

**GreenSavers**  
HOME PERFORMANCE REPORT



**PREPARED FOR**

Jane and John Doe  
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Portland, OR 97232  
Audit Date: February 16, 2016

**PREPARED BY**

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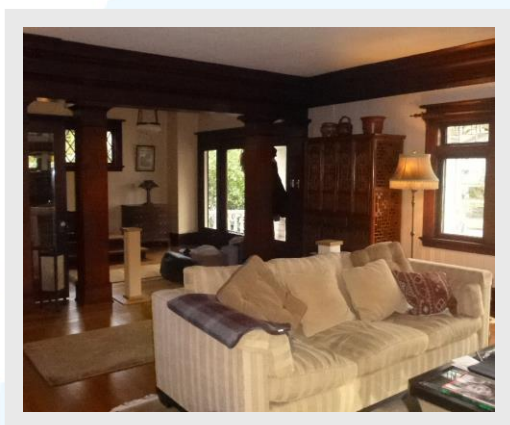


## HOME PERFORMANCE REPORT

Thank you for taking the first step towards a safer, more comfortable, and efficient home. This Home Performance Report will serve as your guide. It includes both general information on home performance and specific recommendations for your home. The recommendations are based on data collected during your Home Energy Audit.

You will see explanations of the tests performed during your audit as well as tables with your test results. Your report calls out the highest priority issues and most cost-effective solutions. If you have questions about anything in the report, please don't hesitate to contact your Home Performance Consultant.

GENERAL INFORMATION ABOUT YOUR HOME			
Type:	Single Family Stick-Built	Year Built:	1912
Primary Utility:	NW Natural	Square Footage:	4,552



## BLOWER DOOR TEST / AIR LEAKAGE

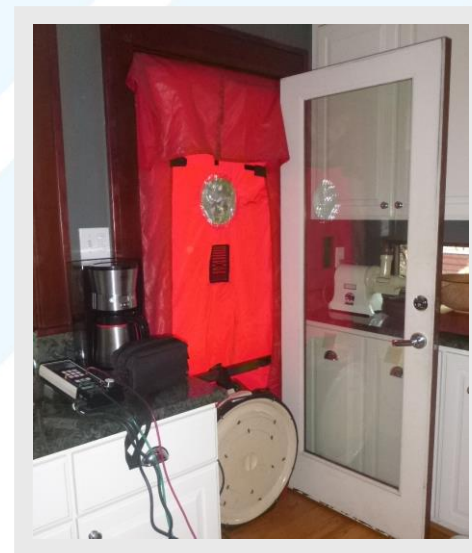
When you heat and cool your home, a percentage of hot and cold air escapes through unseen cracks and gaps. The cracks and gaps are typically found in attics, basements, duct systems, and around floors, doors, and windows. The resulting air leakage can be equivalent to leaving a door or window open year-round.

A blower door test measures the amount of air moving through your home. Its results tell us exactly how much air sealing to complete and whether your home needs additional mechanical ventilation. The optimal level of air sealing will keep your home comfortable, reducing energy costs and allowing enough airflow to avoid the accumulation of mold, mildew, and other indoor air pollutants. For homes that are too tight, mechanical ventilation ensures a high level of indoor air quality.

## BUILDING AIRFLOW STANDARD

We use a calculation called the Building Airflow Standard (BAS) to determine the optimal amount of airflow for your home, balancing energy efficiency with indoor air quality. BAS is based on the indoor volume as well as the number of levels and occupants.

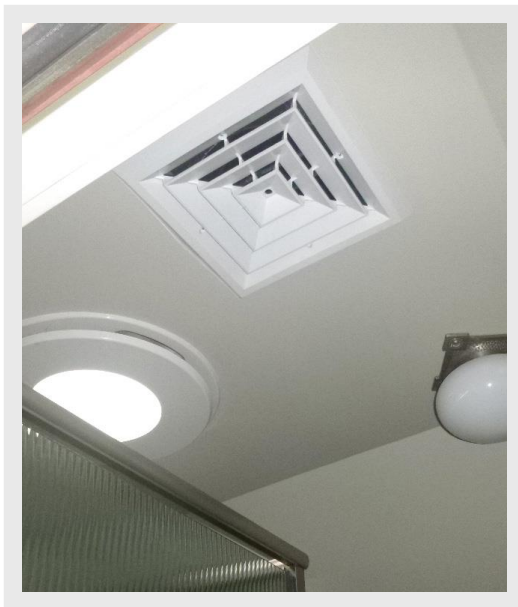
BLOWER DOOR TEST / AIR LEAKAGE RESULTS			
Blower Door Test Pre-CFM @ 50 Pa:	6700 CFM <sub>50</sub>	Prescribed BAS Ideal Range:	2,332 – 3,300 CFM <sub>50</sub>
Comments & Recommendations:	Our blower door test indicates that your home is very leaky. This is likely the source of your high heating bills and feeling of draftiness. We recommend sealing the sill plate in your basement as well as penetrations in the ceiling of your crawlspace and floor of your attic.		



## VENTILATION AND MOISTURE ISSUES

High relative humidity in indoor air can lead to both structural problems for your home and health problems for the people who live there. Signs of moisture problems include high levels of condensation on windows, mildew odors, or mold growth on walls or articles in the home. The conditions that facilitate mold growth also encourage the growth of dust mites and other microorganisms.

One of the best ways to ensure good indoor air quality is to regularly use ventilation fans in bathrooms and kitchens, which are typically the biggest sources of moisture in homes. In tighter homes with less natural air leakage, we recommend installing fans that are rated for continuous operation. The most efficient way to provide mechanical ventilation is to install a Heat Recovery Ventilator, or HRV. These systems control the exhaust of stale air and the influx of fresh air, using a heat exchanger to warm or cool the fresh air before it enters the home.



VENTILATION AND MOISTURE RESULTS	
Vent Fans Location(s):	Fans located in the 2 <sup>nd</sup> and 3 <sup>rd</sup> floor bathrooms
Moisture Issues:	None observed
Comments & Recommendations:	We did not see any issues related to excessive moisture in your home. It's recommended that you run your bath fans whenever taking a shower to reduce the risk of issues arising.



## HEALTH AND SAFETY

Energy gets a lot of attention. But the most important recommendations we make are the ones that keep you safe and healthy at home. In addition to proper ventilation, it is critical to eliminate the sources of pollution in your home. GreenSavers tested your home for 6 common indoor air pollutants and completed a full assessment of potential gas leaks, backdrafting combustion appliances, mold, asbestos, and leaky ductwork that can carry pollutants into your living space.

### HEALTH AND SAFETY RESULTS

Please review your [GreenSavers Indoor Air Quality Report](#).

We flagged a very small gas leak in the line running to your furnace. This leak should be sealed ASAP.

We recommend installing a vapor barrier and air sealing the crawlspace ceiling (floor of the home). About 40% of the air that you breathe at home originated in the crawlspace. Without a vapor barrier, your crawlspace threatens indoor air quality and building durability. According to the Environmental Protection Agency, "Moisture and contaminants [such as radon] can be driven into living spaces by the differences in air pressure between the crawlspace/basement and the living spaces above."



## DUCT SEALING AND INSULATION

Your air supply and return ducts should be sealed as tightly as possible. Leaks in your supply ducts can waste energy and make rooms uncomfortable. Return leaks can pull mold, dust and other unwanted particles into your home. We recommend using mastic to seal the seams and joints in the ductwork, including connections to the registers in the ceilings and floors. Flexible ductwork needs to be properly sealed at connections and supported, and needs to be replaced if it is severely damaged.

Duct insulation keeps conditioned air inside your ducts at the desired temperature. For example, if you have a supply duct that runs from your furnace through your crawlspace into your living room, you should insulate the section of duct that runs through your crawlspace to ensure that the warm air from your furnace is still warm by the time it reaches your living room.



DUCT SEALING RESULTS			
Duct Test Pre CFM:	N/A	Ideal Duct Leakage:	N/A
Comments & Recommendations:	Most of your ducts are in the conditioned (heated) portion of the home, with the exception of some ducts in the crawlspace and the new attic heat pump ducts, which appear to be in great shape. The only section of ducts we recommend sealing and insulating are in the back addition crawlspace.		

## ATTIC INSULATION

To maximize efficiency and comfort, we recommend insulating attic floors to R50. It is also important to do a thorough regimen of air sealing to create a clear separation between unconditioned attic space and the conditioned living space in your home. Air sealing in the attic can include sealing around bath fans, baffling and sealing recessed lights, sealing wiring chases, and sealing over or insulating dropped soffits or other interior wall cavities open to the attic. Do not compress or store objects on top of attic insulation.



ATTIC INSULATION RESULTS			
Existing Insulation Type:	R21 Batts, Paper-Side Down in Crown and Attic Flats	Beginning R Value:	R12 Effective on Flats, R8 in Crown
Comments & Recommendations:	The attic of your home is under-insulated. This presents one of the most cost effective opportunities to save energy and increase comfort in your home. We recommend that you add blown-in insulation to bring the total insulation level to R50.		

## KNEEWALL AND SLOPE INSULATION

Attic kneewalls and sloped ceilings are weak points in the thermal envelope that separates your living space from the great outdoors. Kneewalls should be properly insulated with R19 fiberglass batts and covered in an air barrier - such as Tyvek - to keep the insulation in place and prevent air movement through the kneewall. At the base of kneewalls, we often find framing that is not properly blocked, allowing hot or cold air into the floor cavity of your upper level. If you want to use side attics for storage and prefer not to cover the attic floor with cellulose, an alternative approach is to insulate your attic slope with rigid foam board.

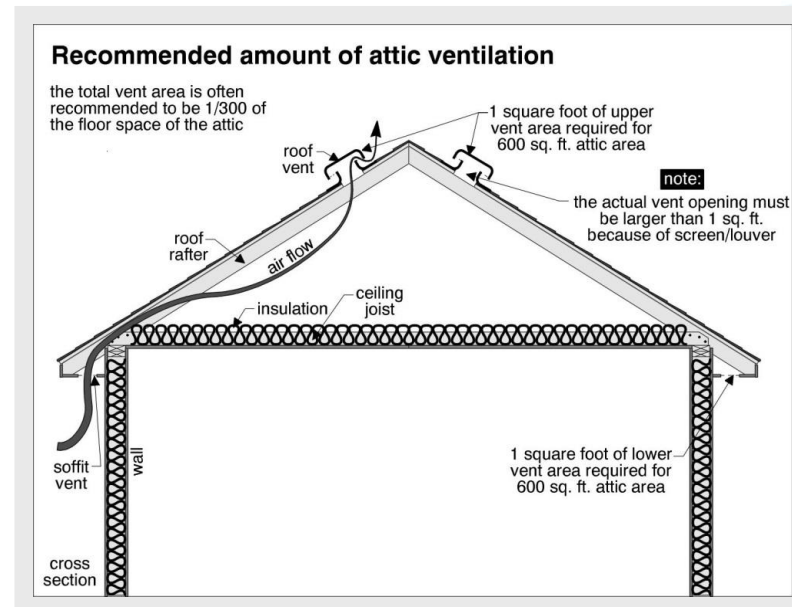
KNEE WALL AND SLOPE INSULATION RESULTS			
Existing Insulation Type:	R11 fiberglass / None	Beginning R Value:	R6
Comments & Recommendations:	Your knee walls are insulated but lack an air barrier. We recommend installing additional insulation and a vapor-permeable air barrier to maximize the effectiveness of your knee wall insulation. Some slopes contain insulation; some slopes do not.		





## ATTIC VENTILATION

Attics require ventilation to operate properly. With the right amount of ventilation, your attic will stay cooler in hot weather and dry more quickly in wet weather. Vents in the eaves of an attic require baffles to prevent wind from displacing the insulation.



### ATTIC VENTILATION RESULTS

Your attic was found to be under-ventilated, needing additional upper ventilation such as roof or ridge vents to meet Energy Trust and BPA required-levels to ensure your attic does not overheat in summer or develop moisture problems in winter.

## WALL INSULATION

If your walls are uninsulated, adding wall insulation is the single biggest opportunity you have to increase comfort and save energy at home. In a home without wall insulation, about 35% of heat loss occurs through wall cavities. Dense packed cellulose, a post-consumer recycled product, is an excellent material for insulating walls; it slows the movement of air through wall cavities, reduces noise transmission, resists fire and pests, and fills irregularly shaped voids. When installed properly, cellulose will not settle or slump over time.

WALL INSULATION RESULTS			
Existing Insulation Type:	Fiberglass in kitchen walls / None	Beginning R Value:	R11 in kitchen, R0 in remainder of home
Comments & Recommendations:	The exterior walls of your home are almost entirely uninsulated. We recommend installing dense pack cellulose, which can be done from the exterior without altering the appearance of your home.		



## FLOOR INSULATION

For a typical crawlspace, the best approach is to completely fill each cavity with fiberglass batts. The batts must be secured to the floor joists so that they do not droop or fall. Air gaps between insulation and the subfloor significantly diminish the effectiveness of insulation and provide winter habitat for pests, particularly rodents. It is also important to insulate water pipes to prevent freezing and cover crawlspace floors with a vapor barrier. Other floors – such as bump-outs and garage overhangs - are best addressed with blown-in insulation.

FLOOR INSULATION RESULTS			
Existing Insulation Type:	Degraded / missing insulation in back. Side bump-out not insulated.	Beginning R Value:	Old, degraded
Water Pipes Wrapped:	N/A	Ground Covering:	No vapor barrier
Comments & Recommendations:	The floors in your home are under-insulated. This results in cold feet and lost heat energy. We recommend insulating your floor to R30 with fiberglass batts. Your overhang was found to be uninsulated in our IR inspection. The best approach is to cut into these cavities from beneath and dense-pack each cavity with blown-in cellulose insulation.		

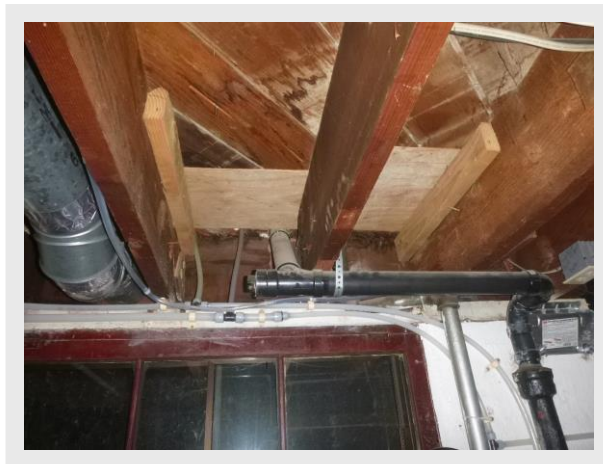


## RIM JOIST

Your wood framing sits on the foundation at the rim joist or sill plate. This is a major area for air leakage. It is critical to seal and insulate your rim joist to avoid what is known as the “stack effect.”

The stack effect refers to a condition in which cold air enters the home at a lower level – such as a rim joist – heats up on the main floor of the home, then escapes through an upper level – such as an attic hatch, can light, or older windows. The warm, conditioned air in your home leaks at a much more rapid rate when it is easily replaced with cold air at a lower level. Sealing your rim joist slows and stops the stack effect before it begins.

For most homes, the best option is to install rigid foam board insulation in the rim joist cavities, sealing any air gaps with spray foam.



RIM JOIST RESULTS			
Existing Insulation:	None	Beginning R Value:	R0
Comments & Recommendations:	The rim joist in your basement is totally accessible, and this presents a major opportunity to complete the thermal boundary and increase comfort throughout your home. We recommend the installation of 2" foam board, sealed with spray foam, around the entire perimeter.		

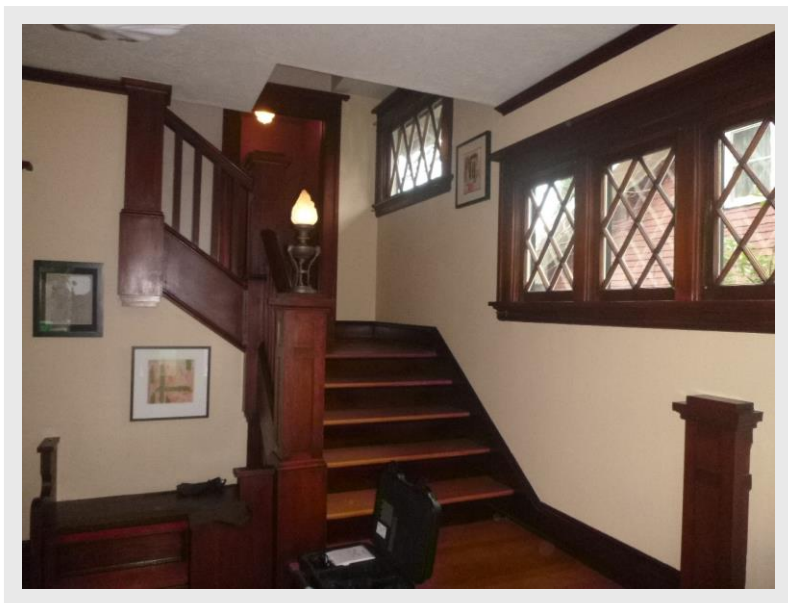


## WINDOW U-VALUE AND SOLAR HEAT GAIN

According to the US Department of Energy, single-pane windows are impractical in heating-dominated climates, like the Pacific Northwest. "In these regions, multiple-pane, low-E, and gas-filled window configurations are advisable."

"U-Factor" refers to the rate of heat loss for a window assembly. The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating value.

"Solar Heat Gain Coefficient" (SHGC) is the fraction of incident solar radiation admitted through a window. SHGC is expressed as a number between 0 and 1. The lower a window's SHGC, the less solar heat it transmits.



WINDOW RESULTS			
Window Description:	Various	Estimated U-Value:	Various
Replacement Recommendation:	Single pane windows are a source of air leakage and heat loss. We recommend you consider upgrading your existing single pane windows to multi-pane windows that have a U-value of .25 or better, though we know you won't take us up on that one! The kitchen windows have been updated.		

## WATER HEATER

According to the US Department of Energy, the average household spends \$400 to \$600 on water heating each year. The average resistance electric water heater uses more energy than the refrigerator, dishwasher, clothes washer and dryer combined. By upgrading to a heat pump water heater or a tankless water heater, you can save quite a bit on your monthly energy bills.

If you're using an atmospherically vented water heater [this includes most natural gas water heaters] you run the risk of spilling flue gasses into your home. Non-fire related CO poisoning is responsible for 15,000 ER visits and 500 deaths per year in the US.



WATER HEATER RESULTS					
Location:	Basement	Make:	American	Year:	2003
Fuel:	Gas	Gallons:	75	EFF:	.59
CAZ Baseline:	-1.5	CAZ Depress. Test (PA)	-1.5	Gas Leak Detection:	Pass (None Found)
CAZ Ambient CO: (PPM):	0	Flue CO (PPM):	20	Flue Draft (pa): -7	
Comments & Recommendations:		Your atmospheric water heater passed our tests and appears to be working properly. We recommend increasing performance and efficiency by replacing this unit with a power vented model.			

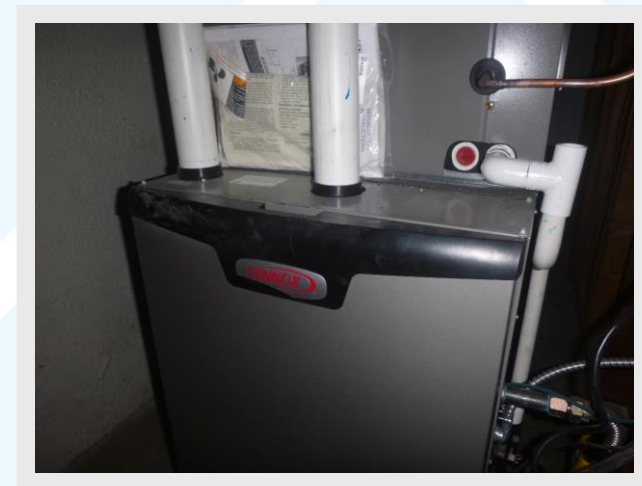
## HEATING / COOLING SYSTEMS

**FURNACES:** According to the US Department of Energy, space heating is the largest energy expense in the average US home, accounting for about 45% of energy bills. When it comes to efficiency, it's important to consider not just the efficiency rating of your furnace, but also proper sizing. Putting in an over-sized furnace will reduce the efficiency, comfort and indoor air quality in your home.

**HEAT PUMPS:** During the heating season, heat pumps move heat from the cool outdoors into your warm house, and during the cooling season, heat pumps move heat from your cool house into the warm outdoors. Because they move heat rather than generate heat, heat pumps can provide equivalent space conditioning at as little as 1/4 of the cost of operating conventional heating or cooling appliances.

**AIR CONDITIONERS:** Air conditioning is becoming a necessity in the Pacific Northwest: 15 of the 16 hottest years on record have occurred since 2001. The US Department of Energy estimates that homeowners can reduce cooling costs by 20-50% by switching to a high-efficiency air conditioner and taking other actions to keep costs down.

HEATING / COOLING RESULTS					
Location:	Basement / Attic	Make:	Lennox / Daikin Slim	Year:	2015 Lennox / 2015 Daikin
Fuel:	Gas Furnace / Electric HP	BTU:	70,000	AFUE:	98
Comments & Recommendations:		Both your gas furnace and Daikin mini-split heat pump are great options to condition your home.			



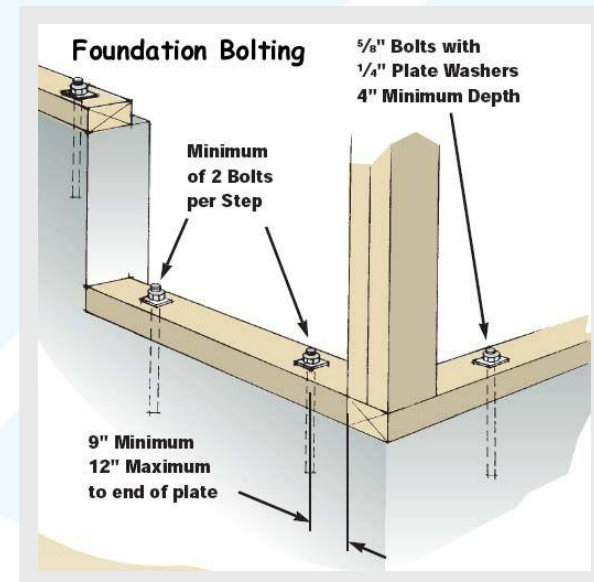
## SEISMIC RISK

**FOUNDATION BOLTING:** Wood-frame houses generally fare well in earthquakes, as they are more flexible than masonry or brick structures. Of Portland's estimated 152,000 single-family homes, 70% were built before the first seismic code in 1978. That means they were not originally bolted to their foundations and could shake off, leaving the structure uninhabitable.

**GAS SHUTOFF VALVES:** In the event of major earthquake, your gas line could snap, spewing gas into your home and increasing the risk of an explosion. That's why GreenSavers installs automatic gas shutoff valves. The valve connects to your gas meter and responds to seismic activity by stopping the flow of gas to your home.

**WATER HEATER STRAPPING:** Fresh water after a disaster may be as close as your water heater – if it is still standing. Water heaters can topple over during an earthquake causing broken water lines and flooding or broken gas lines and gas leaks. GreenSavers will securely anchor your water heater to wall studs or masonry.

SEISMIC RESULTS			
Cripple Wall:	Braced	Seismic Gas Shut-Off Valve:	Yes
Floor Framing Type:	Platform	Number of Stories:	3
Comments & Recommendations:	Your house has been successfully retrofitted to withstand seismic activity. Way to go!		





## THANK YOU

Thank you for choosing GreenSavers. We hope this report gives you a better understanding of the opportunities to stay safe, get comfy, and be efficient at home. We also hope you'll keep us in mind when friends, family or neighbors need help. GreenSavers is a locally-grown company that depends on the support of our customers for continued success.

If you have questions about anything in your report, please don't hesitate to follow up. We look forward to continuing the conversation soon.

Regards,



Damian Lillard  
Home Performance Consultant



## HOME PERFORMANCE DEFINITIONS AND EXPLANATIONS

**AIR SEALING:** Air leakage occurs when outside air enters and conditioned air leaves your house uncontrollably through cracks and openings. Reducing the amount of air that leaks in and out of your home is a cost-effective way to cut heating and cooling costs, improve durability, increase comfort, and create a healthier indoor environment. Caulking and weather-stripping are two simple and effective air-sealing techniques that offer quick returns on investment, often one year or less.<sup>1</sup>

GreenSavers gives special attention to the following areas: plumbing and electrical penetrations in attics and crawlspaces, flue penetrations, exhaust fans, can lights, duct boots, exposed beams as well as tongue and groove paneling.

**COMBUSTION APPLIANCE ZONE (CAZ):** A zone in the house that contains a combustion appliance. The CAZ need not be heated. For example, a garage with a combustion-fired furnace or water heater is a CAZ.

**CUBIC FEET PER MINUTE (CFM):** Measurement of the flow of a gas or liquid that indicates how much volume in cubic feet pass by a stationary point in one minute.

**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.<sup>2</sup>

GreenSavers gives special attention to the following areas: plenum joints, elbow seams, flex to metal connections, wall chase returns, take off collars, furnace to duct connections, torn or ripped flex lines and hard pipe connections.

**BUILDING ENVELOPE:** The envelope is a physical separator between the interior and exterior of a building. Components of the envelope are typically: walls, floors, roofs, fenestrations and doors. Fenestrations are any opening in the structure: windows, skylights, clerestories, etc.

**PASCALS (Pa):** Standard units of air pressure measurement

**R VALUE:** Used to describe insulation, a measure of thermal resistance; the bigger the number, the better the building insulation's effectiveness.

**U-FACTOR:** Used to describe windows, a measure of the rate of heat transfer through a building element over a given area; the smaller the number, the better the performance.

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<sup>1</sup> Source: US Department of Energy, "[Air Sealing Your Home](#)"

<sup>2</sup> Source: US EPA's Home Performance with ENERGY STAR Program, "[Duct Sealing](#)"