



Clark Howard Does His Homework

By: Sydney G. Roberts, Ph.D.

Planning home improvements can be a daunting task, even for the savviest homeowner. There is so much information, and misinformation, available in the marketplace that it can be difficult to determine the right solutions.

We all want to get the most bang for the buck and consumer advocate Clark Howard is certainly no exception. Those who know Clark Howard from radio, television, or the newspaper know that he is always searching for the best value. So when Clark wanted advice on the most cost effective improvements for lowering his energy bills last winter, he called Southface to first identify the problems.

Clark, wife Lane, and their children live in a comfortable and well-maintained 18-year-old home in Atlanta. They have invested in home improvements and maintenance to increase the comfort, health and energy efficiency of their home during their eight years in the house. Specifically, Clark and Lane have installed high efficiency air conditioners and high efficiency air filters for their heating and cooling systems, which are regularly serviced. Despite these efforts, their energy bills were quite high, and some family members experience asthma and allergy symptoms in the home.

Southface developed and administers a program called Home Performance with ENERGY STAR®. Under the program, Southface trains contractors to use the whole-house approach to inspect homes, diagnose problems, and offer solutions. The homeowner receives a list of recommended improvements prioritized by cost effectiveness that the contractor can perform, with Southface monitoring for quality control on a percentage of projects. Additional information is available at southfacehomeperformance.com.

Southface residential staff Sydney Roberts and Howard Katzman performed a Southface Home Assess-



Figure 1a. BEFORE: Missing insulation on the sloped ceiling. Note that some of it is discolored, indicating an air leakage pathway.

ment following the Home Performance with ENERGY STAR criteria. The home was visually inspected from the basement to the attic, inside and out, and diagnostic tests were performed to quantify both building envelope and duct leakage. The results of Clark Howard's initial inspection are summarized in the second and third columns of Table 1. After the inspection, the Howards received prioritized suggestions for improvement, with "A" being the highest priority.

Studies show that ductwork leaks are the biggest source of energy loss in most Southern homes, accounting for up to 30 percent of total heating and cooling costs. For the average home, this amounts to hundreds of dollars each year. Additionally, comfort and indoor air quality are significantly compromised by leaky ducts.

A duct blaster test was performed to measure duct leakage of two HVAC systems. In this test, the ducts are pressurized with a calibrated fan and air leakage out of

the ducts is measured. The systems showed leakage of 29 percent and 27 percent. Unfortunately, this large amount of leakage is not unusual. A significant portion of conditioned air was being lost to the attic, and unconditioned and unfiltered air was being drawn into the system through leaks in the return side of the ductwork. In this case, the leaks were hidden behind the insulation that was wrapping the ducts (Figure 1a). Clark and Lane were surprised to learn that their home and duct systems had significant air leakage.

As a solution, the Howards chose to have the metal ductwork sealed and insulated (Figure 1b). In doing this, the improvement contractor found and replaced a duct that had been crushed by previous workers in the attic. The boot connections through the drywall were sealed with caulk. By taking these steps, duct leakage was reduced to 13%. That is a 55% improvement!

Ductwork can be sealed from either the outside or the inside. The

choice of approach depends on the home. If the ductwork is all accessible like in Clark Howard's home, for instance in an attic or unfinished basement, it is often possible to seal the ducts from the outside. Whether the ducts are constructed of hard metal or flexible runs, the insulation layer should be peeled back and all joints and seams should be sealed at the pressure boundary. The most durable sealant is duct mastic. Ducts must be reinsulated once sealing is complete. A duct system fact sheet is available at www.southface.org.

The other option is to air seal ductwork from the inside with a system such as AeroSeal®. This procedure involves computer controlled pumping of an aerosol sealant into the duct system to seal holes up to 1/2 inch in size. Sealing from the inside may be the best option if ducts are inaccessible or if metal ducts are already insulated. Additional information on AeroSeal is available at www.aeroseal.com.

Like the ductwork, the entire house was tested for air tightness with a blower door. Prior to making improvements, the house was experiencing 0.51 air changes per hour under normal conditions (ACHnat). To provide context, EarthCraft House standards require homes to have 0.35 ACHnat or less; smaller is tighter. These leaks were coming from many different spots in the home including through attic access doors, unsealed recessed lights, plumbing and electrical penetrations, chimneys, and around windows and doors. These leaks are directly related to energy, and money loss. The Howards took a multi-pronged strategy for sealing the leaks. Chases were covered with foam board and the edges sealed with spray foam (Figure 1b). Plumbing, electrical and other penetrations were sealed with spray foam (Figure 2). Insulated, airtight boxes were built over leaky recessed can

Table 1. Quantitative Home Performance with ENERGY STAR improvements.

Improvement Type	Priority Level	Pre-improvement	Post-Improvement	Improvement Achieved
Ductwork air tightness	A	29% leakage	13% leakage	55%
House air tightness	B	0.51 ACHnat	0.35 ACHnat	31%
Kneewall insulation	B	Loose batts	Spray foam insulation	Permanent, complete coverage
Attic insulation	C	R-24	R-40	Plenty, for Atlanta climate



Turn to the Experts.™

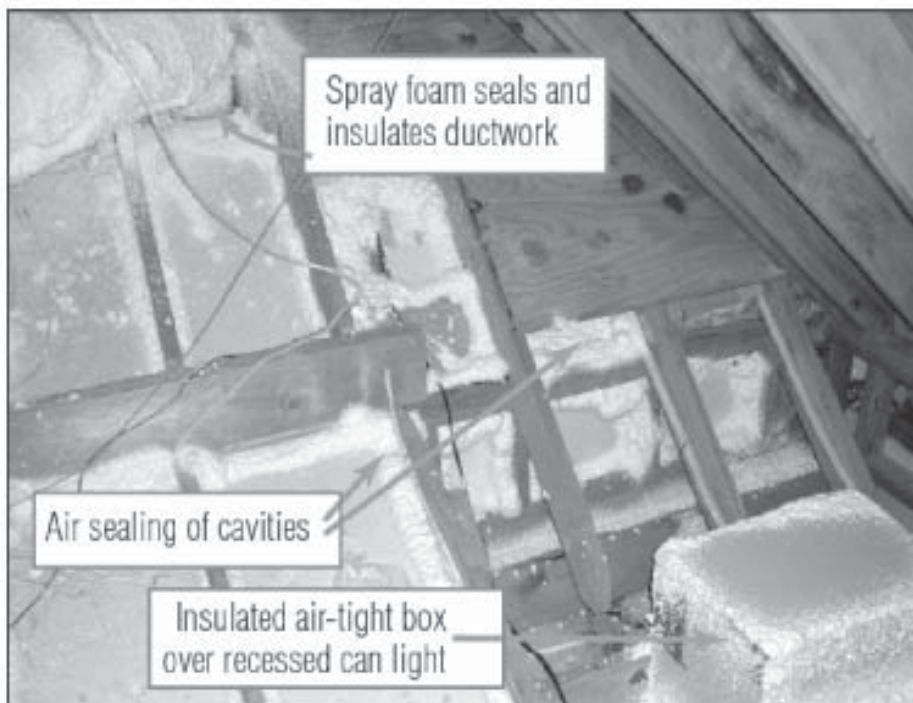


Figure 1b. AFTER: Cavities are air sealed; air-tight boxes built over recessed can lights; spray foam insulation is used to seal and insulate metal ductwork. Cellulose insulation was added later.

lights. The attic kneewall door was weather-stripped and a threshold was installed. On the attic side of the pull-down stair, an Attic Tent™ was installed. Additional weather stripping was installed on some exterior doors. All of these improvements added up to a 31% improvement in air tightness, bringing the value to 0.35 ACHnat.

Attic kneewall insulation and air sealing and attic floor insulation were also high priorities for improvement. For the attic kneewall, the vertical wall separating attic space from living space, the solution was to replace the batt insulation on the kneewall with spray foam and to block off joist cavities under kneewalls with foam board using spray foam to seal the joints. Spray foam is ideal for vertical applications because it provides air sealing and insulation in one application.

Blown cellulose insulation was added to the attic floor, increasing the effective R-value from 24 to 40. While a lower priority than the other improvements in this case, adding attic insulation is relatively simple and affordable. For all homes, the effective R-value of attic insulation should be at least R-30. It is critical to ensure that all penetrations through the attic floor are air sealed prior to adding insulation.

Exhausts for two bathroom fans were emptying into the attic instead of being ducted to the outside. This situation had caused visible moisture damage and mold growth on the underside of the roof deck. Bath fans, as well as kitchen fans and laundry dryer vents, should be ducted to the outside. Controlling moisture at the source reduces the work that the air conditioner must do to decrease humidity.

Outside the house some downspouts terminate only a foot from the building. This tends to soak the foundation walls, increasing the likelihood of high humidity or water penetration into the basement. Downspouts should be connected to piping that carries the water to a

spot that is downhill and at least 5 feet from the house.

Clark has been diligent in replacing incandescent light bulbs with more efficient compact fluorescent lights (CFLs). Not only do CFLs use only 25 percent of the energy of incandescent bulbs, they last 10 times longer. For an average bulb, this will save \$50 over the life of the CFL.

An important part of taking the whole-house approach to improvement work is to maintain the health and safety of the occupants. At the final inspection, Southface performed a combustion safety test to ensure that gas water heaters would not back draft under worst-case conditions. The Howard's home passed the test. In homes that do not pass, carbon monoxide, moisture and other combustion gases can be drawn into the home with potentially catastrophic consequences.

In all homes with combustion equipment (e.g., gas appliances and fireplaces), carbon monoxide detectors should be installed outside of each sleeping area and in each room with a fireplace or other combustion equipment.

Clark Howard and his family have experienced incredible comfort benefits as a result of these im-



Figure 2: Plumbing, electrical, and other penetrations through the attic floor were sealed with spray foam prior to adding blown cellulose insulation. Old insulation was removed to reveal these holes.



Home Performance with ENERGY STAR – A business opportunity for HVAC contractors.

Why should HVAC contractors be interested in the home performance approach? Here are some of the many reasons:

- Market differentiation. Taking a whole house approach allows you to offer more comprehensive solutions. HVAC solutions alone don't always solve customers' problems. For example, bonus rooms often have building envelope issues that need to be addressed. One contractor stated that he joined the program because he couldn't solve all his customers' problems with HVAC alone.

- Reduce competition. When homeowners see you as just any other HVAC contractor you have hundreds of competitors. If you transform your company to become a home performance contractor, you'll have only a handful of companies competing for the business.

- Increase sales and profits. When you offer to fix other areas and issues in the home your sales per job increase. Most home performance contractors report that profits increase as well. Homeowners want the one-stop shop; they are too busy to deal with multiple contractors. When you offer solutions that make sense they'll want you to handle all of it.

- Even out workflow. Most HVAC contractors in Atlanta report significant drop offs in calls and work orders for one or two periods per year. When you sell comprehensive home assessments and solutions you create work during the "slow" seasons.

- Increase credibility. When you join the Home Performance with ENERGY STAR program you are joining a program recognized by the public. The ENERGY STAR logo enjoys 60% recognition. Southface, a local energy non-profit with 28 years of experience helping homeowners and builders in greater Atlanta, provides training, technical assistance and quality assurance. As the ENERGY STAR sponsor, Southface checks a percentage of the contractors' paperwork and projects to ensure program quality and consistency.

The next training for contractors who want to join the program is November 8th, 15th, and 16th. For more information, go to www.southfacehomeperformance.com/contractors/training.html. ■

provements. Lane reports, "I love it. The house is so much more comfortable. I mean, a real change." Now, all rooms in the house are the same, comfortable temperature; there are no longer certain rooms that are hotter or colder than the rest of the house. The drafty feeling is gone. Additionally, it is very easy to maintain a constant temperature throughout the house all day and night. The family no longer adjusts the thermostat, relying instead on the programmable thermostat to keep the house comfort-

able while still setting the temperature back at night for greater energy efficiency.

A surprise benefit has been the reduced noise of the heating and cooling system. In the past, it was not uncommon for the noise to wake up their young daughter in the middle of the night. She, in turn, would wake up her parents. Since the improvements were made, everyone is sleeping through the night.

Further, respiratory system symptoms have lessened for affected family members. Lane no longer awakened on mornings this past winter to a scratchy throat. Clark suffers from asthma but reports that his symptoms have lessened.

Following the Home Performance with ENERGY STAR protocol provided a quantitatively-based road map for making whole-house improvements for Clark Howard and his family. The Howard's were empowered to make smart decisions regarding their home improvements that have resulted in increased comfort in the home. Lane Howard paid the process and the improvements the highest compliment, saying, "I love it. I would do it again." ■