✓	✓		R38 to R60	R30 to R38	R13 to R15	R2.5 to R6	R25 - R30
4				✓	R38 to R60	R30 to R38	R13 to R15	R5 to R6	R25 - R30
5	✓	✓	✓		R38 to R60	R30 to R38	R13 to R15	R2.5 to R6	R25 - R30
5				✓	R38 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30
6	✓	✓	✓	✓	R49 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30
7	✓	✓	✓	✓	R49 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30
8	✓	✓	✓	✓	R49 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30

Air Leaks

Checking your home's insulation is one of the fastest and most cost-effective ways to use a whole-house approach to reduce energy waste and make the most of your energy dollars. A good insulating system includes a combination of products and construction techniques that protect a home from outside hot or cold temperatures, protect it against air leaks, and control moisture. You can increase the comfort of your home while reducing your heating and cooling needs by investing in proper insulation and sealing air leaks.

Quality Building Envelope Sealing Air Leaks

Warm air leaking into your home during the summer and out of your home during the winter can waste a lot of your energy dollars. One of the quickest dollar-saving tasks you can do is caulk, seal, and weatherstrip all seams, cracks, and openings to the outside. You can save on your heating and cooling bill by reducing the air leaks in your home.

Tips for Sealing Air Leaks

Pie chart shows how air escapes from a typical home: 31% floors, ceiling, walls; 15% ducts; 14% fireplace; 13% plumbing penetrations, 11% doors; 10% windows; 4% fans and vents; 2% electric outlets.

How Does the Air Escape?

Air infiltrates into and out of your home through every hole and crack. About one-third of this air infiltrates through openings in your ceilings, walls, and floors.

First, test your home for air tightness. On a windy day, carefully hold a lit incense stick or a smoke pen next to your windows, doors, electrical boxes, plumbing fixtures, electrical outlets, ceiling fixtures, attic hatches, and other locations where there is a possible air path to the outside. If the smoke stream travels horizontally, you have located an air leak that may need caulking, sealing, or weatherstripping.

Caulk and weatherstrip doors and windows that leak air.

Caulk and seal air leaks where plumbing, ducting, or electrical wiring penetrates through walls, floors, ceilings, and soffits over cabinets.

Install foam gaskets behind outlet and switch plates on walls.

Look for dirty spots in your insulation, which often indicate holes where air leaks into and out of your house. You can seal the holes with low-expansion spray foam made for this purpose.

Look for dirty spots on your ceiling paint and carpet, which may indicate air leaks at interior wall/ceiling joints and wall/floor joists. These joints can be caulked.

Install storm windows over single-pane windows or replace them with more efficient windows, such as double-pane. See Windows on page 18 for more information.

When the fireplace is not in use, keep the flue damper tightly closed. A chimney is designed specifically for smoke to escape, so until you close it, warm air escapes—24 hours a day!

For new construction, reduce exterior wall leaks by installing house wrap, taping the joints of exterior sheathing, and comprehensively caulking and sealing the exterior walls.

Use foam sealant around larger gaps around windows, baseboards, and other places where warm air may be leaking out.

Kitchen exhaust fan covers can keep air from leaking in when the exhaust fan is not in use. The covers typically attach via magnets for ease of replacement.

Replacing existing door bottoms and thresholds with ones that have pliable sealing gaskets is a great way to eliminate conditioned air leaking out from underneath the doors.

Fireplace flues are made from metal, and over time repeated heating and cooling can cause the metal to warp or break, creating a channel for hot or cold air loss. Inflatable chimney balloons are designed to fit beneath your fireplace flue during periods of non-use. They are made from several layers of durable plastic and can be removed easily and reused hundreds of times. Should you forget to remove the balloon before making a fire, the balloon will automatically deflate within seconds of coming into contact with heat.

Cutaway house illustration showing areas of home where air leaks. Refer to caption for list.

Sources of Air Leaks in Your Home

Areas that leak air into and out of your home cost you lots of money. Check the areas listed below.

1. Dropped ceiling
2. Recessed light
3. Attic entrance
4. Sill plates
5. Water and furnace flues
6. All ducts
7. Door frames
8. Chimney flashing
9. Window frames
10. Electrical outlets and switches
11. Plumbing and utility access

Diagnosing the Problem

Rather than focusing on a single component, such as single-paned windows, an old air conditioning system, or leaky ductwork, a participating contractor will assess how improvements to all of these components can work together to provide:

* fewer drafts
* consistent temperatures across rooms,
* better ventilation and humidity control, and
* lower utility bills

Common Recommendations

Sealing Air Leaks and Adding Insulation

Many air leaks in homes are fairly obvious, such as around windows, doors, and electrical outlets. But others, like those in attics, around chimneys, and through recessed lighting fixtures, are often the more significant sources of energy loss in a home. Sealing air leaks is critical to improving the overall efficiency of your home and will make your heating and cooling system perform better. Along with air sealing, your contractor may recommend that you add insulation. Many older homes are not well-insulated, and some have no insulation at all. Properly installed insulation in walls, floors, and attics provides for more even temperatures throughout the house and results in a quieter, more comfortable living environment that is easier to heat and cool.

Ductwork Sealing

Sealing leaky ducts can help improve comfort and avoid indoor air pollution problems, fire hazards, and rooftop ice-dam formation during the winter.

Having your ducts professionally sealed to reduce leakage can help avoid a number of problems, in addition to cutting back on your energy bills. Well-sealed ducts can:

- Well-sealed ducts have been shown to improve the flow and temperature of the air delivered to rooms, improving the comfort of even those rooms that were previously uncomfortable during certain times of the year.
- Reduce moisture damage or mold in the spaces surrounding the ducts (such as the walls, floor, or attic). For ducts located in the attic, moisture and heat leaks through the ducts can result in condensation on the attic walls or ceiling, or in the winter can cause rooftop snow to melt and form dangerous ice dams. Ice dams are a common cause of roof damage and also create dangerous conditions for pedestrians around the home.
- Reduce phenomena such as door slamming. Leaky supply ducts can cause a situation called "depressurization", in which the house experiences a kind of suction effect because the amount of air being exhausted from the home is greater than the amount being supplied. One symptom of depressurization is doors that mysteriously slam.
- Reduce fire risk. Depressurization in rooms containing combustion appliances (such as water heaters or furnaces) can cause the burner flames from those appliances to come into contact with flammable parts of your home. This phenomenon is called "flame roll-out" and is a known cause of house fires. Homes will well-sealed ducts are less prone to flame roll-out.
- Help avoid indoor air pollution problems. Depressurization in rooms containing combustion appliances can also cause dangerous combustion products (fumes), such as

carbon monoxide, to be pulled into the home. Depressurization can also increase the rate of radon entry into a home, particularly in basements.

- Help reduce odors, dust and mold in the air circulating through your ducts. Leaky return ducts can cause basement or garage odors, crawlspace dust or mold, or attic insulation fibers to be sucked into your duct system and then delivered into your rooms. Not only is this detrimental to your health, but these particles can also degrade the performance of your air conditioner by clogging up the cooling coil.

Air Flow

Many homes have leaky ductwork and poor air flow, resulting in stuffy and uncomfortable rooms — regardless of the thermostat setting. The home performance contractor may recommend sealing your home's ducts with mastic, metal tape or spray-on sealant, and balancing the duct system to optimize air flow to all rooms. Insulating ductwork in attics, crawlspaces, and some basements can also help to ensure that your home will be more comfortable.

Improving Heating and Cooling Systems

If your furnace or air conditioner is more than 10 years old, your contractor may recommend that you replace it with high-efficiency heating and cooling equipment that has earned the ENERGY STAR label. Installed correctly, these units can save up to 20 percent on heating and cooling costs. Make sure to insist on a quality installation of your cooling equipment, in particular. Studies show that half of all central air conditioners in U.S. homes never perform to their advertised capacity and efficiency due to incorrect installation. The EPA has introduced ENERGY STAR Quality Installation Guidelines to help ensure that your cooling equipment is properly installed by a contractor to deliver efficiency and comfort.
Watch Video: A comprehensive approach to Home Improvement

Quality Installation Guidelines are based on industry best practices to help avoid common cooling equipment installation problems like incorrect sizing, insufficient refrigerant charge and airflow, and poorly sealed and improperly balanced duct systems. Only selected contractors have the training and certifications necessary to conduct installations that meet ENERGY STAR Quality Installation Guidelines.

For more information on how to ask for a quality installation of a new or replacement central air conditioner system, check out ENERGY STAR Quality Installation.

Upgrading Lighting and Appliances

Energy used for lighting and appliances can account for half of your home's total utility bill. As a result, the home performance contractor may recommend ENERGY STAR qualified products, such as refrigerators, dishwashers, electronic equipment, light fixtures, and compact fluorescent bulbs. An energy- and water-efficient hot water heating system may also be recommended.

Once you've taken steps to increase your home's efficiency, you may also want to consider adding renewable energy systems, such as solar electric (photovoltaics) or solar hot water, to further reduce your utility bills.

Duct Sealing

In houses with forced-air heating and cooling systems, ducts are used to distribute conditioned air throughout the house. In a typical house, however, about 20 percent of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts. The result is higher utility bills and difficulty keeping the house comfortable, no matter how the thermostat is set.

How do you know that your home has poorly performing ducts?

* you have high summer and winter utility bills;
* you have rooms that are difficult to heat and cool;
* you have stuffy rooms that never seem to feel comfortable;
* your ducts are located in an attic, crawlspace, or the garage;
* you find tangled or kinked flexible ducts in your system.

Benefits of Duct Sealing

A duct system that is well-designed and properly sealed can make your home more comfortable, energy efficient, and safer.

Simple Steps to Improving Duct Performance

Because ducts are often concealed in walls, ceiling, attics, and basements, repairing them can be difficult. But there are things that you can do to improve duct performance in your house.

Some homeowners choose to take on duct sealing as a do-it-yourself project. Start by sealing air leaks using mastic sealant or metal tape and insulating all the ducts that you can access (such as those in attics, crawlspaces, unfinished basements, and garages). Never use duct tape, as it is not long-lasting. Also, make sure that the connections at vents and registers are well-sealed where they meet the floors, walls, and ceiling. These are common locations to find leaks and disconnected ductwork.

Many homeowners choose to work with a professional contractor for duct improvement projects. Most heating and cooling equipment contractors also repair ductwork.

Heat & Cool Efficiently

As much as half of the energy used in your home goes to heating and cooling. So making smart decisions about your home's heating, ventilating, and air conditioning (HVAC) system can have

a big effect on your utility bills — and your comfort. Take these steps to increase the efficiency of your heating and cooling system. For more information, see our Guide to Energy Efficient

Change your air filter regularly

Check your filter every month, especially during heavy use months (winter and summer). If the filter looks dirty after a month, change it. At a minimum, change the filter every 3 months. A dirty filter will slow down air flow and make the system work harder to keep you warm or cool — wasting energy. A clean filter will also prevent dust and dirt from building up in the system — leading to expensive maintenance and/or early system failure.

Tune up your HVAC equipment yearly

Just as a tune-up for your car can improve your gas mileage, a yearly tune-up of your heating and cooling system can improve efficiency and comfort. Learn more:

* Maintain your Equipment: A Checklist
* Finding the right contractor: 10 tips

Install a programmable thermostat

A programmable thermostat is ideal for people who are away from home during set periods of time throughout the week. Through proper use of pre-programmed settings, a programmable thermostat can save you about $180 every year in energy costs.
Seal your heating and cooling ducts

Ducts that move air to-and-from a forced air furnace, central air conditioner, or heat pump are often big energy wasters. Sealing and insulating ducts can improve the efficiency of your heating and cooling system by as much as 20 percent — and sometimes much more.

Focus first on sealing ducts that run through the attic, crawlspace, unheated basement, or garage. Use duct sealant (mastic) or metal-backed (foil) tape to seal the seams and connections of ducts. After sealing the ducts in those spaces, wrap them in insulation to keep them from getting hot in the summer or cold in the winter. Next, look to seal any other ducts that you can access in the heated or cooled part of the house. See our See our Duct Sealing brochure PDF (1.13MB) for more information. for more information.

Consider installing ENERGY STAR qualified heating and cooling equipment

If your HVAC equipment is more than 10 years old or not keeping your house comfortable, have it evaluated by a professional HVAC contractor. If it is not performing efficiently or needs upgrading, consider replacing it with a unit that has earned the ENERGY STAR. Depending on where you live, replacing your old heating and cooling equipment with ENERGY STAR qualified equipment can cut your annual energy bill by nearly $200. But before you invest in a new HVAC system, make sure that you have addressed the big air leaks in your house and the

duct system. Sometimes, these are the real sources of problems rather than your HVAC equipment.

Proper installation of your new equipment

Replacing your old heating and cooling equipment with new, energy-efficient models is a great start. But to make sure that you get the best performance, the new equipment must be properly installed. In fact, improper installation can reduce system efficiency by up to 30 percent — costing you more on your utility bills and possibly shortening the equipment's life. Learn more.

Efficient HVAC Equipment

Efficient gas-fired furnaces make your home more comfortable. Some models are less prone to causing indoor air quality problems or house fires.

Efficient gas-fired furnaces may provide the following benefits in addition to reducing your energy bills.

- Improved Comfort. Efficient furnaces provide greater comfort because they cycle on and off less often, and have improved controls so as to provide more precise comfort control throughout the home.
- Improved Indoor Air Quality. Some efficient furnaces (e.g. sealed combustion units) contain and exhaust all the "combustion products" with no chance of their being introduced into the home.
- Improved Fire Safety. Efficient furnaces don't need to operate for as many hours to provide the required heat. This means that time when flames are present is reduced, which has been noted by some insurance companies as a benefit in terms of improved fire safety.

Proper Sizing

You can obtain additional benefits by having your contractor install the correct size (capacity) of furnace for your home. A properly sized furnace can reduce noise (because of its reduced airflow), increase comfort (because the longer run times provide a more consistent furnace output rate), improve combustion safety (because of decreased potential for depressurization), and also reduce energy consumption.

Correctly Charged Refrigerant

According to a report on research funded by ENERGY STAR, more than 50% of all heat pumps have significant problems with low airflow, leaky ducts, and incorrect refrigerant charge.

There should be about 400–500 cubic feet per minute (cfm) airflow for each ton of the heat pump's air-conditioning capacity. Efficiency and performance deteriorate if airflow is much less than 350 cfm per ton. Technicians can increase the airflow by cleaning the evaporator coil or

increasing the fan speed, but often some modification of the ductwork is needed. See the sections on Minimizing Energy Losses in Ducts and on Insulating Ducts.

Refrigeration systems should be leak-checked at installation and during each service call. Room heat pumps and packaged heat pumps are charged with refrigerant at the factory. They are seldom incorrectly charged. Split-system heat pumps, on the other hand, are charged in the field, which can sometimes result in either too much or too little refrigerant. Split-system heat pumps that have the correct refrigerant charge and airflow usually perform very close to manufacturer's listed SEER and HSPF. Too much or too little refrigerant, however, reduces heat-pump performance and efficiency.

For satisfactory performance and efficiency, a split-system heat pump should be within a few ounces of the correct charge, specified by the manufacturer. The technician must measure airflow prior to checking refrigerant charge because the refrigerant measurements aren't accurate unless airflow is correct. When the charge is correct, specific refrigerant temperatures and pressures listed by the manufacturer will match temperatures and pressures measured by your service technician. Verify these measurements with the technician. If the manufacturer's temperatures and pressures don't match the measured ones, refrigerant should be added or withdrawn, according to standards specified by the EPA.

Find Energy-Saving Products and Services

You can save energy by carefully selecting the products and services you use at home, in your vehicle, and at work. The following information will help you find products and services to reduce your energy use.

How a Product Earns the ENERGY STAR Label

What is ENERGY STAR?

ENERGY STAR is the trusted, government-backed symbol for energy efficiency helping us all save money and protect the environment through energy-efficient products and practices.

The ENERGY STAR label was established to:

- Reduce greenhouse gas emissions and other pollutants caused by the inefficient use of energy; and
- Make it easy for consumers to identify and purchase energy-efficient products that offer savings on energy bills without sacrificing performance, features, and comfort.

How Does EPA Choose which Products Earn the Label?

Products can earn the ENERGY STAR label by meeting the energy efficiency requirements set forth in ENERGY STAR product specifications. EPA establishes these specifications based on the following set of key guiding principles:

- Product categories must contribute significant energy savings nationwide.
- Qualified products must deliver the features and performance demanded by consumers, in addition to increased energy efficiency.
- If the qualified product costs more than a conventional, less-efficient counterpart, purchasers will recover their investment in increased energy efficiency through utility bill savings, within a reasonable period of time.
- Energy efficiency can be achieved through broadly available, non-proprietary technologies offered by more than one manufacturer.
- Product energy consumption and performance can be measured and verified with testing.
- Labeling would effectively differentiate products and be visible for purchasers.

How Does EPA decide when to Revise Specifications?

Generally, a market share of ENERGY STAR qualified products in a particular category of 50 percent or higher will prompt consideration for a specification revision. However, there are other factors that weigh into the decision, such as:

- A change in the Federal minimum efficiency standards.
- Technological changes with advances in energy efficiency which allow a revised ENERGY STAR specification to capture additional savings.
- Product availability

- Significant issues with consumers realizing expected energy savings
- Performance or quality issues
- Issues with Test Procedures

ENERGY STAR Quality Installation

You may be familiar with the ENERGY STAR label on energy efficient heating and cooling equipment, but did you know there are also Quality Installation (QI) guidelines to help ensure that heating and cooling equipment is installed properly? Nearly half of all heating and cooling equipment in U.S. homes never performs to its advertised capacity and efficiency due to incorrect installation, which means homeowners pay higher operating costs over the life of the equipment.

The ENERGY STAR QI program helps homeowners identify contractors who install heating, ventilation and air conditioning (HVAC) equipment to the QI guidelines. By purchasing high efficiency equipment and having it properly installed, a homeowner can lower their energy bills, increase comfort in their home, and extend the useful life of their equipment.

The ENERGY STAR QI program requires a local sponsor, such as an electric or gas utility. For more information on ENERGY STAR QI program in your area, contact your local sponsor. But even if your utility does not yet offer an ENERGY STAR QI program, you may be able to find local contractors who follow some of the Quality Installation procedures. Use the Bid Comparison Checklist PDF (350KB) to help find the right contractor for you.

Program Benefits

When your new heating and cooling equipment is installed to meet ENERGY STAR Quality Installation Guidelines, you avoid common installation problems that can reduce the efficiency of your home. These improvements to efficiency can reduce your heating and cooling costs by as much as 30%.

ENERGY STAR Quality Installation Guidelines, are based on the Air Conditioning Contractors of America's (ACCA) HVAC Quality Installation Specification, and is recognized as an American National Standard. These industry best practices help ensure that your new equipment is:

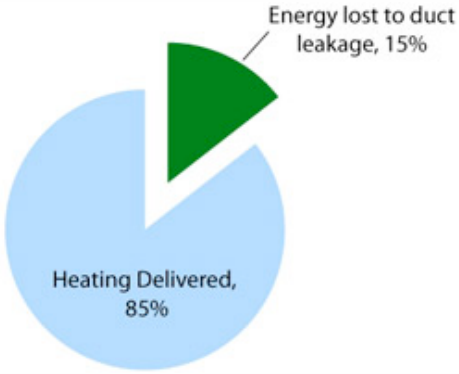
* Correctly sized to meet your home's needs
* Connected to a well-sealed duct system
* Operating with sufficient airflow in the system
* Installed with the proper amount of refrigerant

Whether you are installing a new system or replacing existing heating and cooling equipment, installing equipment properly is essential to getting the best performance.

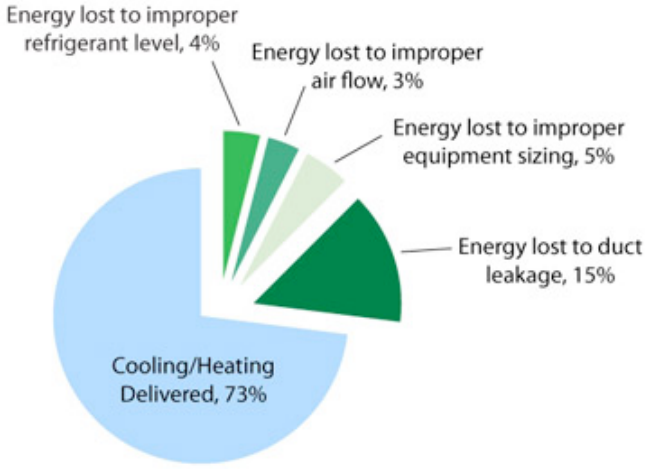
Estimated savings potential with QI ranges from 18% to 36% for air conditioners and heat pumps and 11% to 18% for furnaces.

The charts below show the losses in typical residential HVAC systems. Quality installations help deliver the equipment's full potential.

Typical Furnace Installation



Typical Air Conditioner or Heat Pump Installation



Components of a Quality Installation

Proper Sizing of Equipment

Installing the right size equipment for your home is essential to getting the best performance for your heating and cooling equipment and maintaining the comfort you deserve. Some believe that bigger is better when buying new equipment, but a system actually operates best when each component is properly sized. Oversized equipment may cycle on and off more frequently, which can make the home less comfortable and shorten the equipment life. In the ENERGY STAR QI program, contractors will take measurements of your home then do calculations to determine the appropriate size for your air conditioner, furnace or heat pump.

Sealing Ducts

Ducts circulate air from the furnace, central air conditioner or heat pump throughout the house. Often ducts have damage or poor connections that leak the hot or cold air and waste a lot of energy. Sealing ducts can greatly improve the efficiency of your heating and cooling system. The ENERGY STAR QI program requires that contractors measure duct leakage and make necessary repairs to minimize losses.

Optimizing Air Flow

To operate well, a heating or cooling system needs to have the proper volume of air flow. If air flow is too high or too low , it may make the home less comfortable and increase utility bills. In the ENERGY STAR QI program, contractors will measure air flow and make any adjustments necessary for optimal performance.

Proper Refrigerant Charge (Central Air Conditioners and Heat Pumps Only)

It is important for an air conditioner or heat pump to have the correct amount of refrigerant, or correct refrigerant charge. An improperly charged system may consume more energy and provide less dehumidification. Contractors in the ENERGY STAR HVAC QI program will test refrigerant charge and adjust if necessary to make your home comfortable and avoid waste on your utility bills.

Program Locations

ENERGY STAR Quality Installation programs are currently offered in five states.

U.S. map showing the five states currently offering programs: California, Connecticut, Rhode Island, Massachusetts, and Texas.

Overview of ENERGY STAR Products and Appliances

The average American family washes almost 400 loads of laundry each year. It's a good thing families can cut their related energy costs by about a third - and the water costs by more than half - just by purchasing a clothes washer with the ENERGY STAR label.

Over the life of your new ENERGY STAR qualified washer, you'll save enough money in operating costs to pay for the matching dryer. With your water savings, you could fill three backyard swimming pools.

Is your washer over 10 years old? Replace it with a new ENERGY STAR qualified washer and you could save $135 each year on your utility bills. That's like getting your High Efficiency (HE) detergent free year round.

ENERGY STAR qualified dishwashers use advanced technology to get your dishes clean while using less water and energy.

- **Trim your utility bills** - Do you have a dishwasher made before 1994? If so, you're paying an extra $40 a year on your utility bills compared to owning a new ENERGY STAR qualified model. Replace one of these old dishwashers with ENERGY STAR and save enough money to pay for dishwasher detergent all year.
- **Save loads of water** - A dishwasher built before 1994 wastes more than 10 gallons of water per cycle compared to owning a new ENERGY STAR qualified model. Replace one of these old dishwashers with ENERGY STAR and save enough water each week to wash 3 loads of laundry in an ENERGY STAR qualified clothes washer.
- **Save the environment** - Nearly 70 percent of U.S. electricity is generated by burning coal and natural gas, which releases greenhouse gasses and other air pollutants into the atmosphere, contributing to climate change and air quality problems. ENERGY STAR qualified dishwashers use less energy than conventional models, which helps reduce air pollution and combat global climate change. By reducing water consumption, ENERGY STAR qualified dishwashers also help protect our lakes, streams, and oceans.

Non-Energy Benefits of Improving Energy Efficiency

Improved indoor air quality is a benefit associated with weatherization programs. Faulty furnaces can release carbon monoxide into houses, with very negative health effects. Improvements to heating equipment made during the weatherization process can prevent such releases, and the installation of carbon monoxide monitors can alert household occupants to the presence of this dangerous gas.

Non-Energy Benefits of Efficient Gas-fired Water Heaters

Efficient gas-fired water heaters may hold their temperature longer following power interruptions and operate more safely.

Many efficient water heaters are better insulated and will cool off more slowly if the heating elements are unable to operate. (Since they rely on electronic ignitions, even gas-fired water heaters are vulnerable to power interruptions.)

One type of efficient water heater (the so-called "sealed combustion" style) reduces the chance of "backdrafting", in which dangerous pollutants can inadvertently spill back into the home rather than being exhausted to the outdoors.

Non-Energy Benefits of Basement Wall Insulation

Well-insulated basement walls can make your home more comfortable and quieter, and guard against moisture problems and water pipe breakage.

Well-insulated basement walls can yield many sorts of benefits in addition to energy cost savings. For example, well-insulated basement walls can:

- improve comfort. Basement wall insulation can make your home more comfortable by buffering your home against high outside temperatures in summer and cold temperatures in winter. Proper insulation will help minimize uncomfortable drafts. Additionally, the surface temperature of your walls will stay closer to the desired room temperature (so the walls are warmer to the touch in winter, for example).
- Make your home quieter. A well-insulated building envelope can make your home quieter by blocking outdoor noise sources.
- reduce moisture-related problems. Moisture can be introduced into basement walls by outside weather conditions (humidity or precipitation) as well as indoor sources of moisture (people, showers, cooking, etc.) If the moisture meets cold surfaces along the way it can condense and invite mold growth or moisture damage problems. Proper insulation reduces moisture-related problems.

- lower the risk of frozen water pipes. Water pipes running inside poorly insulated walls can be exposed to freeze damage; proper insulation will lower the risk. Hundreds of millions of dollars in insurance claims are filed each year for frozen water pipe damages. In relatively mild regions that experience occasional strong freezes, people often don't anticipate the problem and fail to take preventive measures ahead of time.

Non-Energy Benefits of Efficient Central Air Conditioners

Efficient central air conditioners may operate more quietly, be more visually appealing, have better temperature and/or moisture control, and be easier to maintain than minimum efficiency air conditioners.

Efficient central air conditioners (CACs) may operate more quietly than standard (minimum efficiency) CACs. Most CACs that qualify for the ENERGY STAR label come with "sound blankets" on the compressor to make the outdoor condensing unit quieter.

Efficient ACs may be more visually attractive than minimum efficiency units. Manufacturers of high-efficiency CACs tend to put more effort into making the outdoor condensing unit look more attractive (e.g., better cabinet shape and better corner posts and grills).

Some efficient CACs may have better control systems that improve the humidity and/or temperature control.

Some efficient CACs are easier to maintain than minimum efficiency units. Some high-efficiency units have ports on the refrigerant tubing coming in and out of the compressor, which make it easier to check the refrigerant charge.

Make sure you buy a CAC that is properly sized for your home. Proper sizing helps to reduce humidity and therefore control mold and mildew, and also reduces energy consumption.

Non-Energy Benefits of Ceiling Insulation

A well-insulated ceiling can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.

A well-insulated ceiling can yield many sorts of benefits in addition to energy cost savings. For example, a well-insulated ceiling can:

- Make your home more comfortable. A well-insulated ceiling buffers your home against high outside temperatures in summer and cold temperatures in winter, making your home more comfortable. Well-insulated construction also helps minimize uncomfortable drafts.
- Make your home quieter. A well-insulated building "envelope" can make your home quieter by blocking outdoor noise sources.
- reduce moisture-related problems. Moisture can be introduced into ceiling cavities by outside weather conditions (humidity or precipitation) as well as indoor sources of

moisture (people, showers, cooking, etc.) If the moisture meets cold surfaces along the way it can condense and invite mold growth or moisture damage problems.
- improve fire safety. Well-insulated building envelopes can improve fire safety by reducing air leakage that could otherwise nourish a fire. And, uneven (or missing) insulation can provide channels through which fires can spread. The use of approved products and installation practices (e.g. electrical safety measures) must be observed to guard against insulation-related fires.
- remain comfortable longer during power outages. Proper insulation reduces heat loss through the building envelope, allowing your home to remain comfortable and habitable longer during power outages.
- lower the risk of frozen water pipes. Water pipes in uninsulated ceiling areas can be exposed to freeze damage; proper insulation will lower the risk. Hundreds of millions of dollars in insurance claims are filed each year for frozen water pipe damages. In relatively mild regions that experience occasional strong freezes, people often don't anticipate the problem and fail to take preventive measures ahead of time.
- reduce the likelihood of ice forming in attics or "ice dams" on top of the roof. Ice dams are caused by the melting of rooftop snow over the warm roof, and re-freezing at the cold eave. Water pools behind the eave and can run under the roofing. Ice dams are a common cause of roof damages and also dangerous conditions for pedestrians around the home.

Non-Energy Benefits of Crawlspace Wall Insulation

Well-insulated crawlspace walls can make your home more comfortable and quiet, and guard against moisture problems and frozen water pipes.

Well-insulated crawlspace walls can yield many sorts of benefits in addition to energy cost savings. For example, well-insulated crawlspace walls can:
- improve comfort. Crawlspace wall insulation can make your home more comfortable by buffering your home against high outside temperatures in summer and cold temperatures in winter. Proper insulation will help minimize uncomfortable drafts.
- Make your home quieter. A well-insulated building envelope can make your home quieter by blocking outdoor noise sources.
- reduce moisture-related problems. Moisture can be introduced into uninsulated, leaky or poorly-installed crawlspace wall insulation by outside weather conditions (humidity or precipitation) as well as indoor sources of moisture (people, showers, cooking, etc.) If the moisture meets cold surfaces along the way it can condense and invite mold growth or moisture damage problems. Proper insulation reduces moisture-related problems.
- lower the risk of frozen water pipes. Water pipes running inside uninsulated or poorly insulated crawlspaces can be exposed to freeze damage; proper insulation will lower the risk. Hundreds of millions of dollars in insurance claims are filed each year for frozen water pipe damages. In relatively mild regions that experience occasional strong freezes, people often don't anticipate the problem and fail to take preventive

Non-Energy Benefits of Efficient Clothes Washers

Efficient clothes washers can reduce water use significantly, leave the clothes drier and cleaner, and reduce wear and tear on clothes.

Some efficient horizontal axis clothes washers use up to 50% less water.
Some efficient clothes washers spin the clothes faster, leaving them drier, which in turn decreases the amount of time in the dryer and the energy consumed by the clothes dryer.
Some efficient horizontal-axis washers cause less wear and tear on the clothes, and some are easier to fit bulky items (such as blankets) into. Front-loading tumble-action washers may actually get clothes cleaner, according to independent studies.

Non-Energy Benefits of Well-insulated Ducts

Well-insulated ducts can help avoid rooftop ice-dam formation during the winter.

Insulating ducts located in your attic reduces the leakage of heat into the attic. Heat leaks can cause rooftop snow to melt, resulting in dangerous ice dams. Ice dams are a common cause of roof damage and also dangerous conditions from melting ice for pedestrians around the home.

Non-Energy Benefits of Duct Sealing

Sealing leaky ducts can help improve comfort and avoid indoor air pollution problems, fire hazards, and rooftop ice-dam formation during the winter.

Having your ducts professionally sealed to reduce leakage can help avoid a number of problems, in addition to cutting back on your energy bills. Well-sealed ducts can:

- Well-sealed ducts have been shown to improve the flow and temperature of the air delivered to rooms, improving the comfort of even those rooms that were previously uncomfortable during certain times of the year.
- Reduce moisture damage or mold in the spaces surrounding the ducts (such as the walls, floor, or attic). For ducts located in the attic, moisture and heat leaks through the ducts can result in condensation on the attic walls or ceiling, or in the winter can cause rooftop snow to melt and form dangerous ice dams. Ice dams are a common cause of roof damage and also create dangerous conditions for pedestrians around the home.
- Reduce phenomena such as door slamming. Leaky supply ducts can cause a situation called "depressurization", in which the house experiences a kind of suction effect because the amount of air being exhausted from the home is greater than the amount being supplied. One symptom of depressurization is doors that mysteriously slam.
- Reduce fire risk. Depressurization in rooms containing combustion appliances (such as water heaters or furnaces) can cause the burner flames from those appliances to come into contact with flammable parts of your home. This phenomenon is called "flame roll-out" and is a known cause of house fires. Homes will well-sealed ducts are less prone to flame roll-out.
- Help avoid indoor air pollution problems. Depressurization in rooms containing combustion appliances can also cause dangerous combustion products (fumes), such as

carbon monoxide, to be pulled into the home. Depressurization can also increase the rate of radon entry into a home, particularly in basements.

- Help reduce odors, dust and mold in the air circulating through your ducts. Leaky return ducts can cause basement or garage odors, crawlspace dust or mold, or attic insulation fibers to be sucked into your duct system and then delivered into your rooms. Not only is this detrimental to your health, but these particles can also degrade the performance of your air conditioner by clogging up the cooling coil.

Non-Energy Benefits of Efficient Electric Water Heaters

Efficient electric water heaters may hold their temperature longer following power interruptions.

Some efficient electric water heaters are better insulated and will cool off more slowly if the heating elements are unable to operate (e.g., during a power interruption).

Non-Energy Benefits of Floor Insulation

A well-insulated floor (above a basement or crawlspace) can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.

A well-insulated floor can yield many sorts of benefits in addition to energy cost savings. For example, a well-insulated floor can:

- improve comfort. Floor insulation can make your home more comfortable by buffering your home against high outside temperatures in summer and cold temperatures in winter. Well-insulated floors will help minimize uncomfortable drafts. Additionally, the surface temperature of your floor will stay closer to the desired room temperature (so the floor is warmer to the touch in winter, for example).
- reduce moisture-related problems. Moisture can be introduced into floor cavities by outside weather conditions (humidity or precipitation) as well as indoor sources of moisture (people, showers, cooking, etc.) If the moisture meets cold surfaces along the way it can condense and invite mold growth or moisture damage problems.
- improve fire safety. Well-insulated building envelopes can improve fire safety by reducing air leakage that could otherwise nourish a fire. And, uneven (or missing) insulation can provide channels through which fires can spread. The use of approved products and installation practices (e.g. electrical safety measures) must be observed to guard against insulation-related fires.
- remain comfortable longer during power outages. Proper insulation reduces heat loss through the building envelope, allowing your home to remain comfortable and habitable longer during power outages.
- lower the risk of frozen water pipes. Water pipes in uninsulated basements or crawlspaces can be exposed to freeze damage; proper insulation will lower the risk. Hundreds of millions of dollars in insurance claims are filed each year for frozen water pipe damages.

In relatively mild regions that experience occasional strong freezes, people often don't anticipate the problem and fail to take preventive measures ahead of time.

- Make your home quieter. A well-insulated building envelope can make your home quieter by blocking outdoor noise sources.

Non-Energy Benefits of ENERGY STAR Gas Furnaces

Efficient gas-fired furnaces make your home more comfortable. Some models are less prone to causing indoor air quality problems or house fires.

Efficient gas-fired furnaces may provide the following benefits in addition to reducing your energy bills.

- Improved Comfort. Efficient furnaces provide greater comfort because they cycle on and off less often, and have improved controls so as to provide more precise comfort control throughout the home.
- Improved Indoor Air Quality. Some efficient furnaces (e.g. sealed combustion units) contain and exhaust all the "combustion products" with no chance of their being introduced into the home.
- Improved Fire Safety. Efficient furnaces don't need to operate for as many hours to provide the required heat. This means that time when flames are present is reduced, which has been noted by some insurance companies as a benefit in terms of improved fire safety.

You can obtain additional benefits by having your contractor install the correct size (capacity) of furnace for your home. A properly sized furnace can reduce noise (because of its reduced airflow), increase comfort (because the longer run times provide a more consistent furnace output rate), improve combustion safety (because of decreased potential for depressurization), and also reduce energy consumption.

Non-Energy Benefits of Efficient Gas-fired Water Heaters

Efficient gas-fired water heaters may hold their temperature longer following power interruptions and operate more safely.

Many efficient water heaters are better insulated and will cool off more slowly if the heating elements are unable to operate. (Since they rely on electronic ignitions, even gas-fired water heaters are vulnerable to power interruptions.)

One type of efficient water heater (the so-called "sealed combustion" style) reduces the chance of "backdrafting", in which dangerous pollutants can inadvertently spill back into the home rather than being exhausted to the outdoors.

Non-Energy Benefits of Efficient Heat Pumps

Efficient heat pumps may operate more quietly, be more visually appealing, have better temperature and/or moisture control, and be easier to maintain than minimum efficiency heat pumps.

Efficient heat pumps may operate more quietly than standard (minimum efficiency) heat pumps. Most heat pumps that qualify for the ENERGY STAR label come with "sound blankets" on the compressor to make the outdoor condensing unit quieter.

Efficient heat pumps may be more visually attractive than minimum efficiency heat pumps. Manufacturers of high-efficiency heat pumps tend to put more effort into making the outdoor condensing unit look more attractive (e.g., better cabinet shape and better corner posts and grills).

Some efficient heat pumps may have better control systems that improve the humidity and/or temperature control.

Some efficient heat pumps are easier to maintain than minimum efficiency units. Some high-efficiency heat pumps have ports on the refrigerant tubing coming in and out of the compressor, which make it easier to check the refrigerant charge.

You can obtain additional benefits by having your contractor install the correct size (capacity) of heat pump for your home. Proper sizing helps to reduce humidity and therefore control mold and mildew, and also reduces energy consumption.

Non-Energy Benefits of Sealing Home Air Leaks

Having a professional seal your home's air leaks can make your home more comfortable, reduce the risk of moisture damage, improve indoor air quality and fire safety, and help to prevent frozen water pipes.

A properly -sealed and -ventilated home can:

- improve comfort. Leaky homes are uncomfortable, both in winter and summer.
- reduce drafts and moisture problems. Sealing leaks reduces infiltration into your home, which helps to reduce drafts and the frequently associated moisture problems.
- reduce annoying phenomena such as mysterious door slamming. Well-sealed homes also can avoid "pressure imbalances", which are created when more air is being exhausted than resupplied, or vice versa. These imbalances cause annoying phenomena such as mysterious door slamming.
- improve indoor air quality and fire safety. Pressure imbalances can lead to more serious situations in which furnace or combustion appliance exhausts are not removed fully from the home, or in which combustion flames are pulled down and out of their safe containment areas, potentially leading to house fires. Pressure imbalances can also increase the rate of radon entry into a home, particularly in basements.

- Keep your home comfortable and habitable longer during power outages. A well sealed home can remain comfortable and habitable longer than the ordinary home during power outages.
- Help prevent damages caused by frozen water pipes by reducing the infiltration of cold air into the house.
- Reduce your heating and/or cooling needs so that you may be able to get by with smaller, less expensive, heating or cooling equipment.

Non-Energy Benefits of Efficient LPG Furnaces

Efficient LPG-fired furnaces make your home more comfortable. Some models are less prone to causing indoor air quality problems or house fires.

Efficient LPG-fired furnaces may provide the following benefits in addition to reducing your energy bills.

- Improved Comfort. Efficient furnaces provide greater comfort because they cycle on and off less often, and have improved controls so as to provide more precise comfort control throughout the home.
- Improved Indoor Air Quality. Some efficient furnaces (e.g. sealed combustion units) contain and exhaust all the "combustion products" with no chance of their being introduced into the home.
- Improved Fire Safety. Efficient furnaces don't need to operate for as many hours to provide the required heat. This means that the amount of time when flames are present is reduced, which has been noted by some insurance companies as a benefit in terms of improved fire safety.

You can obtain additional benefits by having your contractor install the correct size (capacity) of furnace for your home. A properly sized furnace can reduce noise (because of its reduced airflow), increase comfort (because the longer run times provide a more consistent furnace output rate), improve combustion safety (because of decreased potential for depressurization), and also reduce energy consumption.

Non-Energy Benefits of Efficient Oil Furnaces

Efficient Oil-fired furnaces make your home more comfortable. Some models are less prone to causing indoor air quality problems or house fires.

Efficient Oil-fired furnaces may provide the following benefits in addition to reducing your energy bills.

- Improved Comfort. Efficient furnaces provide greater comfort because they cycle on and off less often, and have improved controls so as to provide more precise comfort control throughout the home.
- Improved Indoor Air Quality. Some efficient furnaces (e.g. sealed combustion units) contain and exhaust all the "combustion products" with no chance of their being introduced into the home.

- Improved Fire Safety. Efficient furnaces don't need to operate for as many hours to provide the required heat. This means that time when flames are present is reduced, which has been noted by some insurance companies as a benefit in terms of improved fire safety.

You can obtain additional benefits by having your contractor install the correct size (capacity) of furnace for your home. A properly sized furnace can reduce noise (because of its reduced airflow), increase comfort (because the longer run times provide a more consistent furnace output rate), improve combustion safety (because of decreased potential for depressurization), and also reduce energy consumption.

Non-Energy Benefits of Efficient Oil-fired Water Heaters

Efficient oil-fired water heaters may hold their temperature longer following power interruptions and operate more safely.

Many efficient water heaters are better insulated and will cool off more slowly if the heating elements are unable to operate. (Since they rely on electronic ignitions, even gas-fired water heaters are vulnerable to power interruptions.)

One type of efficient water heater (the so-called "sealed combustion" style) reduces the chance of "backdrafting", in which dangerous pollutants can inadvertently spill back into the home rather than being exhausted to the outdoors.

Non-Energy Benefits of Boiler Pipe Insulation

Insulating boiler pipes reduces noise and the likelihood of freeze-related breakage.

Boiler pipe insulation can help tone down the sound of water circulating through boiler pipes in the home.

Insulating boiler pipes also reduces the potential for freeze damage. While usually full of warm water, during periods in which the system is not operating (for example, when a home is unoccupied), water-filled pipes can freeze and break causing substantial damage to the home and contents.

Non-Energy Benefits of Efficient Room Air Conditioners

Efficient room air conditioners may operate more quietly, be more visually appealing, and provide better humidity and/or temperature control than minimum-efficiency units.

Efficient room air conditioners (room A/Cs) may operate more quietly than minimum-efficiency room A/Cs.

Efficient room A/Cs may also be more visually appealing than minimum-efficiency units. They may have better-looking cabinets that provide movable louvers for directing airflow.

Some room A/Cs may have better control systems that improve the humidity and/or temperature control.

Non-Energy Benefits of Efficient Refrigerators

Energy-efficient refrigerators are quieter, run less often, release less heat into your kitchen, and keep their contents cool longer during power outages.

An extra benefit of the more efficient compressors and motors found in energy-efficient refrigerators is that they run quieter and turn on and off less often.

Since efficient units gain heat from their surroundings more slowly they don't need to reject as much heat into your kitchen, making your home more comfortable during hot summer periods.

Because energy-efficient refrigerators are better insulated, they stay cool better than ordinary units. One major benefit of this, in addition to energy savings, is that during power outages they will warm up much more slowly than ordinary (less efficient) units. This means less inconvenience and loss of valuable contents.

Non-Energy Benefits of Programmable Thermostats

Programmable thermostats can help keep your home more comfortable.

Most people with standard thermostats turn them off at night or when away from home. With programmable units, the furnace can be turned on shortly before you wake up in the morning or return to your home, so that you don't have to wait for your house to reach the desired temperature. They can also be set back to cost-saving temperatures while you're away from home, protecting plants or pets while saving energy.

Non-Energy Benefits of Upgraded Wall Insulation

Wall insulation can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.

- Well-insulated walls can provide many sorts of benefits in addition to saving energy.
- Well-insulated walls will make your home more comfortable by buffering your home against high outside temperatures in summer and cold temperatures in winter.
- Well-insulated walls can also help minimize uncomfortable drafts and make your home quieter by blocking outdoor noise.
- Properly installed insulation also helps to seal your home against unwanted air leakage (sometimes known as "infiltration"). By helping to reduce unwanted infiltration, the

likelihood of moisture problems is also reduced. Moisture can be introduced into walls, floors, or ceiling cavities by outside weather conditions (humidity or precipitation) as well as indoor sources of moisture (people, showers, cooking, etc.) If the moisture meets cold surfaces along the way it can condense and invite mold growth or moisture damage problems.

- Well-insulated walls can improve fire safety in several ways. Air leakage can supply outside air that helps to nourish fires, and uneven (or missing) insulation can provide channels within walls through which fires can spread. The use of approved products and installation practices (e.g. electrical safety measures) must be observed to guard against insulation-related fires.
- Another benefit of well-insulated homes is that during power outages, your home can remain comfortable and habitable longer than the ordinary home. This can help lower the costs of relocation often faced by people during power outages caused by major storms and other natural disasters.
- Proper wall insulation can reduce the risk of freeze damage to water pipes running inside the walls by insulating the pipes from the elements.
- Thermally "massive" (e.g. concrete) and well-insulated walls also offer many of the above-mentioned benefits, in addition to helping take advantage of solar energy gains.

Non-Energy Benefits of Efficient Windows

Efficient windows can make your home more comfortable year-round, reduce condensation, block outside noise, improve fire safety, and cut back on ultraviolet radiation that can fade your carpets and furniture.

Efficient windows can provide more benefits than just energy savings. For example, efficient windows can:

- improve comfort in the winter. Since an efficient window is better insulated from the elements, its interior surface will feel warmer to the touch during the winter. Whereas, the glass of most older, inefficient windows will feel cold to the touch. Cold glass can cause drafts when air coming into contact with the window is cooled and drops to the floor. This creates an airflow pattern that feels drafty and accelerates heat loss. An efficient window, being warmer, will have fewer drafts and less heat loss. You can also improve the comfort of your efficient window by making sure it is properly installed and sealed to reduce air leakage.
- improve comfort in the summer. Efficient windows reduce the solar radiation coming into your home, which means your home will stay cooler in the summer.
- reduce frost and condensation. High-performance windows have warmer interior glass surfaces, which cuts down on frost and condensation. Many efficient windows have improved spacers and insulating frames, which significantly reduce condensation under all conditions.
- make your home quieter by reducing noise entry from outside, by providing sound insulation

- minimize fading of materials (e.g., carpets and furniture) in the home by reducing incoming ultraviolet (UV) radiation, which can also have benefits for human health. Low-E coated glass or windows incorporating plastic layers will reduce fading.
- deter forced entry (multiple-pane windows or windows with energy-control films can be harder to break)
- contribute to reduced furnace on-time, reducing the potential for fires from faulty HVAC systems
- reduce glass breakage in fires, windstorms, or earthquakes

If you think that efficient windows significantly decrease the amount of visible light that comes into your house, or look funny from the outside, think again. In the past, people used tinted glazing or shades to reduce solar heat gain, but these measures reduced the amount of light coming into the house and were sometimes not very visually appealing. Now there are glazings, such as spectrally selective Low-E coatings, that can provide better solar heat gain reduction than tinted glass, with a minimal loss of visible light. Views will also remain clearer and without obstruction.

Combustion Equipment Safety

Combustion appliances using natural gas, propane, oil, kerosene, or wood are often a more efficient and cost-effective way to produce heat than electricity. Combustion appliances have been used for many years in millions of home. However, careful installation and maintenance of each unit is required to sure safe and efficient operation, especially in today's energy-efficient, tightly sealed homes.

Combustion appliances burn fuel by using oxygen from supply air. They produce exhaust gases that should be directly vented to the outside to avoid introducing combustion by-products into the house. Exhaust gases may be released inside the house either knowingly – as in the case of unvented stoves, ovens, fireplaces, or space heaters – or unknowingly from leaky flues, cracked heat exchangers, or backdrafting. Three components of exhaust gases are especially troublesome when introduced indoors: carbon monoxide, water vapor, and nitrogen oxides.

Carbon monoxide (CO) is a toxic gas that is colorless, tasteless, and odorless. It can cause serious medical problems and is the cause of the hundreds of deaths in the U.S. home each year. CO is produced when insufficient combustion air is supplied to the appliance, the burner is improperly turned, and/or the appliance is malfunctioning.

Water vapor is present in large amounts in exhaust gases as a result of burning all fuels. When water vapor is introduced into a house, it increases humidity levels and can lead to condensation on window panes, exterior walls, and interior surfaces of wall cavities. High humidity and wet surfaces promote mold growth, wood deterioration, and other health and structural problems.

Nitrogen oxides are usually present only in small amounts in exhaust gases, but they still present a health hazard to the inhabitants. Fuel-fire furnaces, clothes dryers, and water heaters that are vented to the outside can also pose problems. Their use of indoor air for combustion increases household energy use since the air used for combustion must be replaced by outdoor air.

Most new fuel-fire furnaces have a fan-assisted or powered combustion system, meaning a small blower forces or draws combustion air and flue products through the furnace and exhausts combustion gases out the flue to the outside. Most fuel-fire water heaters, and some furnaces, still use an atmospheric or natural draft vent – the buoyancy of the hot exhaust gases carries these combustion products through the appliance and up the flue. Appliances with atmospheric vents that are installed inside the house are susceptible to backdrafting problems.

Most fuel-fired furnaces and water heaters use air surrounding the appliance for combustion. Others, known as sealed-combustion or 100-percent-outdoor-air appliances, bring combustion air directly into the burner via sealed inlets connected to the outside and usually have a fan-assisted exhaust. Because non-sealed-combustion appliances installed indoors rely on the indoor air for

combustion, they increase the infiltration rate of the house during operation and are more likely to have problems with insufficient combustion air and backdrafting.

Only sealed-combustion furnaces and water heaters that are equipped with a powered combustion system should be installed inside a house. Such appliances are provided with sufficient combustion air and are unlikely to backdraft or impact the infiltration rate of the house. Other types of fuel-fired furnaces and water heaters should be installed outside the living area of the house or in a sealed combustion closet if an inside location is absolutely required. This action will ensure proper efficient operation and prevent indoor air quality problems.

All combustion appliances should be installed by knowledgeable technicians according to the manufacturer's installation instructions as well as following all national and local code requirements. As part of the installation process, CO measurements should be made to ensure the proper operation of the units and the safety and health of the occupants. CO Should be measured in the combustion products of furnaces and water heaters before the diverter or before dilution occurs, and after the burner has run continuously for 5 minutes. Levels greater than 100 ppm (air free rater than as tested) indicate adjustments are necessary; levels less than 10 ppm usually are readily achievable. Ovens should be tested while operating on the BAKE setting, and range tops should be tested with a water-filled pan over the burner. CO levels greater than 50 ppm (air free) are not acceptable.

Backdrafting occurs when combustion gases are pulled down the exhaust flue and into the house rather than being vented to the outside. Appliances with atmospheric vents rather than powered combustion systems are most susceptible to backdrafting.

Clothes dryers, ventilation fans in bathrooms and kitchens, and whole-house fans are examples of household equipment that can reduce the air pressure surrounding the combustion appliance to levels that cause it to backdraft. The potential for backdrafting increases the closer the fan runs simultaneously, and when the appliance cannot be isolated from the fan through the use of a closed door or together means.

Leaks in heating and cooling ducts or poorly designed ductwork can also be a major cause of backdrafting.

- Leaks in supply ducts can create a negative pressure in the house (the pressure in the house is less than outside) because less air is being returned to the house through the supply ducts than is being removed from the house by the return ducts. If this negative pressure is large enough, it can prevent combustion gases from rising up the flue and cause combustion products to spill into the house.
- A return register that is too close to the combustion appliance (especially if it is the only return register in the house) can create a negative pressure around the appliance that draws exhaust gases into the house. A leak in a return duct or return plenum that allows air surrounding the appliances to be drawn into the return system creates a similar effect.
- Negative pressures can also be created in the main part of a house, where the combustion appliance often is located, when interior doors are closed. This can occur especially when there are only one or two return register in the house and even in homes with tight

ductwork. When the doors to rooms with supply registers are closed, it may be difficult for the air in these rooms to circulate back to a central return register. The pressure in the closed-off room increases, and the pressure decreases in the main part of the house open to the central return.

The potential for backdrafting can be reduced by:

- Using appliances with powered combustion systems rather than atmospheric vents.
- Installing appliances with atmospheric vents in a sealed combustion closet.
- Sealing all supply and return duct leaks.
- Installing return registers in all rooms with supply registers.
- Making sure rooms without a return register have a t least 1-inch gap under the door (recommended only for rooms with one supply register) or a transfer grill to provide pressure equalization between rooms.

Notice to Occupants of Safety Issue (Safety Notification Form)

Following discovery of a safety issue during an inspection, the inspector is obligated to notify the occupants of the property about it.

In advance of an official InterNACHI form, inspectors can add a paragraph to their own "leave behind" letter, or they can adapt the following suggested language for their own notice:

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Dear Occupant/s,

Based on a recent inspection of the property located at: _____

_____, a safety issue was discovered.

The nature and location of the safety issue are:

_____.

We recommend immediate correction and further evaluation of the safety issue by a qualified professional contractor.

You may also request a copy of the inspection report from my client for whom the inspection was performed.

Feel free to contact me for further assistance.

Thank you.

Sincerely,

John Smith
ABC Inspections

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http://www.nachi.org/notice-safety-issue.htm