

Misery in Paradise

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I occasionally come across a job that epitomizes the level of confusion in the market place about which energy conservation strategies actually reduce energy bills and which ones don't. The following case study highlights what can go wrong when a high bill complaint is turned over to the uninformed contractor, in this case an insulation contractor, who applied solutions that are not based on basic building science principles.

Several years ago I received a call from an affluent individual in Paradise Valley who had just invested over \$7000 in energy upgrades to lower his utility bills. The result of the insulation work and new attic fans had increased the customer's energy bill. I was called in to consult as to why the contractor's strategy had backfired. The solutions the contractor applied represent a special blend of ignorance and self interest and that is not that uncommon in the market place.

The insulation contractor had made four basic mistakes. First off he did not use diagnostic tools to understand the problems in the house. The second mistake was to convince the customer to replace the blown cellulose with blown fiberglass. The third was not to deal with the leakiness of the pressure envelope and pressure imbalances in the house. The fourth mistake was to put on large attic fans to suck air out of the attic. The result of these four mistakes was to deliver a solution that completely backfired. The homeowner's energy bills actually increased after the work was performed.

The first mistake was to not correctly diagnose why the utility bills were so high. Tests performed with a blower door, digital manometer and infrared camera would have told most of the story. The contractor was applied solutions without any understanding of the underlying problems. He also obviously didn't know the basics of heat flow and air flow. This lack of knowledge about his field is highlighted in his second recommendation.

The second mistake the contractor made was to rely on his own expertise or his insulation representatives. The contractor actually convinced the homeowner to vacuum out the cellulose insulation in the attic and replace it with blown fiberglass. Why? There is absolutely no benefit to doing this. Quality of installation is more important than insulation type. Although I have preferences, replacing one type of blown insulation with another is a waste of money.

If this insulation contractor was a professional he would have broken out his infrared camera and performed a scan. I'm in the business of preventing heat flow, so I believe using an infrared camera is an essential piece of equipment for an insulation contractor, just like a duct blaster would be for an HVAC contractor. The infrared scan would have shown the cellulose was working fine and was not the problem.

At Advanced Insulation we vacuum out insulation on gut remodels when it makes sense. By the time the insulation was vacuumed out of the attic and taken to the dump the homeowner probably spent \$4000. He probably spent an additional \$1800 to replace the perfectly good insulation he had just vacuumed out – what a waste of money!

The third mistake was not to deal with problems in the pressure envelope, i.e. leaks in the duct work and a hundred plus recessed cans. If the customer's intentions were to reduce his utility bill, dealing with the flaws in the pressure envelope are critical. On this job no consideration was given to the simple rule of holes and pressures.

A combination of tests performed with a blower door test and digital manometer would have quickly revealed that the house was leaky and where the leaks were located. To deal with one hundred plus recessed cans Advanced Insulation would have constructed and installed insulated and airtight boxes that go over the recessed cans that we seal to the sheetrock.

The last mistake was that the contractor put on a couple of large attic fans which was intended to cool down the attic. These fans were large and pulled a considerable amount of CFM. What this contractor failed to consider was where the fans were going to pull air from. When these fans kicked on they drew a considerable amount of make-up air right out of the home via the leaky recessed cans. As fast as the air conditioner delivered cool air to the house these fans sucked it out.

In an article titled Powered Attic Ventilators Unplanned Impacts on Houses published in 1996 by John Tooley and Bruce Davis drew the conclusion that "powered ventilators should not be used." In tests on eight homes these researchers found that "on average, powered attic ventilators draw 231 cfm of conditioned air out of the house and by themselves cause 0.72 air changes per hour." It is unfortunate in the case of this customer in Paradise Valley that power ventilated fans enjoy a positive reputation.

According to an article in the October 2002 ASHRAE Journal by William Rose and Anton TenWolde titled Venting of Attics & Cathedral Ceilings, that "with the cost of

operating the fan included, mechanical ventilation was a **net energy loser.**" Not only are the fans net energy losers, but if the fans are large enough and the ceiling is leaky enough the fans can create enough negative pressure on a structure that they can actually back draft combustion appliances.

What many builders, HVAC contractors, insulation contractors and homeowners fail to understand is that heat gain through a well insulated ceiling represents a small amount of the total sensible gain. In The Moisture Control Handbook written by Joseph Listiburek and John Carmody it states that "where roof assemblies are tight and well insulated, ventilation of roof assemblies has a negligible impact on cooling loads." p. 71 Attic ventilation only makes a contribution to cooling in poorly insulated attics, so the solution is not a vent or a fan, but proper insulation.

Unfortunately this homeowner took the advice of this uninformed contractor and didn't get his problems resolved. Ideally this homeowner would have built the house right in the first place. This would have required 6" (R-24) of half pound foam in an unvented attic with cathedralized half pound foam insulation. This type of strategy would have brought the duct system inside the pressure envelope and the recessed lights would not have been leaking to the outdoors. *I have written an article on our website about this type of application* www.advancedinsulationinc.com.

Advanced Insulation offers diagnostic testing services. For HVAC companies who are interested in learning more about these topics, I do offer a free in-house training. Feel free to e-mail me or call me if you are interested.