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706-248-0821

## Home Energy Audit



Customer: Sample #2	Auditor: Brian Young	BPI# 5015564
Address: Somewhere	Date: 09/15/2010	Type: Single Family
City: Roswell	State: GA	Zip Code: 30076
House Age: 26	# Stories: 2	Foundation: Basement
Garage: 1 & 2 car attached	Square Footage: 7,815	Volume: 67,966

Homeowner Concerns: High electric bills and uncomfortable rooms.

### **About Home Performance with ENERGY STAR®**

Many homeowners pay high energy bills only to suffer from hot or cold spots, drafts, mold, and excessive dust. These problems are common signs of a house that is not properly insulated, has too many small holes and cracks that allow air leaks, have a heating and cooling system that is improperly sealed, or lacks effective moisture control.

Now there's help: Home Performance with ENERGY STAR developed by the Environmental Protection Agency and the U.S. Department of Energy. It is a voluntary program for home improvement contractors who want to use a whole-house, integrated approach for diagnosing and solving a home's problems. Home Performance with ENERGY STAR standards helps to ensure comprehensive, unbiased recommendations.

### **Your home assessment**

Your home was thoroughly checked in the following areas: insulation, air tightness, ductwork, mechanical equipment, windows, health and safety, indoor air quality, moisture management and indoor water use. Each energy-related recommendation is rated with a priority level of A (most urgent), B, C, D or no improvement needed.

### **Building Envelope and Air Tightness**

The building envelope of a house consists of an air barrier and a thermal barrier. The air barrier eliminates cracks that cause uncomfortable drafts as well as allows insects, rodents and moisture to enter the home. The thermal barrier insulates the inside from the outside. To be effective, the two barriers should be continuous and in contact with one another.

Typically, as much as 25% of your heating and cooling dollars escape through unseen cracks in your home. These are usually found in attics, basements, duct systems, floors and around doors and windows. If you combine all of the cracks in a typical house it would be the same as leaving a door or window open all year long. Sealing air leaks also protects your home from mold and mildew by preventing moisture from entering the house through ceilings, walls and floors.

### **Making the Building Envelope Complete**

Fixing gaps in the building envelope might entail sealing plumbing penetrations into the attic or repairing sections of missing insulation.

### **Blower Door Test**

Air loss in your home was measured using a blower door which is an accurate method to measure and identify areas where air is escaping.

**Your Home's Air Leakage**, overall rating is: B – Important to address soon

Your home's air leakage is 0.52 air changes per hour (ACH). This means that every hour approximately 52% of your home's air will exchange with the outside just through the leaks and holes in the building envelope.

Large leaks were found in the furnace chase and the cabinet under the TV near the kitchen and back door, around the attic access door.

Medium leaks were found around the back and front doors, can lights, electrical outlets, light fixtures and plumbing holes under sinks.

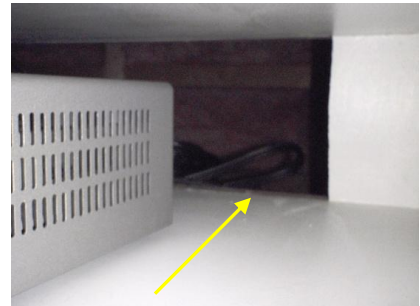
Improvements:

- Leaks around the baseboard in the garage along the interior side of the house will let carbon monoxide into the house from the garage. These leaks need to be taken seriously and caulk needs to be applied at the bottom of the baseboards to seal the cracks.

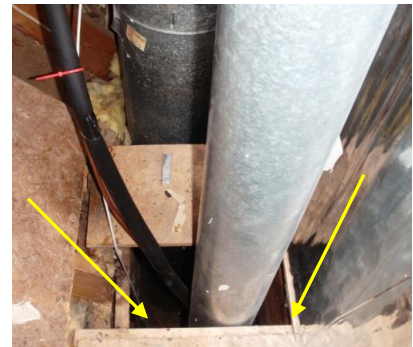


- Apply weather stripping to the attic door to create a seal.
- Install a door sweep to the attic door to stop the air leak underneath it.

- Create an air barrier from foam board or wood for the back of the satellite cabinet and caulk to seal around the electrical cords so that no air passes.



- In the attic exhaust flue chase, use aluminum flashing or other non flammable material to create an air barrier of at least two inches around the exhaust flue and fireplace vent. Use a fire rated caulk to seal close to the flue. Use foam board or plywood to finish sealing the attic floor and caulk the edges and seams.
- Use the same methods to seal the basement exhaust flue chase.

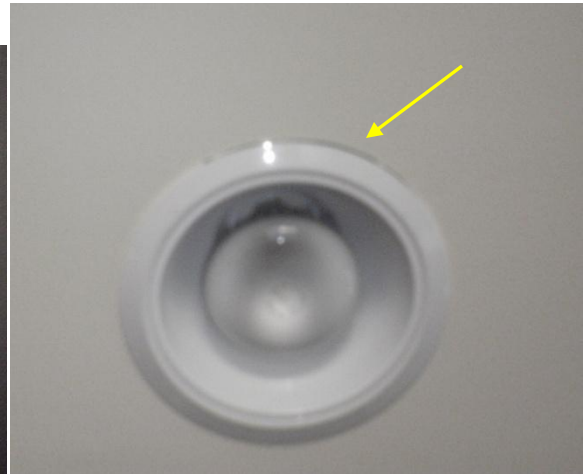
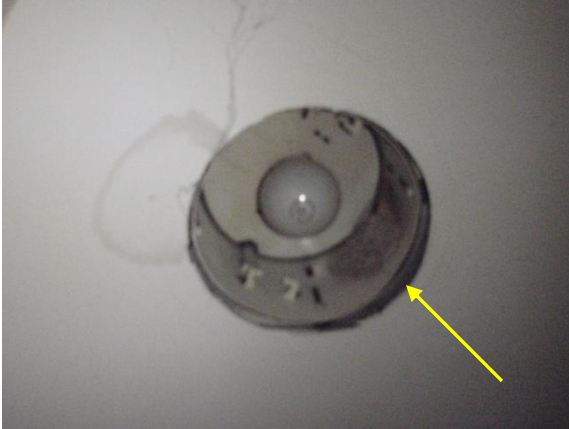


- Adjust the three first floor door jambs so that they close tighter.

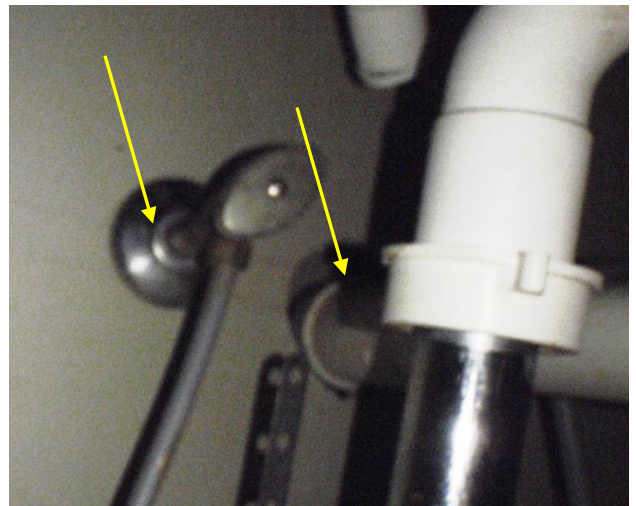
- The dryer vent from the master closet needs a damper door on the outside.



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- Caulk or spray foam around the outlets, light switches and light fixtures inside the house.
- Disassemble all of the can lights in the house and seal any air openings with fire rated caulk. Replace the bulbs with compact fluorescents to reduce the amount of heat at the fixture and the amount of energy used.



- From the attic side caulk or foam any plumbing vents, pipes or holes for electrical wiring that go from the house into the attic space.
- Use spray foam to seal the plumbing holes under the sinks and behind the toilets. Pull the chrome rings away from the wall and spray behind them then put back into position.



## Insulation

Insulation slows down heat flow through the building envelope. Insulation must be installed correctly to function well. Insulation that does not completely cover a surface, is compressed, or is falling out of cavities is not effective at stopping heat flow. Air will move around insulation and through openings in the air barrier so insulation is most effective when installed in conjunction with air sealing. R-value is a measure of the resistance to heat flow; the higher the R-value, the better the insulation.

For attics, the insulation options are usually installing batts or blowing in insulation such as fiberglass or cellulose.

If you have a power roof fan, it is recommended that it be disconnected or removed as studies have shown that the power needed to run the fan can cost more than the benefits. Also, conditioned air from the house can be sucked into the attic.

For basements and crawl spaces, the decision to insulate the floor above or the foundation walls depends on your house. If insulating a floor, a spray foam product is the only option that will continue to perform well in the long term. Batts, which are conventionally used, will unavoidably sag down or fall out over time.

**Your Exterior Walls**, overall rating is: No improvement needed

Your walls have R-13 batts which are sufficient.

**Your Attic Insulation**, overall rating is: C – Improving will provide some energy benefit

Your home has seven inches of blown fiberglass insulation equal to R-21. R-30 is the minimum required today and adding insulation to the attic is always encouraged. There were a few low spots where the insulation had been disturbed and was less than seven inches. Blowing in some cellulose insulation to fill the low spots would be helpful.

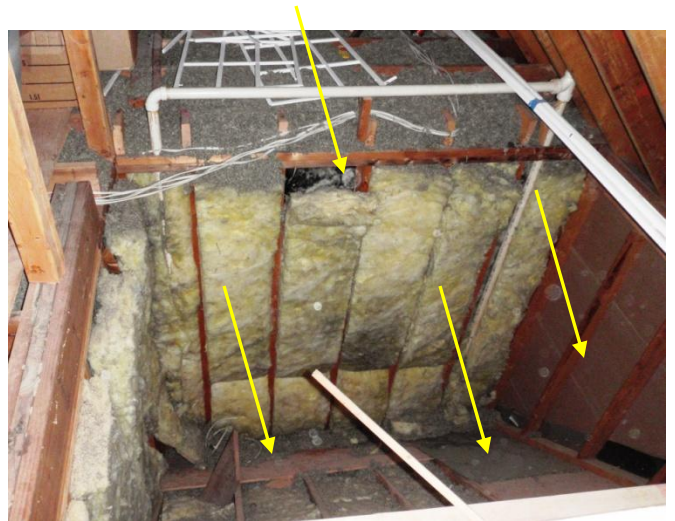
Your attic ventilation consisted of just two 13" diameter whirlybird vents. This is about the minimum required and if the roof was being replaced installing ridge vent in addition to the whirlybirds would be suggested.

Improvements:

Attic main attic door had been insulated well. The smaller access doors in the sewing room need the same foam insulation installed on them.

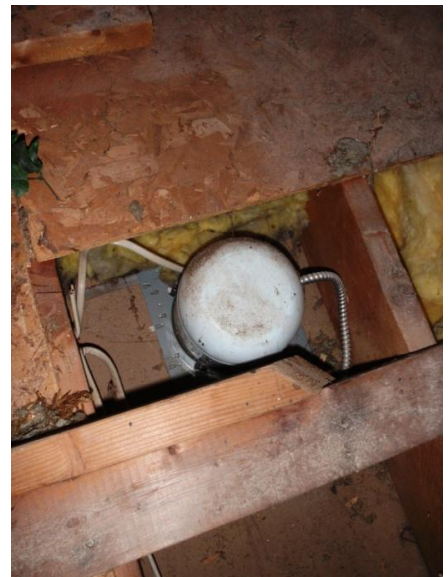
**Your attic kneewall overall rating is: B – Important to address soon**

The valley in the attic is the same as a kneewall. The valley had bats that have pulled away from the walls and they need to be put back in place. Sheathing such as plywood or Tyvek needs to be installed on the attic side over the fiberglass to hold the fiberglass in place and to act as a vapor barrier. All of the seams need to be caulked for leaks. The North wall had no insulation so bats with sheathing need to be installed. Some plywood was installed at the bottom of the sloped wall and could be continued to the top. A second option would be to build a floor over the top of the valley, insulating it then install plywood on top of it to create more attic space.



This is the attic side of one of the many can lights through the house. There were several small holes and a gap that allowed us to see through to the inside of the house. Caulk should be used to seal the holes but air will still leak through the body of the light. An airtight box can be made from thin plywood to cover the light and sealed with caulk to the sheetrock.

The insulation is missing from around the light and needs to be replaced.



**Your Basement**, overall rating is: B – Important to address soon

Your entire basement was considered to be inside your living space. The bare concrete walls have an R value of 0.1 per inch so the 10 inch wall is equal to R-1. To slow down heat conduction through the concrete walls foam board can be glued to the walls.

**Your Sewing Room**, overall rating is B: Important to address soon

Improvements:

- The floor joist under the bonus room is insulated but not sealed on the ends so outside air travels under the floor and transfers heat in and out of the room through the floor. Foam board can be used to seal the ends and it will make the room more comfortable and energy efficient.
- The access doors are uninsulated. Gluing an inch of foam board to the back of the doors will help reduce the heat flow in and out of the room. The main attic door had a piece of foam board attached to the back of it and is a good example of what needs to be done.

### **Heating and Cooling Systems**

Your heating and cooling systems use about half of your home's energy cost, so its efficiency is important.

**Your Cooling System**, overall rating is: No improvement needed

You have three 3 ton units, one 10 SEER unit and two 13 SEER units. New units must be at least 13 SEER and go up to 22 SEER in efficiency rating. Keeping vegetation and debris away from and out of your outside condensing units is important.

**Your Heating System**, overall rating is: A- Essential items to address immediately

You have two furnaces, and one heat pump. The heat pump and the Payne furnace in the attic spaces are efficient enough for today's standards. The Lennox forced air furnace in the basement is 68% efficient and will back draft when the hibachi grill vent is running. Upgrading to a new sealed combustion unit at 93-95% efficiency cannot backdraft will eliminate the chance of CO poisoning and the improved efficiency will help pay for the upgrade within a few years.

Several gas leaks were detected in the combustion closet and replacing the gas lines is essential.

## **Water Heaters**

Water heaters can use as much as one third of a household's energy so improving efficiency can provide great savings. All tank water heaters are rated with an energy factor (EF), which indicates its efficiency. A new water heater's EF should be at least 0.63 for gas and 0.93 for electric.

### **Your Water Heaters**

You have two 9 year old, 40 gallon, gas units that are 59% efficient.

Improvements:

- The CO level with both water heaters exceeds the limits and a qualified technician needs to inspect the units. They are not burning the gas efficiently and probably need adjusting.
- Installing an R-6 or greater water heater blanket can save you 4-9% on your water heating cost.
- Installing foam insulation on your hot water lines will keep the water in the line hotter longer and will keep you from having to purge the line as often to get hot water to the point of use. Insulate any hot water line that you can see and the first few feet of the cold line coming into the tank.
- Because of the back drafting with the Hibachi vent running, replacing the two water heaters with new powered direct venting units that cannot backdraft in combination with the furnace upgrade needs to be given serious consideration. Power vented water heaters will be 96% efficient and pay for themselves in a few years.

## **Duct System**

All air that is heated or cooled circulates through the duct system and can be lost through any holes or unsealed seams. Ducts should be as tight as possible to ensure that conditioned air is delivered to rooms and not lost to attics, basements and crawl spaces. Supply duct leaks can lead to high energy bills and uncomfortable living space. Return leaks can pull mold, allergens and other particulates into your home. Duct leakage is the single largest waste of energy in most homes.

### **Duct Efficiency Test**

Your home was tested with a duct blaster or flow hood. The duct blaster pressurizes the ducts to get a measure of total leakage in the duct system.

### **Sealing Ductwork**

Leaky ductwork can be sealed if it is in good mechanical condition. Otherwise it may need to be replaced and the new ductwork sealed. Ducts located in attics and crawlspaces should be insulated as well as sealed. R-8 is required as a minimum in the attic and R-6 is required as a minimum elsewhere. Mastic, a thick paste that hardens is the best way to seal duct seams. It can be used on all types of ducts and provides a permanent seal. Tape will fail over time and is not recommended for sealing. Caulk is usually used to seal duct boots to the floor, wall or ceiling.

**Your Ductwork**, overall rating is: A - Essential item to be addressed immediately

We did not test the downstairs system because it is all inside the living space so if there are any leaks they are inside the house and not lost to the outside.

Your heat pump ductwork in the addition leaked at a rate of 3.7 % and is an example of a very good system. Mastic could be applied to the seams where the flex duct meets the boot and the seams inside the boots. Caulk should be applied to the seam where the boot meets the sheetrock.

Your upstairs ductwork was tested with a duct blaster and approximately 100% of the air is leaking out. This is extremely high and should be addressed immediately. We were not able to reach our desired test pressure and in fact could only reach a small fraction of the desired pressure so the math is not exact but it shows us that there is a major problem and the majority of the air is leaking out into the attic. A complete removal of the insulation on all of the ductwork and applying mastic to every seam is recommended.

Improvements:

- In the attic, remove the insulation from around the air handler to expose all of the seams. Run the fan and feel where all of the leaks are. Turn the fan off, clean the seams, apply a layer of reinforcing tape then generously apply mastic to all of the seams. Allow time to dry and run the fan again to make sure that all of the leaks have been sealed. Reinstall the insulation and replace any insulation that can't be reused.
- Inside the house, remove the grills from the supply and returns, mastic the duct boot seams and caulk the duct boots to the ceiling.

## **Windows**

Effective windows increase comfort and save energy. However, replacing windows is not the most cost effective improvement compared to air sealing, duct sealing or adding insulation. In new windows, look for the Energy Star label to identify the most efficient windows, skylights and glass doors. The insulating ability of a window is measured by a U-factor. Solar Heat Gain Coefficient (SHGC) measures the ability to block out radioactive heat. Windows with a low-e coating have better SHGC values. Lower values for both U-factor and SHGC mean a better window.

Other options for improving windows include adding storm windows or solar shade screens, which block unwanted solar heat from entering the house.

**Your Windows**, overall rating is: D – Least important to address

You have wooden double pane windows everywhere. Upgrading you windows is unnecessary and will provide very little return for your investment. Most windows leak to some extent and no noticeable leaks were detected.

## Indoor Water Use

Improving water efficiency in your home can save money and protect a valuable natural resource. Replacing an old toilet that uses 3 or 5 gallons per flush with a new model that uses 1.6 gallons or less per flush will save a great deal of water. New low flow showerheads will use 2.5 gallons per minute while providing the same pressure as older showerheads; this will conserve hot water.

All of your faucets and toilets were in the low flow range and no action is needed.

## Lighting and Appliances

Replace incandescent bulbs with compact fluorescents (CFL's). CFL bulbs use one quarter of the electricity of incandescent bulbs and provide the same amount of light. They also last longer which means fewer replacements. When you buy new home appliances, ask for models with the Energy Star label. These will use up to 50% less energy than conventional ones.

Improvements:

- You have several incandescent bulbs that can be changed to CFL's.

## Health and Safety: Carbon Monoxide (CO)

CO is an odorless, tasteless byproduct of combustion. It is found in combustion fumes produced by cars, fireplaces, gas stoves, gas water heaters and gas furnaces. Breathing low levels of CO for a period of time may cause flu-like symptoms. Higher levels can cause illness or death. The greatest danger is in the winter when the windows are closed and gas heating appliances are being used.

Sealed-combustion furnaces, direct-vent and power-vented water heaters send combustion gases directly outside with no chance of mixing with the indoor air. With other systems, a pressure difference between outside and inside could cause back drafting, causing CO and other fumes to stay in the house and not exit through the flue. Unvented gas space heaters pose the most danger. All of their combustion fumes stay in the living space. These should be disconnected and removed.

Recommendations:

- **There are some leaks between the garage and the house and CO from the vehicles can enter the house. Caulk along the baseboards of the garage, door frame and the old attic hatch.**
- **Install a CO monitor in the basement just outside the combustion closet is essential.**
- **The CO level at your hot water heaters is high and repairing and or replacement is recommended.**
- **Complete back drafting of the furnace and water heaters is happening when the hibachi grill vent is running and for safety, I would recommend not running the hibachi vent until the changes have been made. One option is to seal off the combustion closet and bringing in outside air for the units. Based on the 110,000 BTU of the furnace and the 40,000 BTU of each water heater, 95 square inches of duct are needed from the outside. The second option is to replace all three units with more efficient sealed-combustion, induced draft, or power-vented furnaces that can't backdraft.**

- **The back drafting of moist combusted air is probably a contributing factor to the need to run the dehumidifier so frequently. Replacing the three units will probably reduce the amount of time that the dehumidifier runs.**

### **Health and Safety: Moisture and Mold**

In the Southeast, mold can easily find conditions to thrive, and if it grows in and under homes it can create a health hazard. Mold needs moisture to grow, so keeping water away from the house reduces mold problems. Water enters the house as a liquid such as rain water seeping into the foundation and vapor from outdoor humidity, cooking or showering.

The ground around a house should be designed to drain surface water away from the foundation. When downspouts are extended far away from the home or when underground drain systems are designed well, water draining off the roof or through landscape is kept away from the foundation.

In a well-insulated, well-sealed house, indoor surfaces will stay warm enough in the winter to avoid condensation, a source of liquid moisture. When air conditioning is correctly sized, the equipment, which dehumidifies as well as cools, will run long enough to extract moisture from the air. Exhaust fans in the bathrooms and kitchen will remove moisture at their source.

In a basement with high-humidity problems, drainage issues in the yard are the most important items to fix.

Improvements:

- Two of your upstairs bathrooms have venting into the attic instead of outside the house. This still is a commonly seen but today's building codes require it to be vented to the outside.
- The two downstairs vents could not be located and probably do not vent to the outside.
- The master shower fan sounds like it is not turning and needs to be repaired.
- Fumes in the two car garage from flammable chemicals were detected in addition to being a flammable concern the fumes and VOC's will enter the house through the leaks in the baseboard. An unattached storage shed located twenty or more feet from the house is recommended for storing flammables and power tools.

Drainage from the gutters was done well and directs the water far away from your house. No improvements are recommended.

### **Health and Safety: Radon**

Radon is a radioactive gas that can occur in some soils. Radon is odorless, colorless, and tasteless and can cause lung cancer if it builds up in your home. Testing is the only way to know if a house has a radon problem.

### **Choosing your home improvements**

Use this Home Assessment report to help decide what work to have done, while taking into consideration your own needs and budget. In the long run, a comprehensive plan for energy and indoor

air quality improvements, including insulation, air sealing and efficient heating and cooling is usually the best approach to making your home energy efficient, comfortable, healthy and durable.

### **Getting the improvement work done**

The contractor who performed your Home Assessment may be able to provide some or all of the improvement work. The assessment contractor can provide a list of improvement contractors who are qualified to undertake the work.

### **Final Tests**

After the work has been completed, contractors with Home Performance with Energy Star are required to “test out”, repeating the tests performed during the comprehensive Home Assessment. Make sure to have these final tests completed and be present for them. They ensure that the work was performed properly and that the home meets the program’s health, safety and technical requirements. The results are included in the Certificate of Completion and submitted for documentation. While the assessment contractor is responsible for the accuracy and completeness of the final test, he may choose to have the improvement contractor conduct the tests.

### **Accepting the Job – the Certificate of Completion**

When the work in the work scope agreement and the final test are done, the contractor will prepare a Certificate of Completion for your review and signature. The Certificate of Completion is your signed statement to the contractor and to the program that the work for this project has been completed. Do not sign the Certificate of Completion until the work is completed. Participating contractors will provide the customer a written warranty on labor and materials for a minimum of one year. Equipment installed will carry the manufacturer's warranty and any optional extended-warranty coverage that the customer selects.

### **Third-party verification**

Southface Energy Institute provides contractor training and inspects a sample of assessments and jobs for quality and program compliance. The contractors who participate in the program warrant their own work. Southface does not warrant the products and/ or services of any participating contractors.

### **Further Questions**

Further technical information and program standards are available at [www.southface.org](http://www.southface.org). Southface welcomes comments on the program. Please direct comments and questions to [homeperformance@southface.org](mailto:homeperformance@southface.org).