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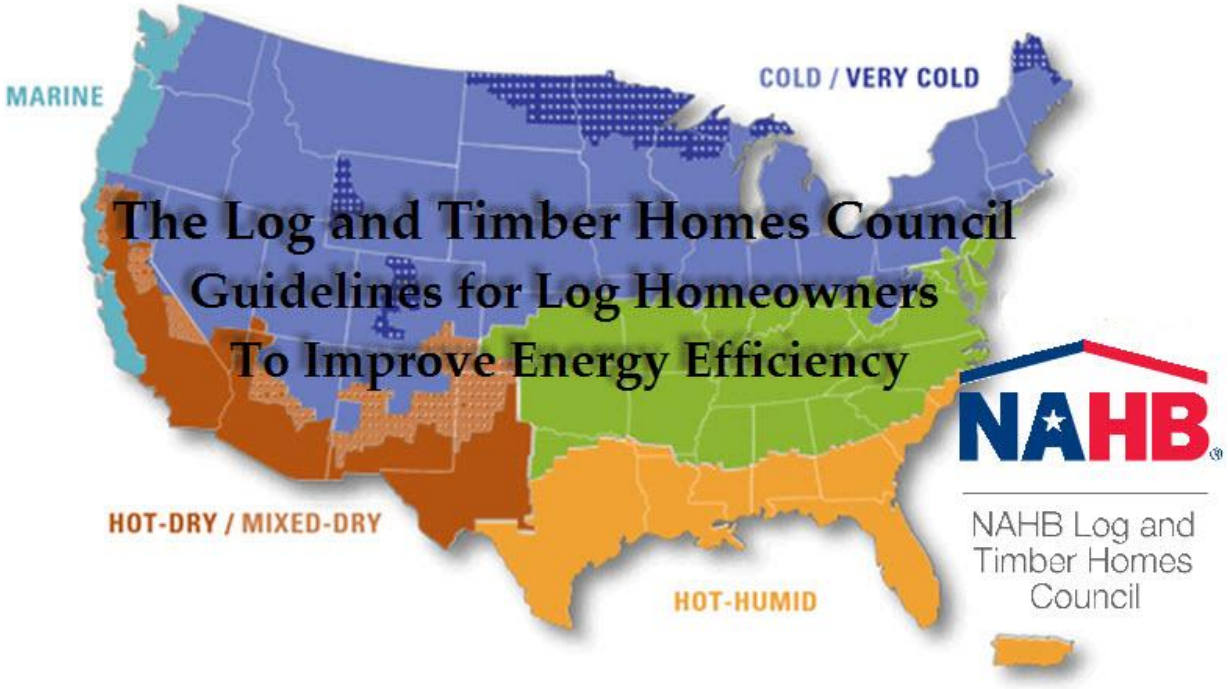


The Log and Timber Homes Council Guidelines for Log Homeowners To Improve Energy Efficiency

Since the 1980's, residential building codes and energy codes have had dramatic impacts on the methods and materials of all types of home construction. Further changes since 2003 were fueled by Federal programs promoting energy conservation policies targeting net-zero homes by 2030.

For new home projects, the log home industry is adjusting to the 2015 family of building codes and standards called the ICC I-Codes. The focus of the log home industry is on ICC400-2012 *Standard on the Design and Construction of Log Structures*. This is an ANSI-Consensus standard developed by the industry and published by International Codes Council (ICC) that is updated every 5 years.

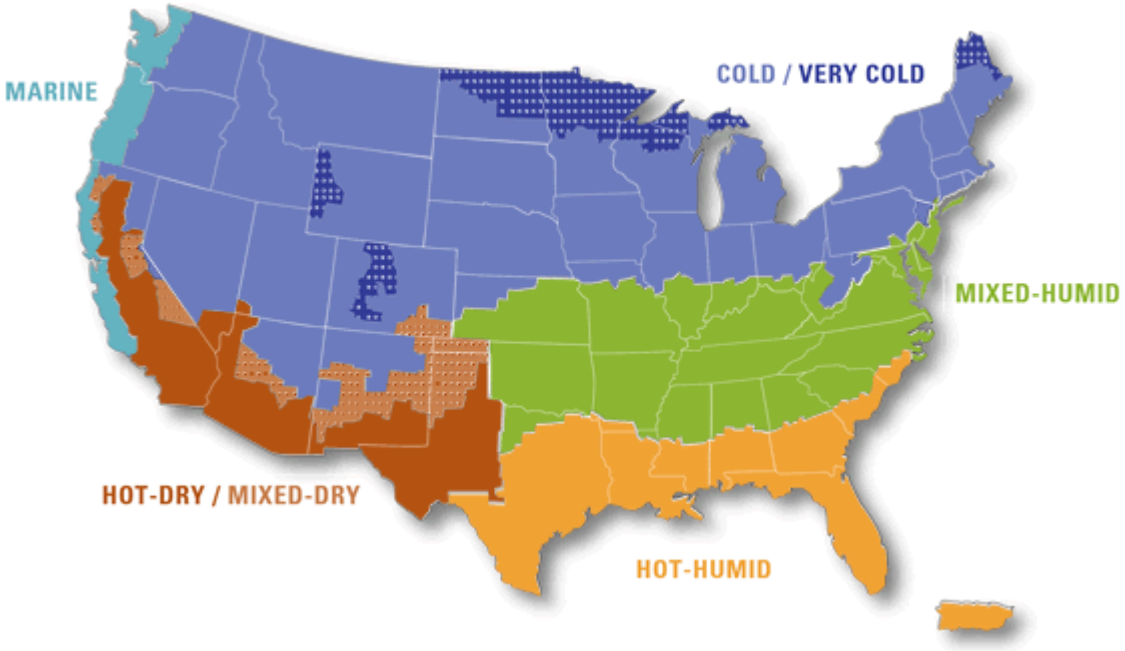
For existing log home owners, there are different ramifications. Technically, any new addition or renovation work must comply with the current code for the area affected. There is also mounting pressure to upgrade the energy efficiency of ALL existing homes before placing them on the market for resale. Some communities around the country have already adopted "Time of Sale Energy Efficiency Ordinances" (i.e., Atlanta, GA; Austin, TX; Burlington, VT). This pressure may lead to some critical decisions.

The purpose of this article is to help log home owners evaluate the best investments to become more energy efficient. Improving an existing home may be beneficial to property value (assessments/appraisals), energy cost (less demand for fuel/power), as well as health and comfort. The following is provided to demonstrate how older homes can be improved to more current levels of energy efficiency without destroying the beauty and comfort provided by your log walls.

The importance of evaluating the energy economics of a particular home is illustrated in the working paper *Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Assistance Program* by researchers at the Energy Policy Institute at the University of Chicago (EPIC) and the University of California, Berkeley, associated with the E2e Project. In new construction, the investment is fully incorporated into the mortgage equation and is therefor amortized over the life of that mortgage. Energy savings gained over those years from greater investment in conservation measures potentially offset the investment. However, similar investments for existing dwellings need to be compared to energy savings over a shorter period. A HERS rater can help with this evaluation to determine what investments will deliver the greatest energy savings. Then, based on the local cost of energy/fuel, the $-value of that savings can be compared to the proposed $-cost of improvements. While the members of the Log & Timber Homes Council pride themselves in generating quality, energy-efficient construction, log homes built to older codes may allow room for improvement in energy conservation. The question is whether the rate of savings at the cost of energy is sufficient to offset the cost of materials and installation, and does that investment add to the resale value of the property?

Some recommended reading includes:

- Building America Best Practices: Insulation Guide
- Building America Best Practices: Preserving Historic Homes
- Building America Solution Center, Optimized Climate Solutions
- Residential Best Practices Criteria by Building Science Corporation



Considering Energy Retrofits to Your Existing Home?

The following ten items are from the U.S. News MONEY Column, *10 Energy-Efficient Home Improvements* from http://money.usnews.com/money/personal-finance/slideshows/10-energy-efficient-home-improvements/1 by *Luke Mullins Feb. 11, 2010,* 9:55 a.m. EST. The list is expanded to include log home related comments (indented).

Get an energy efficiency audit 1 of 10 -- Before you can make your home more energy efficient, you need to know where you currently stand. A so-called energy audit, in which an energy professional inspects your home to determine where efficiency can be improved, is a great way for homeowners to figure out which parts of their property need attention.

Absolutely, this is the best advice anyone can give. Hire the services of a certified RESNET (Residential Energy Services Network) or BPI (Building Performance Institute) Home Energy Rating System (HERS) auditor to evaluate your home's performance. Their findings will prioritize all of the top ten items that follow!

The process is described in the 2010 article at http://www.cnet.com/news/leaky-house-bring-in-the-blower-door/. There, the statement is made that "Almost two years ago, I had an energy audit when I had my first blower door test. Where I live, a utility-funded organization offers free audits, but one with a blower door test, a little bit of air sealing, and a set of recommendations cost me between $500 and $600." The basic costs have not changed significantly, but travel time to remote sites may be factored into the cost.

Seal it up 2 of 10 -- Plugging up the leaks that allow cold air to slip into your house—and drive up your heating bills—is an important first step in creating an energy-efficient home. Such leaks are often found around doors and windows, but they also can be in your basement or attic.

Sealing a log home is the best next step even if an energy auditor has not been hired. It has been estimated that up to 30% of a home's energy consumption can be caused by heat loss through the building envelope to the outside -- And vice versa as outside unconditioned air can enter, requiring the HVAC system to work harder.

Log homes are commonly completed as weather-tight shells before the interior work is done. At this point, when the shell is completed, is a perfect time to run a blower door test and seal any leaks. If needed for certification, a final blower door test will most likely be successful. With only the wall as a real difference, the sealing of a log home is not much different than preparing any type of home for air tight performance.

Building America Best Practices Volume 10 is on Air Sealing. Download this doeument for information beyond the log wall. There are 19 focal points addressed and most may be found in a log home. The log wall naturally aligns the air and thermal barriers, so item 1 is complete!

Inspecting and sealing the log wall is a regular part of maintaining your log home. For more information, refer to the two white papers found at http://loghomes.org/library-2/

- *"Preservation and Maintenance of Log Structures", Prepared by the Technical Committee of the Log Homes Council, Building Systems Councils, National Association of Home Builders, 2000, revised 2003.*
- *"Prevention of Air & Water Infiltration: A Systems Approach", Prepared by the Construction Codes & Standards Committee of the Log & Timber Homes Council, Building Systems Councils, National Association of Home Builders 2004, revised 2014.*

Insulate upstairs 3 of 10 -- Adding insulation can help keep your home comfortable all year round. "It turns out that about half of the homes in the United States are underinsulated," says Kateri Callahan, president of the Alliance to Save Energy.

There is no question that the roof is the first area to look to upgrade insulation. Heat rises. However, there is a reasonable limit to how much to add and how. The point of diminishing returns with roof insulation is at "R-60". What that means is that the investment up to that point has a direct correlation to energy savings, but insulating to a higher level cannot be proven to be as beneficial.

Roof systems in log homes can vary from flat ceilings of conventional framing/trusses to cathedral ceilings of timber framing with structural decking, and combinations thereof. Insulating a flat ceiling is no different than for a conventional home. Insulating a cathedral ceiling brings challenges. Before making changes, be certain as to how the roof was built and insulated. Removing recessed lighting or other fixtures in the insulation cavity may be an initial step. Building up the insulation may involve removing the old. A home energy audit may provide the best guidance.

A side note: Kneewalls and floors over porches or at a cantilever should also be inspected. Insufficient insulation there can lead to cold spots in an upper floor room.

Seal the ducts 4 of 10 -- In forced-air heating and cooling systems, ducts carry hot or cold air to different parts of home. The Environmental Protection Agency estimates that roughly a fifth of this air escapes through leaks. To address this headache, consumers can use duct sealant to repair leaks in exposed ducts.

Without question, this is good advice supported by the fact that distribution losses are a target of current energy codes and efficiency programs. An easy test for a homeowner is to turn on the heating/cooling system and go to the farthest terminal (air register, radiator, etc.) to feel if the heat/cold medium is arriving. If it isn't, hiring a certified HERS auditor to perform a duct test may be advisable. If the distribution (air or water) system runs through an unconditioned space (e.g., attic area above the insulated ceiling, crawlspace below the insulated floor), those lines should be sealed and insulated to reduce distribution loss.

In many instances, insulating the foundation stem walls of a basement or crawl space will be a better investment that the lower cost of insulating the floor. This option allows the interior space to be conditioned and reduces the impact of distribution losses. The goal is still to get the conditioned medium to the terminal where it can heat the room, but the losses to a conditioned foundation will be less.

An aside: When using a concrete slab in a cold climate, consider installing R10 rigid insulation beneath the entire slab. This allows the concrete to absorb and release heat to the space rather than pass into the ground.

Install a programmable thermostat 5 of 10 -- Another way to cut energy costs is a programmable thermostat. These devices "save about 10 percent on your heating bills and your cooling bills in the summer, so they pay for themselves literally in a matter of months," says Kateri Callahan, president of the Alliance to Save Energy.

This recommendation can be debated when using thermal mass. Passive solar, radiant floors, and similar technologies have been shown to perform better when thermostats are left at a consistent temperature or with very minor setback levels. Log walls provide a significant heat sink and will also perform better when the interior temperature is maintained at a more uniform temperature.

Replace old windows with energy-efficient ones 6 of 10 -- Replacing old, leaky windows with higher-efficiency models can also make your home greener. Instead of aluminum-framed models, Paul Zuch, the president of Capital Improvements, recommends that consumers go with wood.

Log homes look great with wood windows! This suggestion is good, but it may be expensive, therefore this recommendation should be tempered with the next two. Window glazing technology has advanced tremendously, and the new double pane, Low-E windows complying with Energy Star® (www.energystar.gov) requirements are recommended.

Install energy-efficient doors 7 of 10 -- When looking for energy efficiency, avoid hollow metal doors, says Celia Kuperszmid Lehrman, deputy home editor at Consumer Reports. "Any kind of hollow door is going to be terrible because the air is going to infiltrate right through," she says.

Again, look for Energy Star® certification. Metal and fiberglass clad insulated exterior doors are available at reasonable cost. New prehung units will include updated weatherstripping.

Add storm windows 8 of 10 -- Storm windows can be a lower-cost alternative to a full-blown window replacement project. "If your interior windows are in good shape, then [installing storm windows is] a quick way to increase your energy efficiency without going through the expense and the mess of ripping out your current windows," says Celia Kuperszmid Lehrman, deputy home editor at Consumer Reports.

This is a significant recommendation. When faced with multiple challenges to make an existing home more energy efficient, storm windows can be more affordable, offering a better return on your overall investment. Not only do they add a layer of insulating glass, but they provide added protection to the opening against water and air infiltration.

Replace old equipment with energy efficient heating, ventilating, and air conditioning units 9 of 10 -- Replacing an outdated HVAC system with a more energy-efficient one can lower your monthly energy bills. But before considering this project, it's essential to make sure your home is as well-sealed and insulated as possible.

> *This item needs to be considered by the certified HVAC contractor when they look at the distribution system. Properly sized equipment makes a difference to control how long and how often the equipment operates. If one is in a cold climate, 90% or better efficiency for heating equipment is a good investment. In a warm climate, a heat pump with a 15 SEER rating will keep cooling costs down (see http://energy.gov/energysaver/articles/air-source-heat-pumps).*
>
> *If you have sealed the home to air tight standards, it is highly recommended that an air-to-air heat exchanger (a.k.a., energy recovery ventilation – ERV or heat recovery ventilator -- HRV) be incorporated into your overall HVAC system. The use of exhaust fans in combination with these units provides a balanced approach to keeping the inside air cleaner and healthier.*
>
> *Another great guide for homeowners is the Building America Volume 14 Best Practices for HVAC. It covers heating, cooling and ventilation options and provides some solar heating insights.*

Install high-efficiency water heaters 10 of 10 -- High-efficiency water heaters can drive down home energy costs. "Water heating makes up anywhere from 15 to 25 percent of the annual energy usage in a home," says Steve Koep, a regional sales manager for Marathon Water Heaters by Rheem.

> *There are many options for saving energy via hot water systems. Again, distribution losses play a part. Expert Gary Klein asks the question, "How long does it take your shower to get hot?" His point is that the supply pipes store water, but it is not heated. Shorter, properly sized water supply lines will shorten the wait at the shower. Locating the water heater centrally to the plumbing fixtures also helps. Tankless and on-demand systems can be integrated with storage options to insure that hot water is available at lower rates of energy consumption. A side note: When the shower is waiting for hot water, additional power is consumed to run the water pump!*
>
> *Solar water systems can be an economical option. Depending on available rebates and tax credits, solar hot water has been a proven method to reduce water heating costs.*

Colder Climates

As reported in BUILDER magazine, May 2015, ice dams (water damage and freezing) generate "the second-most frequent homeowner's insurance claim and accounts for 20-25% of all insurance losses. The average cost of each insurance claim is $6,965." In the 2015 International Energy Conservation Code, the minimum requirement for ceiling insulation is R-49 and the air leakage rate is to be limited to 3 air changes per hour or less. Note: Check local code adoption as some jurisdictions have chosen to relax the air leakage rate requirement.

If ice dams are a problem, take a look at how the roof is insulated and sealed. Again, a certified HERS home inspection is a good idea. Are penetrations in the ceiling or gaps at the perimeter of the ceiling allowing moisture to enter the roof cavity? Are all exhaust vents ducted completely to the outside (and not through the soffit)? Does the installation of the insulation allow for ventilation from soffit to ridge?

Indications of uncontrolled airflow are commonly seen as mold growth, rot, pests, and unwanted odors (e.g., auto exhaust through the wall from garage to house). For framed walls, this airflow can have serious consequences if not properly addressed. For log walls, the issues are far fewer and intrusion of water can be found by regular inspection and remedied by regular maintenance. For more information, see the LTHC white papers,

- Infiltration, sealants, compatibility with wood treatments, and durability are discussed here -- Download the Prevention of Air and Water Infiltration: A Systems Approach.
- This 14-page document is a must if you are contemplating designing, building, and living in a log structure. It compiles features and methods that will ensure the permanent quality of the log structure. Download Preservation & Maintenance of Log Structures to keep your log and timber home safe from Mother Nature's wrath.

Condensation on windows is an indicator of glazing that may need to be replaced. When warmer moist air comes in contact with the cold surface of the glass, condensation will occur. This may be caused by inadequate ventilation of excessive moisture in the air (e.g., steam baths or other sources of high humidity) or by glazing that can be improved.

An excellent summary of the glazing issue can be read here. The authors describe the issue, note that new windows are not always the right answer, and provide some recommendations.

If replacement windows are the answer, it is best to look at Energy Star certified windows and doors. This assures that the glazing is rated better than the minimum 2015 IECC requirement (U-factor of 0.32). If replacement sashes or windows are not a practical option, consider exterior storm windows. Adding a layer of glazing and enclosing a couple inches of air will increase the energy performance of the window and help control condensation.

Warmer Climates

In warmer climates where cooling the indoor environment with air conditioning is more prominent than heating it, a slightly different set of guidelines are applicable. Insulating and sealing are the two key ways to isolate the conditioned indoor air (you already paid for that) from the adverse outdoor air! Assuming that is complete, what else can you do?

Most of the other alternatives to saving energy in a "cooling" climate (actually measured in cooling degree days, or CDD), are based on passive solar technologies. There are a lot of good sources of information for this, but the EarthEasy site says it well and simply.

- Shading techniques are beneficial because the surfaces of the building remain cooler and direct sun does not enter through windows and doors. A side benefit of porches are that they keep the rain away from the wall, window sills and door thresholds. This enhances the durability of the home.
- Sun tinted glass and window blinds on exposed south, east and west walls will help keep down solar gain.
- Reflective surfaces also help keep building surfaces cool. Lighter colors reflect more light while dark colors absorb it.
- Natural landscapes will also tend to keep the exterior of the home cooler. Avoid dark, paved areas as they act as a heat sink. Light colored gravel works better. On the Eastern Shore of Virginia, oyster shells were a common road surface because they were prevalent. But the white tone also reflects the hot summer sun.
- Be sure to allow exterior ventilation to work for you. While shading and natural landscapes can reduce building surface temperatures, air flow through the yard and around the house will provide cooling and can help evaporate moisture. Orienting a home to the predominant summer breeze and using door and window alignment to encourage air flow through the interior can also be effective.
- Maximize the chimney effect. As noted before, hot air rises. Allow cooler air to enter at lower floors and warmer air to exit through upper vents, windows, or other aperatures.

These tips work in both humid and dry enviornments, but the Arizona Solar Center notes that "Passive cooling techniques can be used to reduce, and in some cases eliminate, mechanical air conditioning requirements…" For more on this, visit their website. Keep in mind that techniques that work in the southwestern portion of the U.S. enjoy a dryer climate that helps feeling cooler as the temperature drops. The latent heat of a humid day in the southeastern U.S. may require a little energy to dehumidify!

Sidebar: A History of Energy Codes

1975: ASHRAE 90-75 - "Energy Conservation in New Building Design"

ASHRAE's first comprehensive standard to address the design and construction of new buildings from an energy standpoint.

MCEC 1977 - "Code for Energy Conservation in New Building Construction"

Developed by BOCA, ICBO, SBCCI, and the National Conference of States on Building Codes and Standards; based on 90-75

ASHRAE 90A-1980 - "Energy Conservation in New Building Design"

ASHRAE's update to 90-75

CABO 1983 MEC - "Model Energy Code 1983 Edition"

Maintained by the Council of American Building Officials (CABO) and based on 90A-1980.

CABO 1986 MEC - "Model Energy Code 1986 Edition"

Based on 90A-1980 and 83 MEC with a few changes

CABO 1989 MEC - "Model Energy Code 1989 Edition"

Based on 90A-1980 and 86 MEC with a few changes

10 CFR 435 - "Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings"

Includes requirements for both Federal commercial buildings and Federal residential buildings. For residential buildings, use of the software program "Conservation Optimization Standard for Savings in Federal Residences (COSTSAFR) is referenced. COSTSAFR to be used to derive the energy consumption goal for the Federal residential building.

CABO 92 MEC - "Model Energy Code 1992 Edition"

Based on 90A-1980 and 89 MEC with a few changes

CABO 93 MEC -- "Model Energy Code 1993 Edition"

Based on 90A-1980 and 92 MEC with a few changes

90.2-1993 -- "Energy Efficient Design of New Low-Rise Residential Buildings"

A complete revision to the low-rise residential building provisions in Standard 90A-1980.

CABO 95 MEC -- "Model Energy Code 1995 Edition"

Based on 90A-1980 and 93 MEC with a few changes

ICC 1998 IECC -- "International Energy Conservation Code 1998"

Maintained by the International Code Council (ICC). Chapter 6 "Residential Building Design by Acceptable Practice" was consolidated into Chapter 5 in a rewritten form.

ICC 2000 IECC -- "International Energy Conservation Code 2000"

A new Chapter 6 was added containing a four-page optional and standalone approach prescriptive compliance approach. The approach can only be used on single-family buildings with less than or equal to 15% glazing area or multifamily buildings with less than or equal to 25% glazing area.

ICC 2001 IECC -- "International Energy Conservation Code 2001 Supplement"

NFPA 5000 -- "NFPA 5000, Building Code"

This is planned to be the National Fire Protection Association's first complete building code and will contain ANSI/ASHRAE Standard 90.2-2001 as its residential energy provisions

ICC 2003 IECC -- "International Energy Conservation Code 2003"

Integrates the 2001 Supplement and 2000 IECC.

ICC 2006 IECC -- "International Energy Conservation Code 2006"

Complete rewrite of the IECC with a focus on format/adoptability/usability/simplicity.

ICC 2009 IECC -- "International Energy Conservation Code 2009"

~12-15% more stringent than '06 version. New requirements: Building envelope tightness; Duct testing; Lighting equipment; Pool controls and covers; Snow melt controls; Moisture control requirements moved to IRC; No mechanical trade-offs allowed.

ICC 2012 IECC -- "International Energy Conservation Code 2012"

~30% better than IECC 2006. Major changes include: Residential energy requirements identical in both IRC (Ch. 11) and IECC (Ch. 4); Mandatory whole-house pressure test; more stringent duct leakage test, DHW distribution system requirements.

ICC 2015 IECC -- "International Energy Conservation Code 2015"

Not many significant changes except the adoption of an Energy Rating Index compliance path.

Sidebar: Energy Star's Ways to Save

From https://www.energystar.gov/campaign/waysToSave ...

Use the ENERGY STAR Rebate finder to look for special offers or rebates on ENERGY STAR certified products. These offers are sponsored by ENERGY STAR partners or local utilities. Partners also occasionally sponsor recycling incentives for the proper disposal of old products.

Plumbing & Water

- Set your water heater thermostat at 120 degrees F or lower. This way you'll reduce the amount of energy it takes to produce and maintain your hot water by not overheating it. The average household spends more than $250 per year on water heating; the second largest energy expenditure behind heating and cooling.
- Repair hot water faucet leaks in the kitchen and bathroom. A leaky faucet can waste gallons of water, plus the energy that it takes to heat the make-up water that replaces it. Fixing drips is an easy and cost-effective way to save energy and water. A faucet leak amounting to one drip per second would add up to over 1,600 gallons over the course of a year.
- Fix running toilets
- Turn off water while shaving or brushing your teeth to save water and energy. Even cold water requires energy to pump and treat.
- A low-flow showerhead beats out both the bath and an old-fashioned showerhead when it comes to efficiency, by saving water and the energy it takes to heat the water.

Insulate

- Insulate hot water pipes to save energy by retaining heat in the water that is in the pipes.
- If you have an electric water heater, wrap it in an insulating jacket. Increased insulation slows heat loss through the walls of the water heater. Even if your water heater is in a heated part of your home, energy loss through the walls of the water heater can be significant.

Seal Air-Tight

- Check for signs of air leakage around windows and doors. Then use caulk and weather-stripping to stop the leaks.
- Weather strip and insulate your home's attic hatch or door to help keep your home more comfortable and save energy. You can do this with weatherizing materials and insulation or with a pre-made attic cover.
- Vents, ducts, or electrical wires often have holes or gaps around them which can allow the air in your home to escape, increasing your energy bill and causing more drafts in your house. Seal small gaps with caulk and holes up to 3 inches in diameter with spray foam.

Ventilation

- Proper passive ventilation of the attic extends the life of your roof shingles and helps remove any moisture that can be blown in by storms. Be sure attic soffit vents and gable vents are not blocked so air flows freely through them.
- Install a properly sized ENERGY STAR certified ventilation fan to control moisture in the air while you shower or bathe.
- Use a ceiling fan so you can turn down your air-conditioner. This way you can lower your energy bill and still stay comfortable. Just be sure to turn it off when you leave the room. Ceiling fans cool people, not the room.
- Check your air filter every month, especially during heavy use months. If the filter looks dirty, change it. At a minimum, change the filter every 3 months. A dirty filter slows down air flow and makes your system work harder to keep you comfortable.

Lighting, Electronics & Appliances

- Turn off lights when you're not in the room or don't need them. This is one of the easiest ways to start saving. Turn off fans, too, when you leave the room. Fans cool you, not the room.
    - Use dimmer switches to avoid lighting a room more than you need
    - Use lights with motion sensors
    - Turn off electronics when you're not using them
- Replace incandescent light bulbs with ENERGY STAR certified CFL or LED bulbs. The ENERGY STAR label lets you know this bulb is independently certified and has undergone extensive testing to ensure energy savings and performance promises. CFL or LED bulbs are not all the same when it comes to performance. To get the energy efficiency and performance you expect, always look for the ENERGY STAR label.
- ENERGY STAR certified light fixtures combine attractive design with the highest levels of efficiency. Replacing five fixtures in your home with ENERGY STAR certified models could save you $75 a year in utility bills.
- The outdoor porch light is one of your home's most used fixtures. ENERGY STAR certified fixtures use 75 percent less energy and come in a variety of styles and finishes. Many include features such as a motion sensor or automatic daylight shut-off.
- Whether decorating for the holidays or creating a warm atmosphere in your home, choose ENERGY STAR certified decorative light strings. Many ENERGY STAR light strings feature LED technology, which are exceptionally energy efficient when producing individual colors and can use up to 90 percent less energy than incandescents.
- Plugging electronics into a power strip provides a convenient 'turn-on/turn-off' point, so you can be sure your products are only on when you are using them.

Choose ENERGY STAR Certified Electronics

- New ENERGY STAR certified TVs save energy when they are off or on. The label can be found on standard size models all the way to large screen TVs with the latest features like 3D and internet connectivity.
- Use less energy while enjoying your favorite movies on an ENERGY STAR certified DVD or Blu-ray disc player. Certified models save energy compared to standard models because they are more efficient in all usage modes: sleep, idle, and on.
- An ENERGY STAR certified sound bar or Home Theater in a Box sound system delivers high quality performance as well as an energy efficient entertainment experience. ENERGY STAR certified audio/visual equipment is on average up to 60 percent more efficient than standard models.
- ENERGY STAR certified computers deliver substantial savings over standard models and are available in desktop, integrated desktop, and laptop models. Depending on how it's used, an ENERGY STAR computer uses 30-65 percent less energy, without sacrificing quality or performance.
- Monitors that have earned the ENERGY STAR come in a variety of sizes and offer all the key features. On average, they are 25 percent more energy efficient than standard models.
- Printing is more efficient when using an ENERGY STAR certified printer. They use over 45 percent less energy than standard models and their efficient design ensures they run cooler and last longer. Save energy and space by choosing an ENERGY STAR certified multi-function device that combines several capabilities - print, copy, and scan. Make sure the power management features are enabled for additional savings.
- Enable your computer and monitor to sleep while not in use. Check to ensure your power management settings are activated by following a couple of simple steps.

- Small network equipment (SNE) allows users to connect to the internet or to other devices on a local or wide area network. This equipment -routers, switches, modems, and gateways - tends to be on all the time. On average, small network equipment that has earned the ENERGY STAR uses 20 percent less energy than conventional models.

- Set-top boxes, such as a DVR or cable or satellite box, and set-top boxes are getting more energy intensive. ENERGY STAR certified set-top boxes are, on average 45% more efficient than conventional models.

Choose ENERGY STAR Certified Appliances

- Thanks to recent improvements in insulation and compressors, today's refrigerators use much less energy than older models. An ENERGY STAR certified refrigerator can maximize your energy and dollar savings without sacrificing the features you want.
    - Minimize the number of times you open your refrigerator and freezer doors
    - Replace a 10-year-old refrigerator for bigger savings. Be sure to recycle your old refrigerator
    - A full refrigerator retains cold better than an empty one, which means the compressor turns on less often
    - Keep your refrigerator coils clean

- A dehumidifier that has earned the ENERGY STAR removes the same amount of moisture as a conventional unit, but uses 15% less energy.

- Pool pumps re-circulate water through a filter to maintain water clarity and hygiene. On average, ENERGY STAR certified pool pumps are 55 percent more efficient than conventional models and can save you over $300 a year.

- A dishwasher that has earned the ENERGY STAR gets your dishes clean while using less water and energy, and costs less than $35 a year to run.
    - Wash full loads
    - Scrape dirty dishes, don't rinse
    - Air dry dishes instead of using the heat dry setting