Reducing gas consumption by exterior wall insulation

In the summer of 2005, I compared two buildings that were both 3-story colonial homes. One had all the outside walls blown with insulation back in 1999. The other, in July of 2005, had no wall or attic insulation.

On an 87^0 F day, prior to the beginning of the 2005 insulation project, I measured temperatures and heat fluxes in the two colonials.

- Temperatures varied by 44 degrees in the uninsulated building. It was 77º F in the unfinished basement while the temperature hit 131º F in the attic. The uninsulated house was cold during the winter months and very hot during the summer months; no one lived on the third floor.
- The insulated home varied less than 6^0 F between the finished basement and attic on the same day. It was 74º F in the basement and 80º F in the attic. All four floors of the insulated home are in continuous use year round.

Natural gas requirements

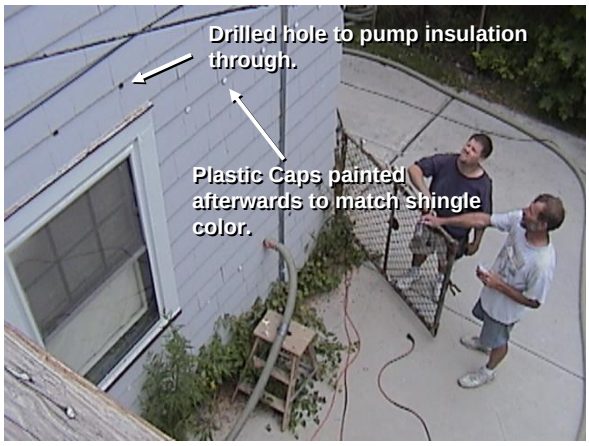
The insulated home used 143.4 MCF of natural gas over the prior twelve-month period. The uninsulated two-family home consumed close to 280 MCF of natural gas. The second floor apartment of this uninsulated two-family home used more natural gas than the insulated home itself. It used 147.8 MCF. The occupants of the uninsulated apartment were paying a burner tip price of $12.42 per MCF.

Winter natural gas bills approached $800 per month at the two-family home whereas bills rarely rose above $300 at the insulated home.

Insulation quotations for the two-family home

We took a Shaker Heights home with uninsulated exterior walls and an uninsulated attic and sought quotes for insulation. In 2005, the walls were insulated and the intention was to insulate the attic next. The outside wall surface area was 2,240 square feet. I took four (4) insulation bids. Quotes were as high as $6,500 for foam insulation and as low as $1,792 for blown insulation.

We analyzed the impact of insulation on the gas bills for the uninsulated colonial. The outside wall surface area was 2,240 square feet. I took four (4) insulation bids. Quotes were as high as $6,500 for foam insulation and as low as $1,792 for blown insulation.



Three of the four bidders warned against trying to remove old shingles. They recommended drill, plug and paint only. Each of these initial bidders talked about two holes per joist section.

The fourth bidder, ABC Insulation, indicated they drill four holes per joist, as opposed to two holes for superior insulation flow. Due to special cutting tools in their possession, ABC Insulation had no hesitation in either offering shingle removal and replacement (slightly higher labor costs) or drilling through the shingles, and then plugging and painting (20% lower quotation).

Selecting the installer and process

I have had successful experience with blown insulation (my own home since 1999). After calling a number of references in Shaker Heights and Cleveland Heights, I chose ABC Insulation out of Strongsville. All the references spoke highly of ABC. Some had called them back for additional projects.

ABC Insulation was also the

lowest bid by more than 50%. ABC quoted 80[1] cents per square foot for drill, plug and paint and $1.00[2] per square foot if the shingle were removed and replaced. The second lowest bid was $1.70 per square foot for only two-hole borings and they informed me that their final price was after a 33% discount.

The owner of the two-family house decided to go with the drill, plug and paint approach rather than the shingle removal and replacement format. ABC showed up in the morning and completed the project by late afternoon.

Projected savings and payback

It is my understanding that the rule of thumb is that uninsulated attics conservatively lead to 35% heat losses (especially in balloon style homes - 16 foot joists). Once attics are insulated, insulated outside walls can save an additional 20% to 30% in heat losses.

Conservatively, if all goes as expected the total building natural gas consumption would fall from 280 MCF to 168 MCF per year.

280*(1-35%)(1-20%) = 168 MCF.

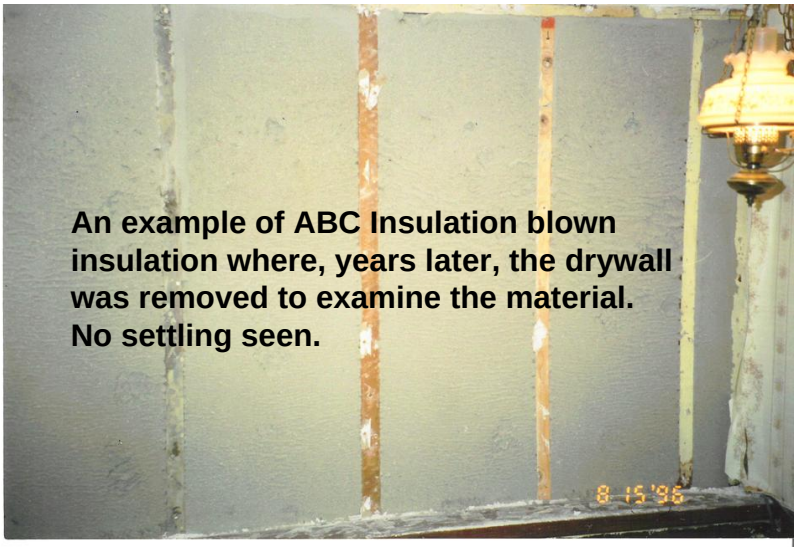
Estimated savings is $1,392 *(112 MCF * $12.42/MCF burner-tip price).*

The cost of insulating the walls ($1,792) and attic ($1,500) is $3,292. Simple energy payback is calculated at 2.4 years. This does not include the benefits of sound proofing, fire resistance and the disappearance of cold drafts during the winter. As utilities become a greater concern in the future, energy efficient homes will become more attractive to buyers and renters.

[1] I called ABC Insulation (9-18-06) and learned that material costs by the manufacturer have climbed. ABC now charges $1.00 per square foot for drill and plug.
[2] Labor costs for shingle removal and replacement went up 10¢ per square foot. Total price is now $1.30 per square foot (including material increases of 20¢ per square foot)

One year later

The wall insulation met or exceeded all expectations. Having watched the installation throughout the day, I was satisfied with the professional standards. When I initially interviewed the owner, I asked him if the material would eventually settle and leave "gaps" in the walls. He showed me a photograph of one of his jobs where the drywall had been removed years later. No settling was seen. The photograph was impressive and I requested a copy for my study (seen to the right).



An example of ABC Insulation blown insulation where, years later, the drywall was removed to examine the material. No settling seen.

There have been delays in finishing the 3rd floor (no fault of the insulator). For the last year, the attic was sealed off with some insulation and plastic so that the third floor acted as a large air buffer between the second floor ceiling and the roof. Time-of-day (and night) thermostats were installed to better control the two apartment furnaces.

Exterior wall insulation met and exceeded our expectations. This apartment building now had similar characteristics to the other insulated colonial home in Shaker Heights. Everyone was very pleased with the results and natural gas savings.

$$280*(1-15\%^{3})(1-20\%) = 190 \text{ MCF.}$$

Estimated savings is $1,117 *(90 MCF * $12.42/MCF burner-tip price).*

Based on these results, an apartment owner who was familiar with both colonials hired ABC Insulation to insulate a four apartment building in September of 2005. The owner recently verified that the blown insulation met her expectations.

She said she and the other residents of the apartment were delighted with the energy savings during the winter, cooler rooms during the summer, and the sound dampening year round.

[3] Since the attic was only set up a trapped air between second floor ceiling and uninsulated roof, energy savings estimate dropped from 35% to 15%.