

# Healthy Home Clinic

## Indoor Air Quality Problems and the Rebates Available to Fix Them

### Fixing Air Quality Problems Saves Energy & Money

By Bruce Severance, Energy Analyst, General Contractor

### Rebates & Finance Packages That Will Make You Cash-Positive

By Kevin Hauber, Loan Officer at iMortgage

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## Are Indoor Air Quality Problems Real?

- A 2013 EPA Study found that 30 million homes in the US have significant indoor air quality issues.
- Many of these occupants are experiencing symptoms and are not always connecting the illness with the house.

– Advancing Healthy Homes – A Strategy for Action, by HUD & EPA

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## Stats on Indoor Air Quality:

- People in the U.S. spend about 90% of their time indoors.

US EPA, (1987). The Total Exposure Assessment Methodology (TEAM) Study

- EPA studies indicate indoor levels of pollutants are up to ten times higher than outdoor levels.

Environmental Protection Agency (2008). An Introduction to Indoor Air Quality.



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**75% Increase in  
Respiratory  
Problems  
Since  
1980's**

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Asthma Statistics

NATIONAL INSTITUTES OF HEALTH  
National Heart, Lung, and Blood Institute

## Data Fact Sheet Asthma Statistics



### Introduction

Asthma ranks among the most

The prevalence of asthma has been increasing since the early 1980s for all age, sex, and racial groups. The overall age-adjusted prevalence of asthma rose from 30.7 per 1,000 population in 1980 to a 2-year average of 53.8 per 1,000 in 1993-94. This represents an increase of 75 percent. The prevalence among children ages 5 to 14 increased 74 percent.

others to become more involved in asthma education, the NAEPP has developed this *Data Fact Sheet on Asthma Statistics* to indicate the magnitude of the problem.

### Prevalence

In 1995, the prevalence of self-reported asthma was 56.8 per 1,000 persons. The prevalence was higher among children than adults and higher among blacks than whites. Among the general population, the prevalence of asthma was higher among females than males (Figure 1); however, among children, the prevalence was higher among males.

The prevalence of asthma has been increasing since the early 1980s for all age, sex, and racial groups. The overall age-adjusted prevalence of asthma rose from 30.7 per 1,000 population in 1980 to a 2-year average of 53.8 per 1,000 in 1993-94. This represents an increase of 75 percent. The prevalence among children ages 5 to 14 increased 74 percent, from 42.8 per 1,000 in 1980 to an average of 74.4 per

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## Why do Widespread Indoor Air Quality Problems Go Unaddressed?

- There is no “warning light” for many issues.
- Problems can be complex and unobvious.
- We all tend to focus on the obvious.
- “People spend more time looking at kitchen counter tops rather than the issues that can cause serious health problems”.

– Nancy Harvey Steorts,  
realtor & author of  
Your Home Safe Home

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## Benefits of Making Your Home Healthier:

- Improved health of living environment
- Monthly savings on utility bills
- Up to 30% return on investment
- Reduced environmental impact
- Increased resale value (8% to 30% more)

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## Does Your House Have Issues?

- Any family members have respiratory problems?
- Is your home dusty?
- Do you have mold?
- Do your windows leak air or condense water?
- Is the crawlspace wet or damp?
- Are any rooms drafty, too hot or too cold?
- Is your electric bill more than \$150 per month?

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## Main Reasons for High Indoor Pollutants

- Duct leakage combined with air leakage draws in toxins
- Unbalanced ventilation
- Inadequate ventilation
- Moisture accumulation & mold  
(over 10,000 people effected annually in US)
- Radon: 2<sup>nd</sup> leading cause of lung cancer.
- Toxins outgassing from building materials.

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## Home Air Infiltration

The single biggest factor affecting

*Comfort, Indoor Air Quality, and Energy Efficiency*

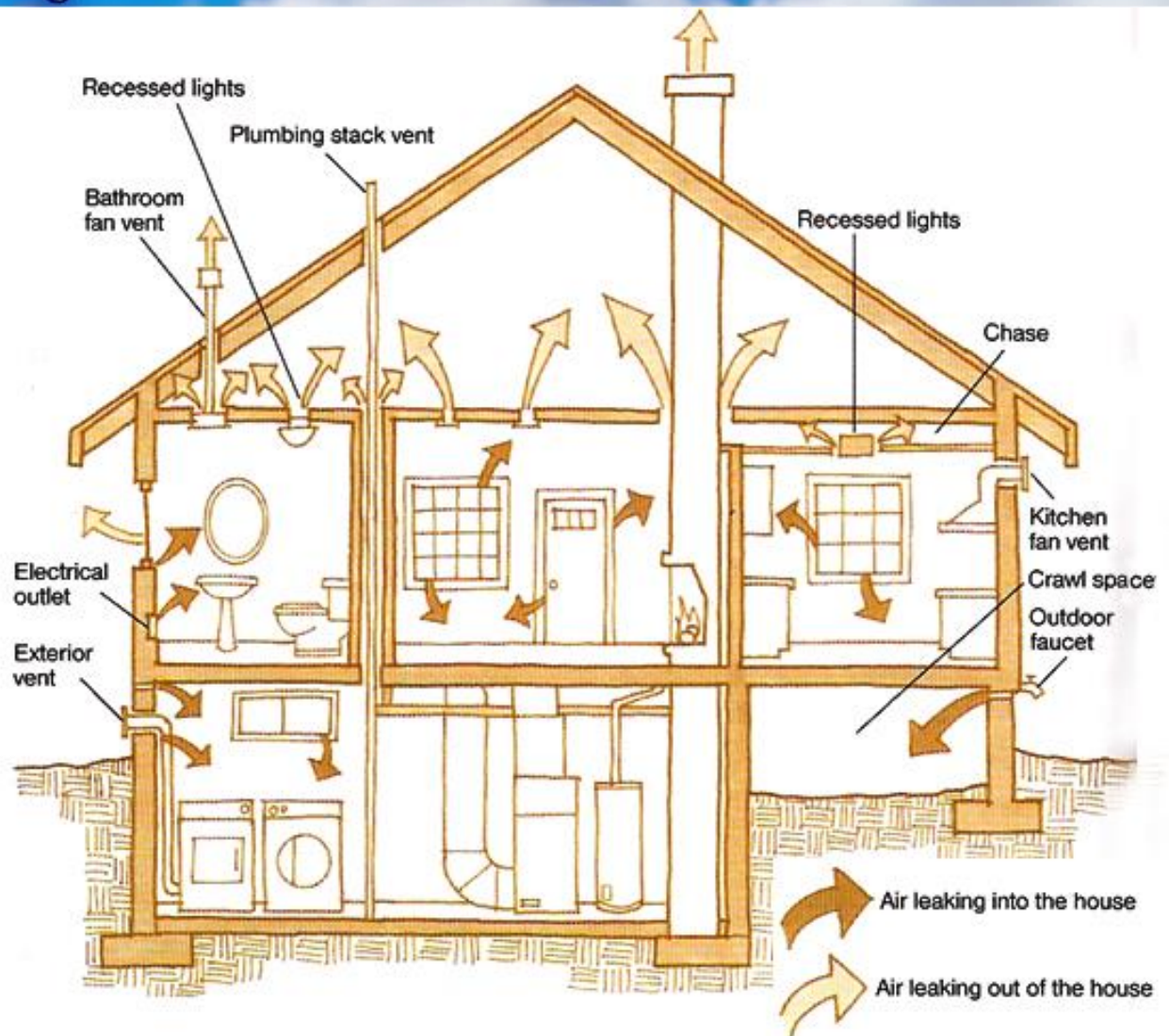
It might be a good idea to know something  
about air infiltration  
(aka ***air leaks***)

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## Home Air Leaks



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## Home Air Leaks

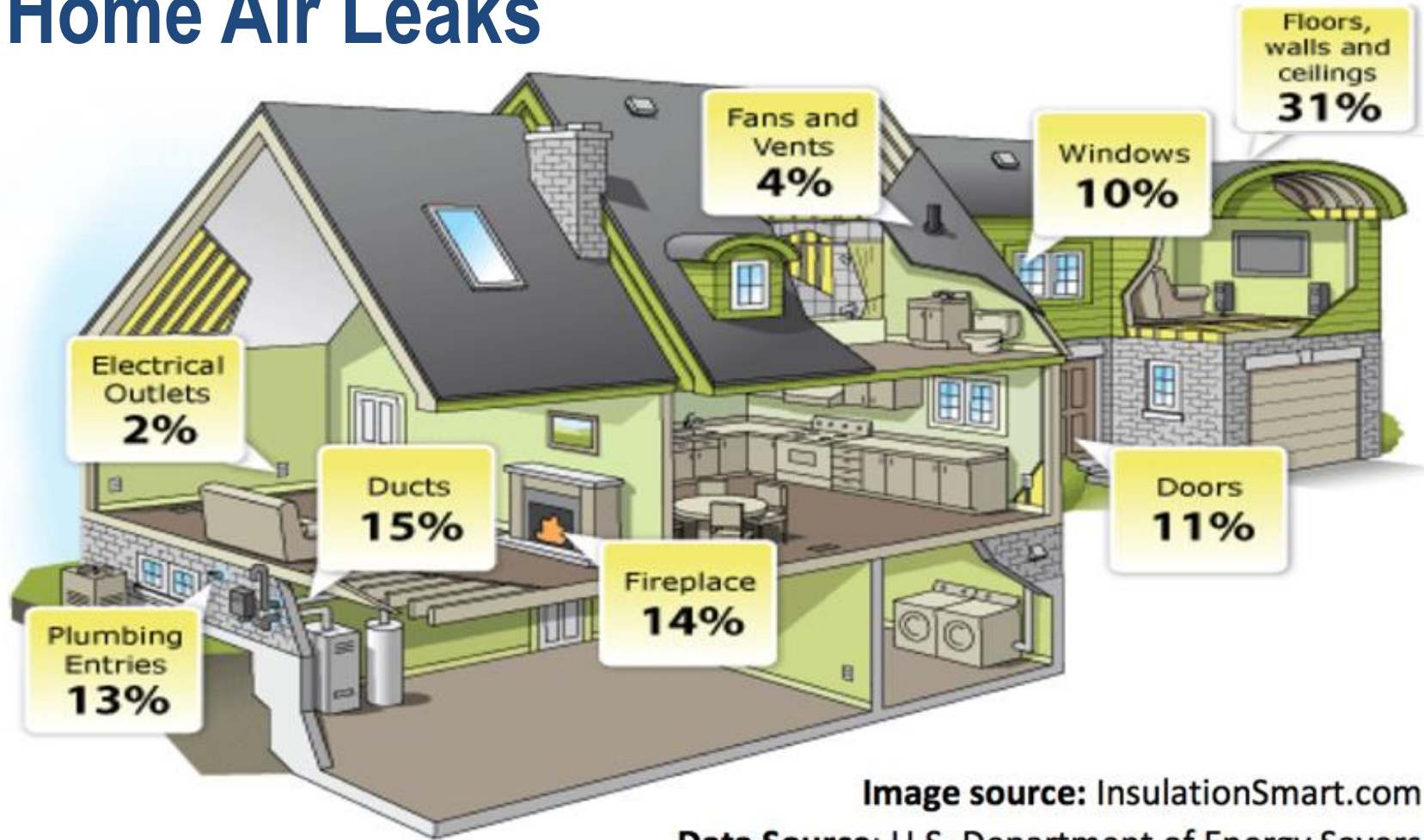


Image source: InsulationSmart.com

Data Source: U.S. Department of Energy Savers

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## How Do We Measure Leakage?

### Blower Door Test

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## Where Does Your Air Come From?

Every cubic foot of air that leaves is replaced  
by a cubic foot from outside.

*Is your “make up air” coming  
from a healthy source?*

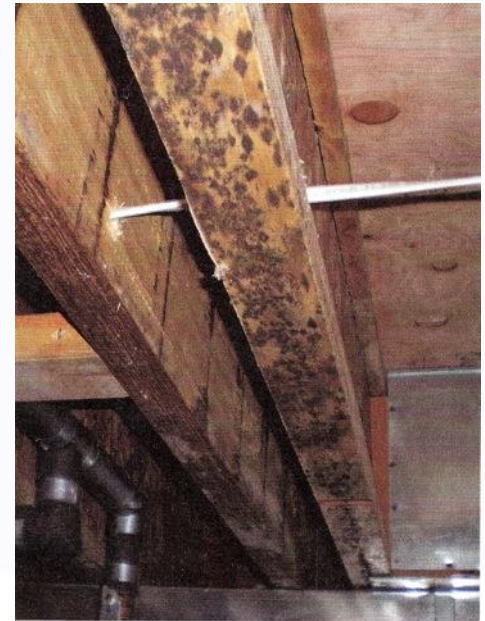
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## Does Your Crawl Space Have Fresh Air?

- Lawrence Berkeley Lab says 40% of ventilation air comes from the crawlspace.
- How?
  - Duct leaks
  - Plumbing access panels in flooring
  - Electrical and plumbing pass-throughs
  - Unsealed sub flooring



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## Plumbing Holes

Not the best source for “fresh” air!



Thanks and a tip 'o the hat to Allison Bailes of *Energy Vanguard*

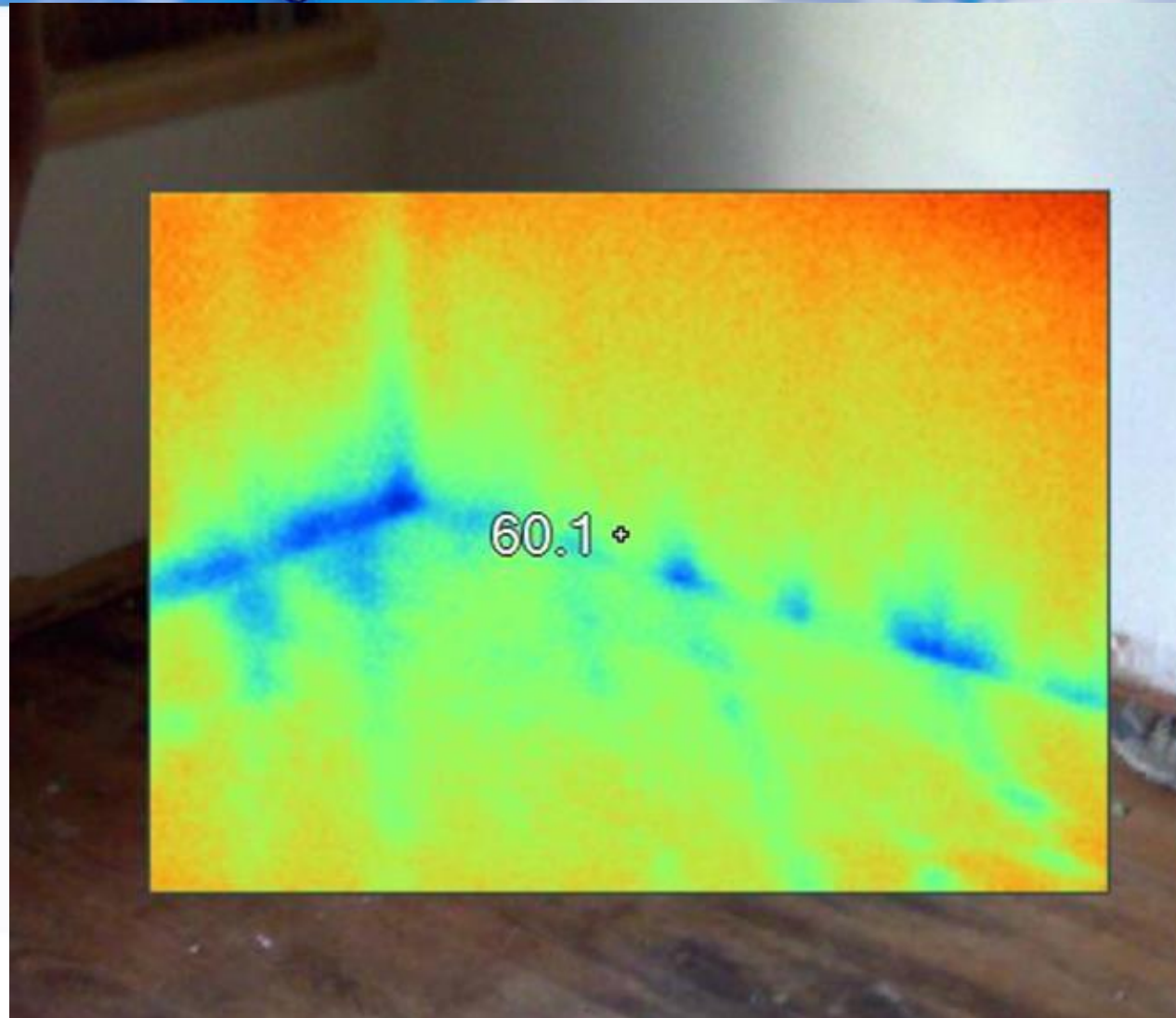
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## Duct Leaks + Air Leaks = Bad Air

- Duct leaks on the *return* side pulls air directly from the attic or crawlspace.
- Duct leakage on the *supply side* of the HVAC draws outside air into the living space.

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## Open Stud Return Plenum – (Common Problem)

Pulls dust from attic  
through stud bays –  
Really bad air!!



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## Typical Heating System Problems:

- The average home has 30% duct leakage!!!
- Every house built before 2000 has duct leakage problems due to widespread cloth-backed “duct tape” failure.



See [Anything But Duct Tape](#), study by Lawrence Berkeley Labs for the DOE

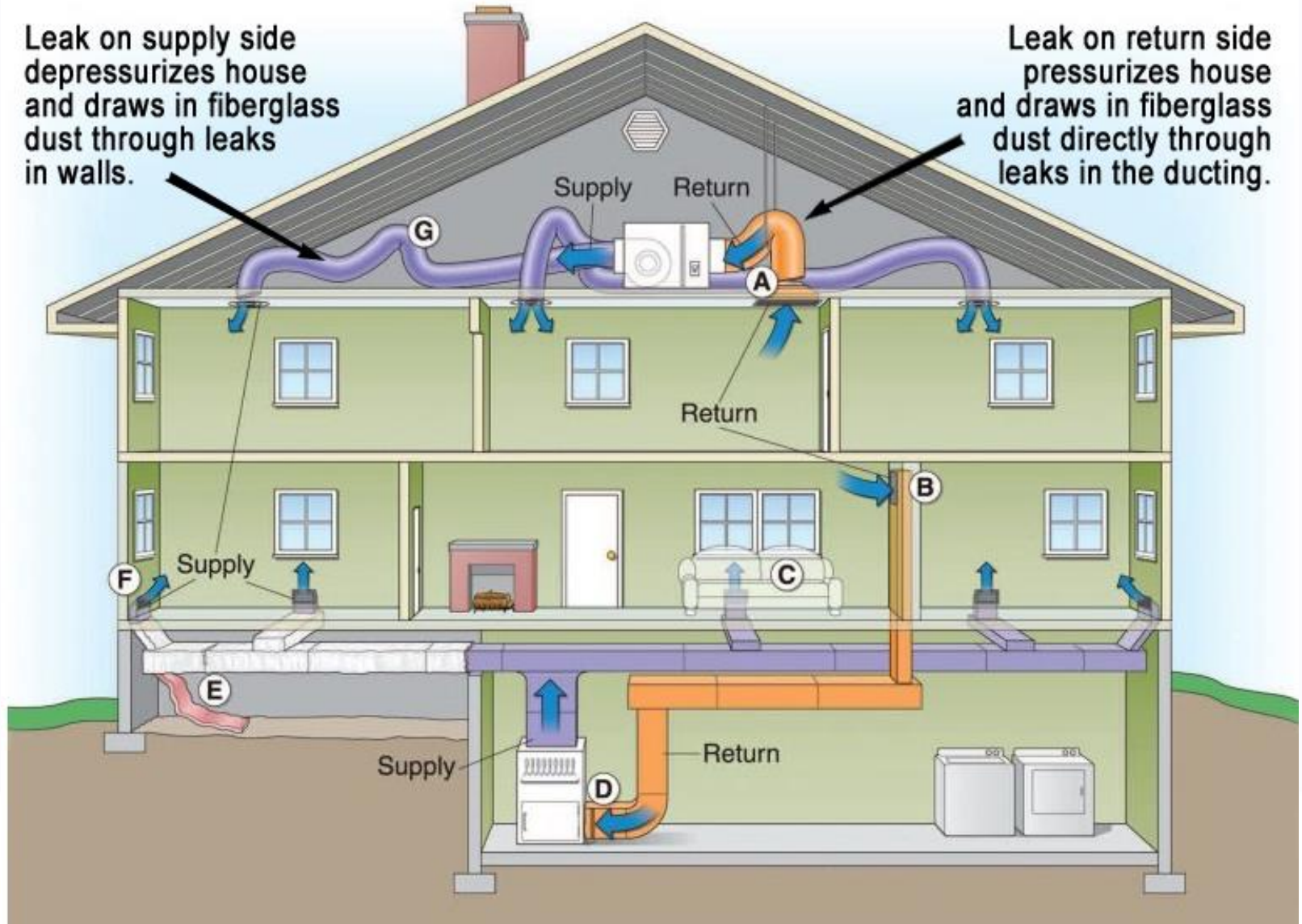
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Leak on supply side depressurizes house and draws in fiberglass dust through leaks in walls.

Leak on return side pressurizes house and draws in fiberglass dust directly through leaks in the ducting.



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**Why are these lights a bad idea?**



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## View From the Attic



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## Leakage vs. Ventilation

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## Leakage vs. Ventilation

Leakage: *Random and Uncontrolled*

Ventilation: *Controlled* amount from *known* source  
moving as *designed*

Contributes to health and comfort of occupants

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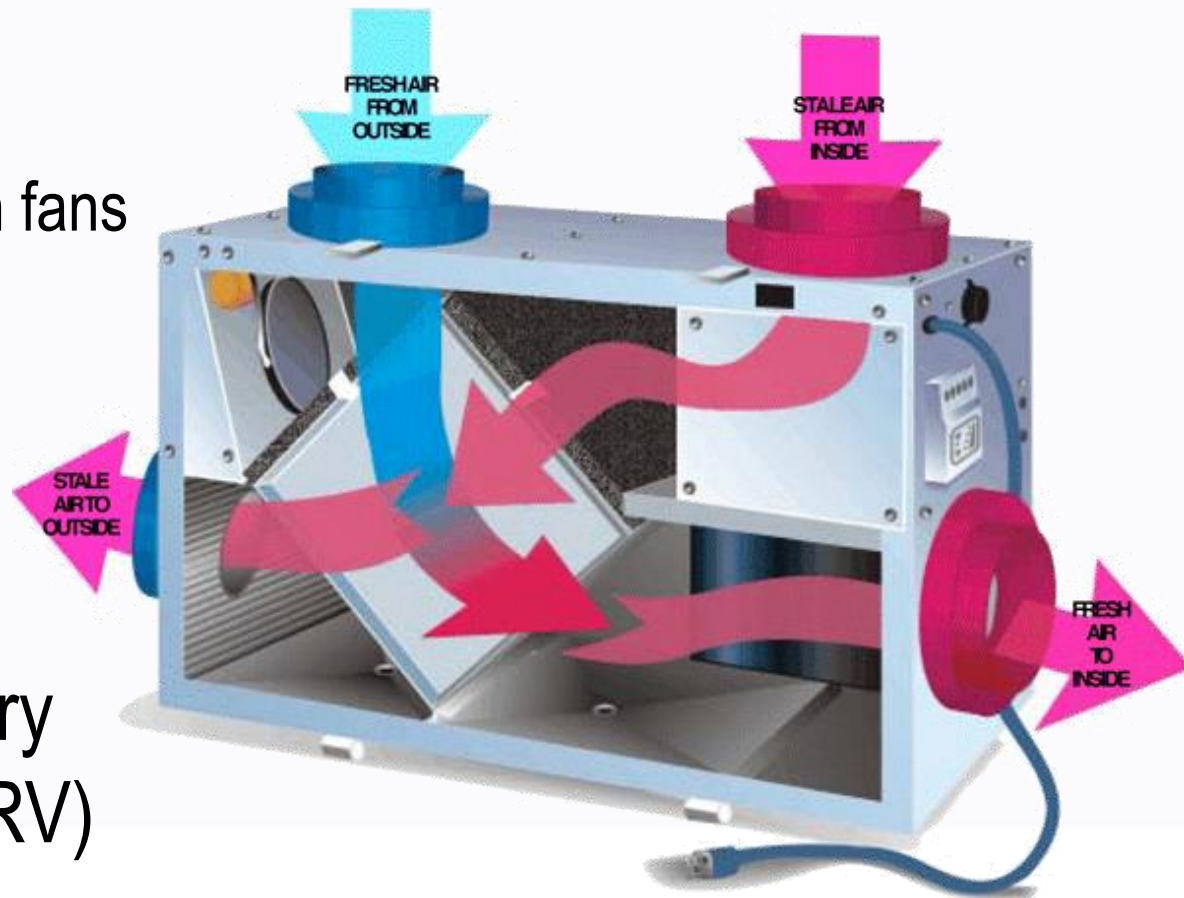
## Ventilation

- Most residential systems do not have controlled source of fresh air
- HVAC can be retrofit to continuously draw air from outdoors, but this may not be the most energy efficient.

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## Types of mechanical ventilation systems

- Exhaust only  
Kitchen & bath fans
- Supply only
- Balanced
- Heat Recovery Ventilator (HRV)



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## Are You Breathing CO from Combustion Appliances?

- **25% of the homes tested in SLO County have combustion appliance safety issues.**
- **20% have an appliance producing more CO than is allowed by national standards.**
- **85% of homes in SLO County have “depressurization” due to ducting leakage problems.**
- **This can cause naturally drafted appliances to “backdraft” drawing flue gasses (and CO) back in.**
- **An energy audit tests conditions that cause CO to backdraft as well as CO levels in flue.**

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## Combustion Safety

Clothes dryer and water heater are competing for air.

THIS can be DANGEROUS!

Carbon Monoxide and other combustion gasses enter the living space!



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## Does Your CO Monitor Keep You Safe?

- UL approved monitors are triggered if they are exposed to 30ppm for 30 days or 70 ppm for four hours. They will not sound an alarm if CO levels are at 150 ppm for under 50 minutes.
- Harmful effects such as headaches and dizziness flue symptoms are felt at 35 ppm in 6 to 8 hours.
- OSHA allows 50 ppm for 8 hours.
- UCLA study indicates safe threshold at 5ppm for pregnant women.

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## What is a Safe Level of Carbon Monoxide?

- UCLA study indicates only 5 ppm is linked to pregnant women having underweight children with smaller heads.

Concentration	Symptoms
35 ppm (0.0035%)	Headache and dizziness within six to eight hours of constant exposure
100 ppm (0.01%)	Slight headache in two to three hours
200 ppm (0.02%)	Slight headache within two to three hours; loss of judgment
400 ppm (0.04%)	Frontal headache within one to two hours
800 ppm (0.08%)	Dizziness, nausea, and convulsions within 45 min; insensible within 2 hours
1,600 ppm (0.16%)	Headache, <b>tachycardia</b> , dizziness, and nausea within 20 min; death in less than 2 hours
3,200 ppm (0.32%)	Headache, dizziness and nausea in five to ten minutes. Death within 30 minutes.
6,400 ppm (0.64%)	Headache and dizziness in one to two minutes. Convulsions, respiratory arrest, and death in less than 20 minutes.
12,800 ppm (1.28%)	Unconsciousness after 2–3 breaths. Death in less than three minutes.

Chart from Wikipedia.org

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## Does Your CO Monitor Keep You Safe?

- **Monitors are triggered at 30 ppm for 30 days, but harmful effects such as headaches and flue symptoms are felt at 35 ppm in 6 to 8 hours.**
- Where is your CO monitor? Location near bedroom is recommended, but do you need one elsewhere?
- Is there a water heater in your laundry room?

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## How Dangerous is Lead?

- Lead can cause permanent brain impairment, behavioral problems and autism in children.
- In adults can cause: anemia, hypertension, depression, nausea, concentration loss and short-term memory loss.
- DIYS lead paint test kits are about \$12 online.
- Use only EPA-certified renovators to remodel at-risk homes.
- Federal fine: \$37,500 per day.

**PROBABILITY OF LEAD-BASED PAINT BY VINTAGE**

Year Built	Probablility
1978-1980	2%
1960-1978	24%
1940-1969	69%
before 1940	87%

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## How Dangerous is Radon?

- A naturally occurring odorless gas which is the second leading cause of lung cancer in the US.
- About 6.8 million U.S. homes have some level of radon risk.
- Of 246,000 residence in SLO County 5.9% live in homes with radon over 4 picocuries/liter EPA action level threshold.
- Radon exposure produces no symptoms.
- Test kits are only \$26 and are found on-line.



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## Do We Have a Radon Problem in SLO?

- In Templeton, 27.3% of residents are exposed to levels that exceed EPA action level.
- In Atascadero: 18.8%
- In Paso: 8.9%

-Based on 2008 Department of Public Health Indoor Radon Program survey of 918 homes in SLO County.  
Radon Potential in San Luis Obispo County.

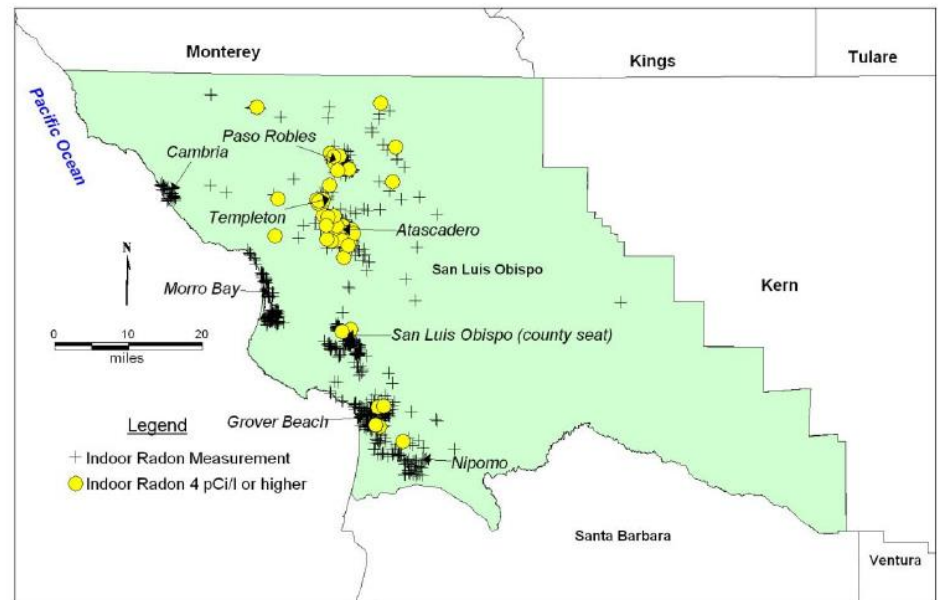


Figure 2. All CDPH Short-Term Radon Test Results for San Luis Obispo County—with 4.0 pCi/l or Greater Sites Shown as Yellow Circles

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## Moisture Accumulates Indoors Causing Mold

- Each person creates an average of three quarts of water vapor per day.
- Inadequate ventilation causes mold.
- Mold is a problem in areas where humidity is high or winter temperatures encourage people to keep windows closed.

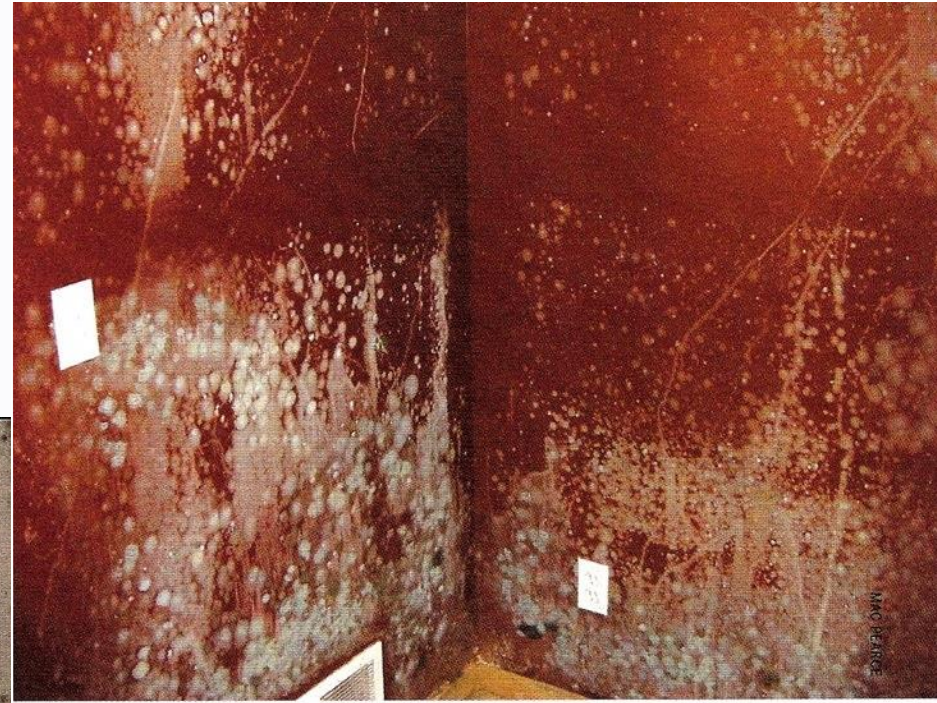




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**Moisture = Mold**

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## How Toxic is Mold?

- Relatively common molds can produce toxins that:
- Cause protein synthesis inhibition
- Neurotoxicity (brain toxicity)
- Cytotoxicity (cell toxicity)
- Immune toxicity (immune cell depression & damage)  
*(Gray et al 2003; Thrasher and Crawley, 2009)*
- Some molds linked to cancers, reduced blood flow to brain, and damage to central nervous system, organs, soft tissue, bone, and other effects.  
*(Dangers in Our Home Mold, Steven Gilbert, 2009, Toxipedia.org)*

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## Bath Fans Need to Be Ducted Out!

- Moisture needs to go out.
- Living space needs to be sealed from attic space.



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## What Causes Mold to Grow in Our Homes?

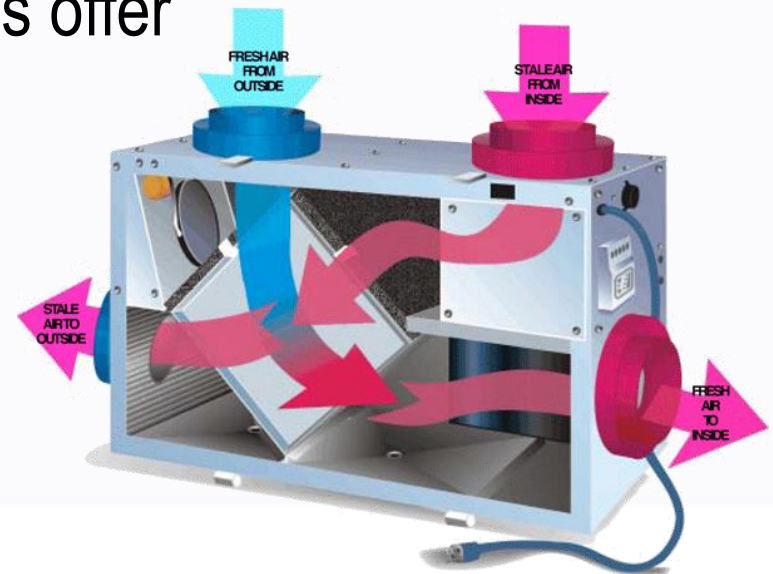
- Plumbing leaks
- Plumbing back-ups
- Roof leaks
- Window leaks
- Wind Driven Rain
- Plants
- Washer Hose leaks
- Ice Maker Leaks
- Reverse Osmosis Leak
- Grading and Drainage
- Shower pans
- Shower vapor
- Lack of Exhaust Fans



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## Mold Mitigation Strategies:

- Eliminate water leaks!!
- Open the windows!
- PREVENTATIVE MEASURE: Heat Recovery Ventilation: HRV's offer balanced ventilation that draws in fresh air and pumps out excess moisture without losing all the heat.



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## Repairs that Improve Air Quality also Save Energy

- Air sealing (the building envelope)
- Duct sealing
- Changing out leaking recessed can lights
- Installing sealed combustion appliances

## Other Important Safety Measures:

- Installing CO monitors
- Eliminating asbestos hazards

**All of these repairs qualify for energy grants**

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## Return on Investment Highest on Ducting Repairs and Additional Insulation

- The most energy-saving improvements (CFL's, duct sealing, insulation & water conservation cost under \$5,000 and will yield a 20% to 30% return on investment with a 4 to 6 year payback.\*
- These energy upgrades that have proven to be cost effective across all US climate zones

\*Actual savings depend on age of house and extent of existing problems



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## Upgrades With the Fastest ROI in SLO County

NOTE: Actual energy savings will vary relative to site conditions. This data is generalized and the actual order of priority of these upgrades and features may vary relative to site variables.

Home Energy Items Upgraded	Avg. Cost	ann\$ sav	1-Yr. ROI	fuel/power	Payback Yrs
Replace 25 incand. lamps with 13W CFLs	\$ 79	\$ 150	190%	Inflat. adj.	0.5
Programmable thermostat (varies with use)	\$ 80	\$ 120	150%		0.7
Low-flow shower heads	\$ 74	\$ 105	142%		0.7
Attic hatch sealing & insulating	\$ 120	\$ 59	49%		2.0
Hot water heater blanket	\$ 65	\$ 29	45%		2.2
Duct leakage(varies with duct length, access, climate,etc.)	\$ 1,200	\$ 392	33%		3.1
Duct insulation (replace R-4 with R-8)	\$ 500	\$ 119	24%		4.2
Air sealing (reduce leakage 20%)	\$ 500	\$ 120	24%		4.2
Adding insulation, add R30 to existing	\$ 1,600	\$ 268	17%		6.0
Replacing 5 leaky can lights & insulating them	\$ 220	\$ 35	16%		6.3
Heating & AC system tune up	\$ 200	\$ 32	16%		6.3
<b>SUBTOTALS &amp; AVERAGES OF ABOVE ITEMS:</b>	<b>\$ 4,218</b>	<b>\$ 1,362</b>	<b>32%</b>	<b>35%</b>	<b>2.9</b>
Replace 10 yr. old 20cf. refrigerator	\$ 900	\$ 145	16%		6.2
Replace 65% eff. furnace with 95%	\$ 3,000	\$ 200	7%		15.0
<b>SUBTOTALS &amp; AVERAGES OF ABOVE ITEMS:</b>	<b>\$ 7,885</b>	<b>\$ 1,332</b>	<b>17%</b>	<b>19%</b>	<b>5.2</b>
3kW solar PV system	\$ 17,500	\$ 1,550	9%		11.3
Replace 70% eff. water heater with 95%	\$ 900	\$ 50	6%		18.0
Passive solar thermal hot water syst.	\$ 3,300	\$ 180	5%		18.3
Replace windows with thermopane	\$ 6,000	\$ 300	5%		20.0
<b>Efficient Vehicle Purchase</b>	<b>Avg. Cost</b>	<b>ann\$ sav</b>	<b>1-Yr. ROI</b>		<b>Payback Yrs</b>
Pure EV (Like Nissan Leaf)	24,000	2,150	9%		11.2
PHEV (Like Volt, Plug-in hybrid EV)	35,000	1,726	5%		20.3
Small HEV (like Prius, not plug-in)	30,000	1,466	5%		20.5

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## Energy Audit Benefits:

- Energy audit identifies and prioritizes safety issues such as CO and other indoor air quality problems.
- Evaluates cost-effectiveness of energy upgrades which also fix air quality problems.

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## Indoor Air Quality Problems and the Rebates Available to Fix Them

### Rebates & Finance Packages That Will Make You Cash-Positive

By Kevin Hauber, Loan Officer at iMortgage

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## But Will it Add Market Value?

### Market Trends

- 91% of U.S. home buyers would prefer to buy a home with energy-efficient features over a less-efficient home that is 2 to 3 percent cheaper.

National Assoc. of Home Builders Consumer Preference Survey, 2009

- 81% of U.S. home buyers prefer green homes.      - McGraw Hill Survey, 2011

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## Really?

- A study published in *The Appraisal Journal* documented that, “**For every \$1 decrease to a home’s annual energy costs, the home’s value increases \$20.**”
- For example, if you saved \$100 per month in energy costs, leading to **annual savings of \$1,200, your home’s value would also increase \$24,000.**

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## Resale Value of Green Remodels

Certified green homes sell for 8% more than comparable uncertified homes.

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### Los Angeles Times

LOCAL U.S. WORLD BUSINESS SPORTS ENTERTAINMENT HEALTH LIVING TRAVEL OPINION  
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#### Energy-efficient homes seem to sell faster, fetch higher prices

*Some research projects in California, Oregon and Washington offer hints that energy efficiency and sustainability certifications for homes may result in easier sales and higher prices.*

August 28, 2011 | By Kenneth R. Harney

Home energy efficiency and sustainability have been major policy priorities for the Obama administration, but lurking in the background are two consistent questions: Beyond the documented savings on utility bills, do such steps add to the resale value of a home? And do they make it easier to sell your property?

Housing groups and housing officials say that definitive statistical data covering multiple regions of the country are scarce. But some localized research projects in Oregon, Washington and California offer promising hints.

In a study covering existing and new houses sold from May 2010 through April of this year, the Earth Advantage Institute, a nonprofit group based in Portland, Ore., found that newly constructed homes with third-party certifications for sustainability and energy efficiency sold for 8% more on average than noncertified homes in the six-county Portland metropolitan area. Existing houses with certifications sold for 30% more.

The raw sales data in the study were provided by the Portland Regional Multiple Listing Service. "Certified" houses were defined as those carrying Energy Star or LEED for Homes designations or Earth Advantage home certifications. (LEED stands for Leadership in Energy and Environmental Design.) The latest study was the fourth in an annual series conducted by Earth Advantage, each of which has shown clear price premiums for certified houses.

But officials caution that using average sales prices pulled from MLS data without trying to measure "comparable" homes against one another directly may not be conclusive. For instance, newly constructed certified houses may be more expensive to start, and existing certified homes may be larger and more likely to be in higher-cost neighborhoods where homeowner adoption rates for energy-efficiency measures are higher.

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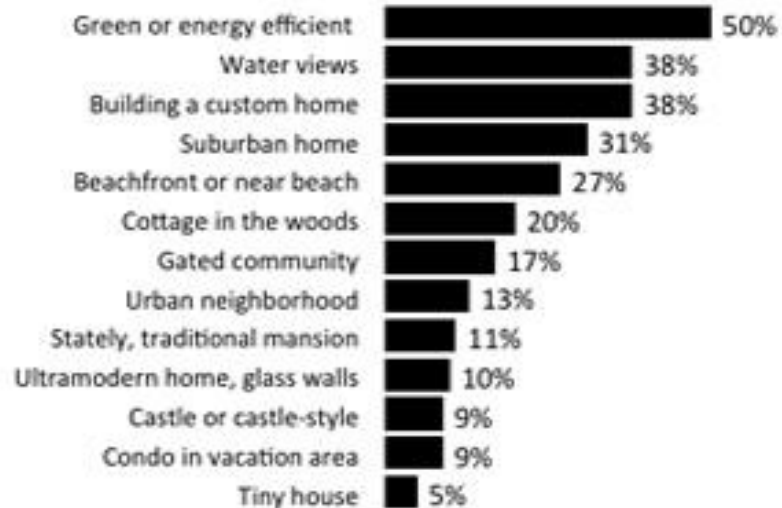
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## Hallmarks of Dream Homes

Would your dream home include one or more of these features?



Yahoo! Real Estate: Home Horizons 2012 Study of 1,500 US homebuyers, home sellers, homeowners and renters | Multiple Responses Allowed

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## Financing Available for Energy Upgrades:

- Energy Upgrade California (EUC) has rebates for \$1000 to \$4500 based on efficiency improvement.
- Energy Efficient Mortgages (EEMs)
- 203K Loans
- CHF Program Loans
- Home Equity Loans
- Home Equity Line
- Refi with Cash for Upgrades

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## **“Basic” Home Upgrade Package:** (effective June 2013)

- Based on simple point system
- No energy audit needed.
- **Can now pay up to \$2,500/dwelling**

## **Advanced Energy Upgrade Package**

- Requires an audit and model (has admin overheads)
- Is most cost effective if includes a package of upgrades costing over \$12,000
- Pays up to \$4500/dwelling for a 45% increase in efficiency.

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More info at: [BEEPenergy.com](http://BEEPenergy.com) & [SLO Green Build.org](http://SLO Green Build.org)



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## Database of State Incentives for Renewable Energy

**[www.dsireusa.org](http://www.dsireusa.org)**

- Federal
- Incentives/Policies for Renewables & Efficiency
- [See All Summaries](#)
- 
- **Financial Incentives Corporate Deduction**
- [Energy-Efficient Commercial Buildings Tax Deduction](#)
- **Corporate Depreciation**
- [Modified Accelerated Cost-Recovery System \(MACRS\) + Bonus Depreciation \(2008-2012\)](#)
- **Corporate Exemption**
- [Residential Energy Conservation Subsidy Exclusion \(Corporate\)](#)
- **Corporate Tax Credit**
- [Business Energy Investment Tax Credit \(ITC\)](#)
- [Energy-Efficient New Homes Tax Credit for Home Builders](#)
- [Renewable Electricity Production Tax Credit \(PTC\)](#)
- **Federal Grant Program**
- [Tribal Energy Program Grant](#)
- [U.S. Department of Treasury - Renewable Energy Grants](#)
- [USDA - High Energy Cost Grant Program](#)
- [USDA - Rural Energy for America Program \(REAP\) Grants](#)
- **Federal Loan Program**
- [Clean Renewable Energy Bonds \(CREBs\)](#)
- [Energy-Efficient Mortgages](#)
- [Qualified Energy Conservation Bonds \(QECBs\)](#)
- [U.S. Department of Energy - Loan Guarantee Program](#)
- [USDA - Rural Energy for America Program \(REAP\) Loan Guarantees](#)

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## Other Financing Options

- **Bank or Credit Union Equity Loan-** Up to 70-80% of home value when you can find them.
- **Equity Line of Credit-** Typically up to about 70% of home value when you can get them from a bank or credit union; usually adjustable rates.
- **Refinance With Cash Out for Upgrades-** a good option while rates are low as long as there is equity in the property.

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## Energy Efficient Mortgage (EEM):

- EEMs incorporate cost of home efficiency investments into a mortgage.
- Borrowers pay these costs over the life of the loan and deduct the interest for upgrades from taxes.
- Similar to a conventional loan but requires a home energy rating (HERS).
- Favorable ratio of expenses-to-income, allowing homebuyers to qualify for a larger mortgage.
- Borrower given credit for projected smaller utility bills.

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## 203K Loans:

- A 203k is an FHA loan that combines the purchase or refinance of the home along with the costs of the improvements.
- LTV (Loan to Value) is based on the value of the home after improvements.
- Work can be completed by the borrower or a contractor
- Up to 6 months PITI can be included in the loan amount if the property is not occupied during construction
- Owner occupied residence only.

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## 203K Loan Typical Repairs:

- Additions to the structure (full 203k only)
- Kitchen or bath remodels and appliances
- Patios, decks or terraces
- Roofing
- New plumbing, electrical
- **Energy efficient improvements** (solar, windows, etc)

Check HUD's website for a more complete list of allowable repairs:

[www.hud.gov](http://www.hud.gov)

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**Thank You for Coming.**

**Please Tell Your Friends About the  
Healthy Home Clinic.**

**2<sup>nd</sup> or 3<sup>rd</sup> Thursdays of every month, 5:30pm to 6:30pm**

**Questions and Answers from 6:30pm to 7pm**

**Future dates: July 16**

**Main Meeting Hall, SLO Library**

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