



Emerson Environmental

Tune Up Your HouseSM

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Home Energy Auditing: How Homeowners Have Benefited

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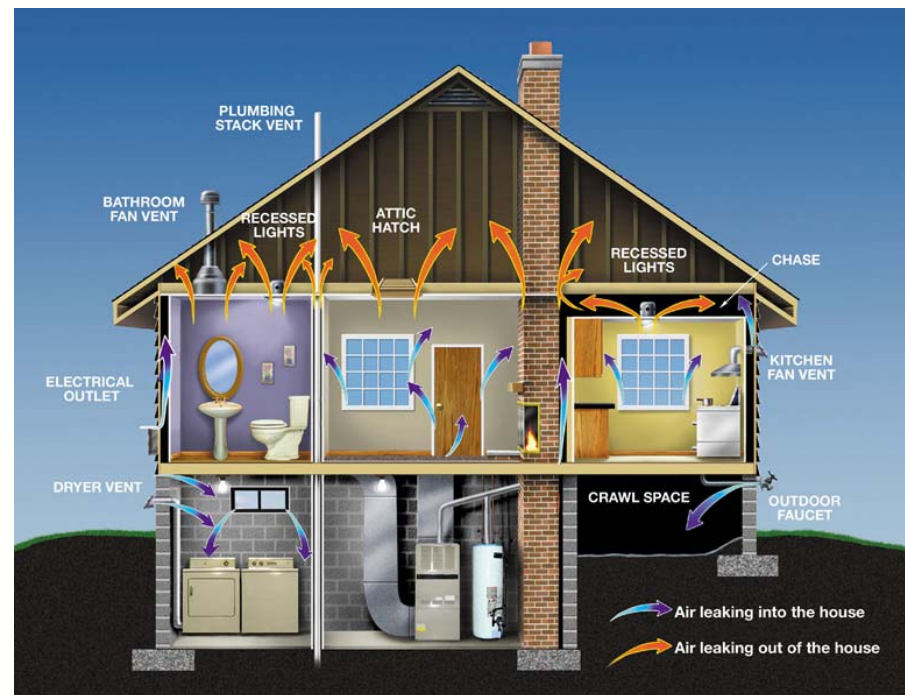
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Saving Energy with Home Performance Upgrades

- Saves you Money...
- Can Improve your Health...
- Can Improve your Comfort...
- Maximize Property Value...
- Can help the Environment...

What is an Energy Audit?

- Evaluation of energy use and recommendation for steps to reduce use
- Not a standardized definition



BPI Building Analyst Home Performance Evaluation

- Air infiltration tested with Blower Door
- Furnace and major appliance efficiency evaluated
- Insulation levels evaluated
- Utility bill analysis



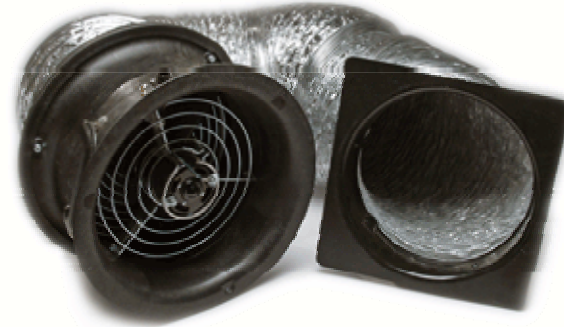
BPI Building Analyst Home Performance Evaluation

- Combustion safety testing
 - Carbon Monoxide production tested at furnace, water heater, range, oven
 - Natural gas leaks tested for
 - Backdrafting tested at furnace & water heater
- Performed by a “Building Analyst Professional” certified by the Building Performance Institute



BPI Building Analyst Home Performance Evaluation

- May include
 - Duct Leakage Test
 - Air flow measurements
 - Lighting efficiency
 - Water fixture flow and toilet leakage test
 - Infrared thermal imaging
 - Electrical load measurements
 - Efficiency evaluations of refrigerators, washers, dishwashers, pool pumps



Energy Audit Report: Emerson Environmental

- Utility bill disaggregation
- Report findings
 - Easy changes, Handyman fixes, Larger upgrades
 - CD with info on appliance efficiency
 - Photo pages



Top 5 Areas for Cost-Effective Energy Efficiency Improvements

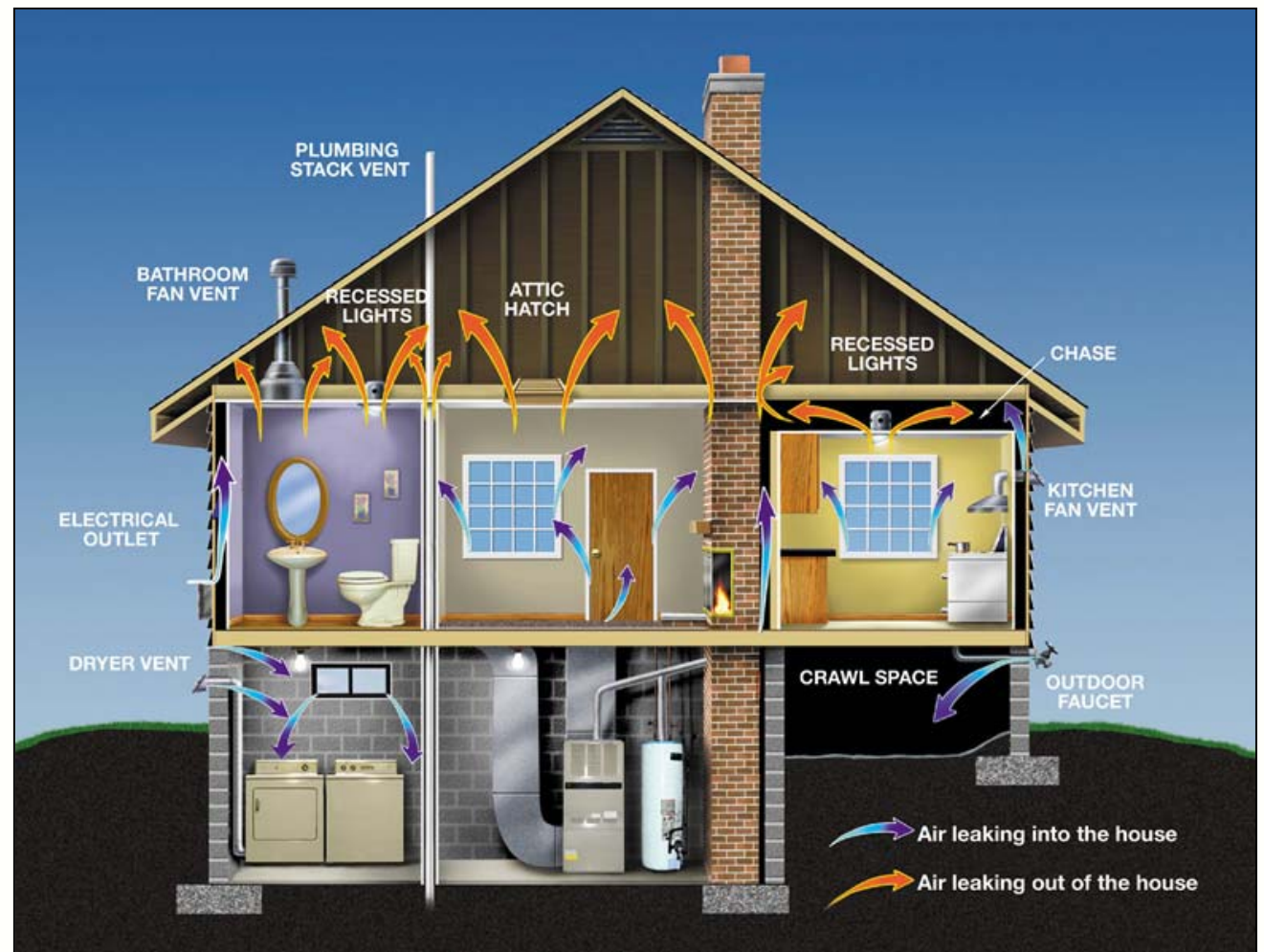


1. Lighting
2. Sealing
3. Insulating
4. Air Ducts
5. Pumps & Appliances

2. Seal Holes in Floor, Walls & Attic

Stack Effect

Imagine a hot air balloon. The balloon's hot air is more buoyant than the cool air around it, so the balloon rises. As we heat our homes, the warm air rises toward the ceiling. Roughly 20% - 30% of this costly warm air escapes into our attics, and the make-up air comes from our crawlspaces.



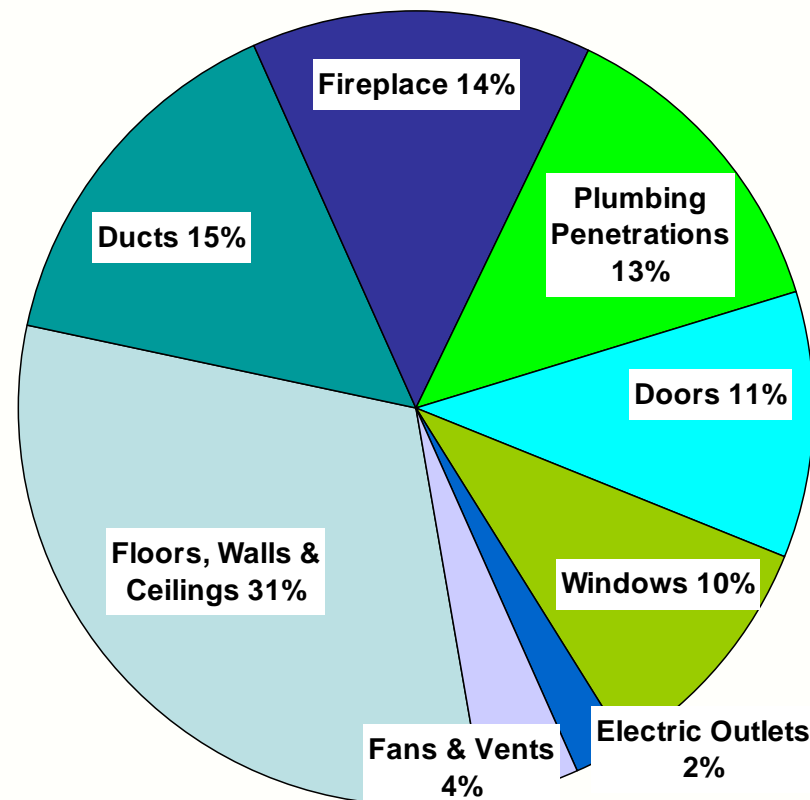
graphics by Energy Star

Air Sealing Cont.

Primary Air Infiltration Locations

“You can increase the comfort of your home while reducing your heating and cooling needs by up to 10% by investing in proper insulation and sealing air leaks.”

Energy Saver\$ at 4.



Data: David Johnson, What's Working, for Build It Green (2007); graphics © Emerson Environmental, LLC

4. Seal & Insulate Ducts

Duct leakage: “20-40% losses, if located outside conditioned space — Like having 3 registers going outside.”

Max Sherman, Lawrence Berkeley National Laboratory, Green Living Forum (Aug. 30, 2007).

“You can lose up to 60% of your heated air before it reaches the register if your ducts aren’t insulated and they travel through unconditioned spaces such as the attic or crawlspace.”

Energy Saver\$ at 12.



Seal & Insulate Ducts



Seal your heat ducts, return ducts, air handlers, register boots, and connections between the boots and the floor or wall, and insulate the entire duct system to R-6 or R-8. The average duct system leaks 30%.



Incentives



Basic Upgrade: \$1,000 rebate

- Shell measures: air sealing & combustion safety testing, duct sealing, attic insulation, hot water insulation, low-flow showerheads

Advanced Upgrade: up to \$4,000 rebate

- Comprehensive test-in and test-out
- Energy efficiency computer modeling
- Shell measures + system upgrades (wall insulation, heating, cooling, ducting, pool pump)

Qualified Contractors: EnergyUpgradeCA.org



Example 1



This beautiful craftsman-style home was drafty and had a couple really cold rooms.

Energy Audit Findings:

- Numerous large air leaks
- Insulation missing in some attic and skylight areas
- No insulation in crawl space
- No insulation on hot water pipes
- Squashed heat duct
- Rodents moving attic insulation
- Problematic carbon monoxide levels from oven.

Example 1



Actions Taken: Handyman

- Sealed air leaks
- Fixed attic & skylight insulation
- Installed floor insulation
- Insulated hot water pipes
- Replaced squashed heat duct
- Sealed leaks in heat ducts
- Repaired rodent damage

Incentives: Homeowners didn't submit insulation rebate application or take tax credit

Results:

“We handed your report to a handyman we know and he pretty much did everything you recommended. The house is MUCH less drafty than it was before!”

“It was definitely worth while -- we're glad we did it!”

Example 2

This 1940's home started out with no insulation and no attention to energy efficiency. By sealing and insulating, their natural gas use has been cut down to one-third of its earlier level, and the home is more comfortable as well.



Energy Audit Findings:

- Many air leaks
- No insulation
- No pipe insulation
- Heat ducts very leaky and uninsulated
- No bathroom ventilation
- Many appliance inefficiencies



Example 2



Actions Taken: Homeowners

- Air sealing
- Chimney pillow
- LaderMate attic hatch cover
- Attic insulation
- Replacement of return duct
- Heat duct sealing & insulation
- Pipe insulation
- Low-flow water fixtures (free from CalWater)
- Showerhead thermostatic control valves
- Contractor: Retrofit wall insulation

Incentives: \$325 insulation rebate;
\$1,500 tax deduction. (If done now, by
Energy Upgrade contractor, would
qualify for \$4,000 rebate.)



Example 2

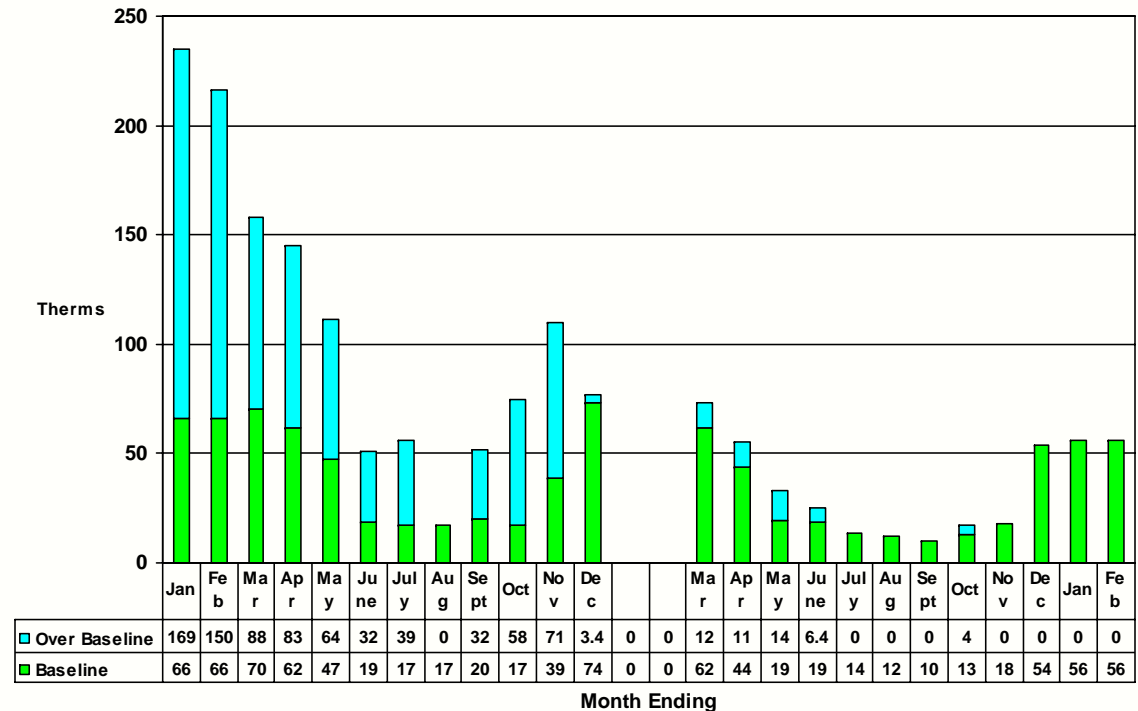
Results:

68% reduction in natural gas use;
49.8% reduction in air leakage.

He said: “I thought all this air sealing and insulating was overkill. But the house is now more comfortable both in the summer and the winter, and our gas use has gone way down.”

She said: “Our natural gas use is literally a third of what it used to be, even though our kids are bigger now. It really is amazing!”

**Gas Usage,
Before & After**



Example 3



The owners of this woodsy home were ready for a remodel and wanted to incorporate energy efficiency into the process. Their contractor used the list of air leakage locations, HVAC recommendations, and high insulation levels for an anticipated 44% energy savings.

Energy Audit Findings:

- Various air leaks
- Wildlife-removed floor & duct insulation
- No insulation on hot water pipes
- Gas leak
- Appliance inefficiencies

Example 3



Incentives: Insulation rebates. If performed by an Energy Upgrade CA contractor, would qualify for \$4,000 rebate.

Results: “Our house is so much more comfortable now!”

Actions Taken: Contractor

- Air sealing
- Increased attic, wall, and floor insulation
- Quality Insulation Installation Verification
- Replaced heat ducts
- Pipe insulation
- Low-flow water fixtures
- Efficient furnace and appliances
- Cool roof
- New windows
- Wildlife control measures
- Fixed gas leak



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The average California home energy usage emits 10,600 lbs. (5.3 tons) CO₂ per year.

PG&E Climate Smart™ "Together we can fight climate change" (2007).

Questions?

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The average CA household is responsible for 1 lb/hr CO₂ emissions, almost exclusively from fossil fuels for energy.

Max Sherman, Lawrence Berkeley National Laboratory, *Green Living Forum* (Aug. 30, 2007)