



170 Security Circle  
Suite 104  
Athens, GA 30605  
706-248-0821  
www.athenshps.com

## Home Energy Audit



Customer: Sample #3

Auditor: Brian Young

BPI# 5015564

Address: Five Points

Date: 10/27/2010

Type: Single Family

City: Athens

State: GA

Zip Code: 30606

House Age: 74

# Stories: 2

Foundation: Crawlspace

Garage: detached

Square Footage: 2851

Volume: 21,073

Homeowner Concerns: High electric bills, uncomfortable rooms, excessive dust and high humidity.

### **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: A – Essential to address immediately

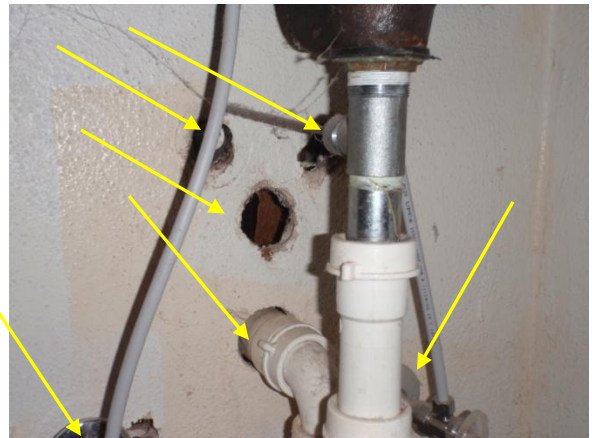
Your home's air leakage is 1.63 air changes per hour (ACH). This means that every hour approximately 163% of your house's air will exchange with the outside just through the leaks and holes in the building envelope.

Large leaks were found in the attic access hole, under the doors to the attic, the exterior doors, can lights and plumbing holes.

Medium leaks were found around the stove down draft, electrical outlets, light fixtures, plumbing vents, a/c ducting, pantry floor and other protrusions into the attic space and crawlspace.

## Improvements:

- Apply weather stripping to the attic door to create a seal.
- The four doors in the upstairs need sealing along the bottoms. Installing door sweeps or thresholds will solve this problem. Weather stripping if needed to the three other edges of the door will also help.
- A lot of leaks were found in closets where the lap siding needed to be sealed with caulk. Inside the closets, near the doors were a lot of big gaps that need to be filled with spray foam.
- Adjust all of the exterior door sweeps so that they seal better.
- Remove the covers or fixtures and caulk or spray foam around the outlets, light switches and light fixtures inside the house.
- Install foam outlet seals on all of the electrical outlets and switches.
- From the attic side and crawlspace side, caulk or foam any plumbing vents, pipes or holes for plumbing or electrical wiring that go from the house into these spaces.
- There were several holes under the sinks, pull back the chrome trip pieces and spray foam into wholes. Seal any plumbing penetrations like these with spray foam.
- Run the downdraft stove vent to the outside of the crawlspace with a flex duct and install a dryer vent damper door to help seal the opening.
- The fireplace showed only minor leakage in the damper and was in good condition.
- The pool room had leaks along the brick wall. Caulk vertically along the brick walls and the pool room walls.
- The old floor in the pantry was leaking. Caulk all the seams and cracks from underneath. Consider painting the floor with urathane and letting it seep into the cracks.
- You have many can lights and all of them were leaking. One option is to build an enclosing box around each can light on the attic side and air seal it to the sheetrock. Another option is to replace the existing lights with IC rated can lights that can be air sealed, less than \$10 each. This is a picture of the attic side of the can light and you can see that the insulation was never replaced.
- Georgia Power has a rebate of \$250 to cover half of the cost to air seal when it is a priority A or B.



## 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 Attic Insulation**, overall rating is: B – Important to address soon

Your main attic has about 3 inches of blown fiberglass and 8 inches of blown cotton for an equivalent R value of R-32. This is more than the recommended R-30 so adding insulation to this part of the house would not benefit you that much.

All of your attic access doors had insulation attached to the attic side which is very good.

Your attic ventilation consisted of gable and ridge vents. This would be adequate for a normal attic but you have no soffit vents to allow air to enter the bottom of your attic space. The only way air can enter the lower part of the attic is through small cracks so your attic is not getting enough ventilation. You need to install soffit vents along the soffit between every third or fourth rafter. Also install baffles on the inside of each of the soffit vents so that insulation does not cover the vent.

Improvements:

- Installing soffit vents and baffles
- Over the pool room you have R-11 batts that are in poor condition. Blowing in at least 8 inches of cellulose will get you over the R-30 recommended and improve the comfort of the room.. Be sure to air seal any wholes or penetrations before installing insulation.
- Georgia Power has a \$200 rebate to cover half of the cost



of insulating the attic to R-30 when it is a priority A or B.

**Your Attic Knee Walls**, overall rating is: B- Important to address soon

Improvements:

- You have 3 inches of fiberglass in a 4 inch wall cavity with some thin plywood sheathing. One option is to remove the insulation, air seal and replace with fiberglass batts that completely fill the cavity. Then cover that with a ½" to 1" thick foam board and air seal all of those edges. Another option would be to remove the insulation and have a professional company spray foam the walls.



**Your Under Floor Insulation**, overall rating is: C- Will provide some energy benefits

You have R-13 batts installed with the sheathing towards the house.

Improvements:

- While R-13 batts are better than nothing, the sheathing (paper side) needs to be on the exterior, bottom side. One option is to install fiberglass batts and a vapor barrier. This will improve conditions but after a while the fiberglass will pull away from the floor due to gravity and make this improvement ineffective. This was seen in several places under the house. A second option would be to have a professional company install spray foam to the underfloor. This would both insulate and air seal and be a permanent solution.
- The floor under the pool room is about 12 inches of concrete with an equivalent R value of R-1. Gluing 1 inch of foam board to the underside will greatly improve the comfort of the room.
- Georgia Power has a \$450 rebate to cover half of the cost of insulating the floor to R-19 or foundation wall insulation.

**Your Foundation Wall Insulation**, overall rating is: B- Important to address

Your basement is dry but has signs of water problems in the past.

Improvements:

- Your basement is a good candidate for a vapor barrier on the floor and insulation on the walls such as R-5 foam board. All of the edges need to be sealed and vents covered and sealed so that you have an airtight crawlspace. This could be done instead of the under floor insulation mentioned above.

- Georgia Power has a \$450 rebate to cover half of the cost of insulating the floor to R-19 or foundation wall insulation. This is the same rebate mentioned above.

**Your Exterior Walls**, overall rating is: C – Will provide some energy benefit.

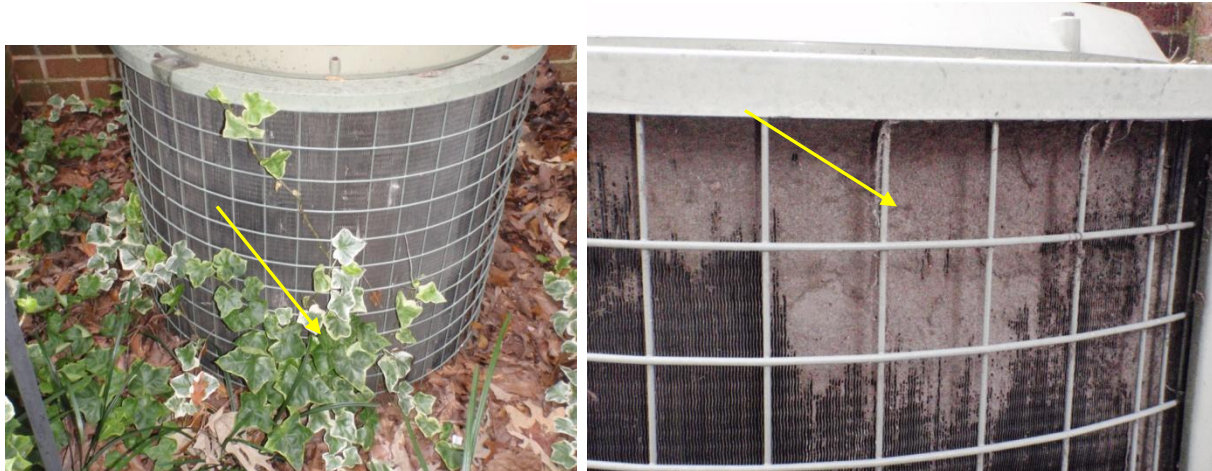
Your walls have no insulation and R-13 is the current requirement. Installing insulation in the walls is difficult and would not return very well on your investment as compared to the other options mentioned in this report.

### Heating and Cooling Systems

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

**Your Heating and Cooling System:** B- Important to address soon

You have a 1 ½ ton 8 SEER, 2 ton 10 SEER and a 2 ton 8 SEER unit that are 15 to 25 years old. New units must be at least 13 SEER and go up to 22 SEER in efficiency rating. Your units are not that efficient in comparison to new units and replacing them in the near future should be something to keep in mind. It's important to keep vegetation and debris away from and out of your outside condensing units and all of yours could use some attention.



- Installing an Energy Star approved digital thermostat and programming it to reduce your cooling when you're away would be a good investment. Georgia Power has a \$100 rebate to cover half of the cost to install a programmable thermostat

### 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 Heater:** D- Least important to address

You have a 7 year old, 50 gallon, electric unit with 0.91 efficiency and a 30 gallon with 0.88 efficiency.

## Improvements:

- Installing an R-6 or greater water heater blanket can save you 4-9% on your water heating cost. Georgia Power has a \$30 rebate to cover half of the cost of the blanket and installation.
- 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.

## 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 to address immediately

Your ductwork was tested with a duct blaster and showed to have serious leaks in all of your systems.

Zone 1 = 36.5% leakage in the main downstairs area

Zone 2 = 27.6% leakage in the kitchen, dining room and part of the living room

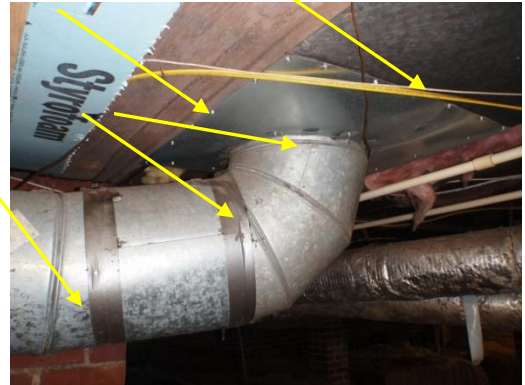
Zone 3 = 45.0% leakage in the upstairs unit now that the duct was reattached

Zone 3 originally tested at 89% leakage which is very high. We found one duct that had fallen off and once reinstalled the system tested at 45% which is still high. There were numerous leaks found in all of the systems and a lot of repairs need to be done.



## Improvements:

- Remove the insulation and duct tape 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 floor.
- In the crawl space all of the returns to the air handlers need to be sealed with mastic along all seams.



## 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. They were installed three years ago and in good condition.

## 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 have low flow aerators. The shower heads were low flow. The toilets could be replaced to newer models that use less water.

## 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.

You have replaced some of the incandescent bulbs with fluorescents, keep up the good work and continue replacing them.

### **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.

Because your furnaces are outside of the living space we could not do a full combustion safety test. We did check the CO levels at each unit and draft in the vents and all three units are in good condition and safe.

Improvements:

- You may want to install a CO monitor near the upstairs furnace and one in the crawlspace near the two furnaces to add an extra level of protection in case one of them malfunctions.

### **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:

- The upstairs bathroom vent fans go into the attic but does not vent to the outside of the house as it should. This was common practice in the past but today's building codes require it to be vented to the outside.
- Your gutters need to be cleaned and the downspout on the left front of the front door needs a 10 foot or longer drain tile to direct the water away from your house.
- The holes near the foundation in the rear of the house need to be filled so that the runoff water doesn't find its way into the crawlspace.
- A roof over the rear entrance would give you shelter from the rain and help direct water away from the house.
- Vines and ivy should be removed from the sides of a house. The vine will degrade the cement in the brick and mortar. It will also work its way under the wood planks and separate them which will then allow water into the house where it was never intended. Vines also provide a pathway for ants to get into the house.



## 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.

### **Financing Your Home's Improvements**

Home Performance with ENERGY STAR has made it possible for participating contractors to provide you with reduced interest rate financing. Improvement work performed by ENERGY STAR contractors qualifies for program financing. To learn more about financing options, ask your contractor for details, or visit [www.southface.org](http://www.southface.org).

### **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).