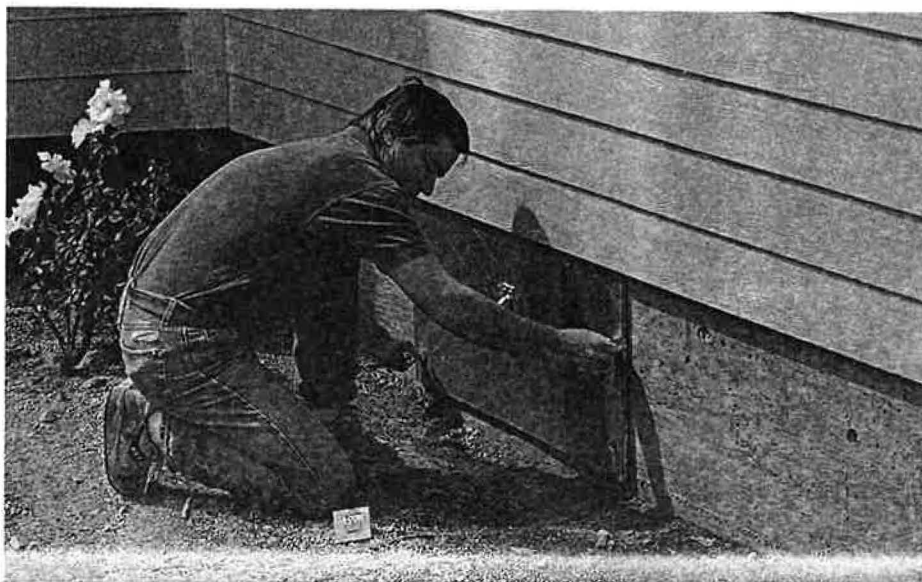


Guaranteed Home Energy Efficiency

by Rick Chitwood



Few homeowners really know how much money they squander on heating and cooling their new homes. Part of the problem is that they often see the road to greater residential energy efficiency as paved with a variety of expensive super-solutions, such as a super-efficient appliance or a super-insulated home. Most of us in residential energy conservation know that, while there is a role for such devices and measures, no one gadget will ever solve the problem.

At Chitwood Energy Management, we look at all the details that contribute to home energy efficiency. We pay particularly close attention to the thermal envelope and the HVAC systems and use diagnostic equipment to verify performance. We not only guarantee that our workmanship is up to snuff, but that our customers' annual utility bills will fall below a certain amount—generally between \$100 and \$300 per year

for a new 1,500 to 2,500 ft² home. Should our customers' annual utility bills exceed the guaranteed amount during the first three years, we pay the difference.

We have guaranteed approximately 30 homes since we started the program in 1995. All of our customers have been very pleased with the results and we haven't had to write any checks to any utility companies yet. (Although we strive to provide the same quality of service on rehabbed homes, we do not guarantee the utility costs as the conditions there are far more difficult to control.)

When we first started guaranteeing energy costs in 1995, we had just completed a three-year weatherization program for Pacific Power and Light (PP&L). Using state-of-the-art diagnostic equipment, we inspected and tested 3,000 homes in the vicinity of Mt. Shasta, California—about 10% of the local housing stock. We calculated the

cost-effectiveness of weatherization measures, inspected insulation levels, measured infiltration and duct leakage, and used an infrared camera to evaluate insulation performance and help identify air leaks.

We found that most of the homes were very leaky, poorly insulated, and were costing owners two to three times more on average in heating and cooling costs than was necessary for the 6,000 heating-degree-day climate. The experience on the project convinced us that we could make a huge impact on home energy use simply by paying attention to the details.

Doing Energy's Bidding

Our company does a regular bid on the insulation and the heating and cooling system for new homes, and another bid on a package of energy efficiency improvements. Our energy improve-

Rodents do a lot of damage to floor insulation and to duct systems. CEM provides insulated metal crawlspace doors and leaves some mouse poison just inside the door on all of the projects they do.



Filming the home with an infrared camera when it is depressurized illustrates where air is moving into and out of the home, and the path it takes.

ment package includes a long list of activities, from installing combustion air ducting to sealing the supply and return duct boots. The improvements add \$500 to \$2,000 to the cost of a new home, increasing monthly mortgage payments by \$4 to \$15.

One of the more unusual improvements on the list is installing metal crawlspace access doors. From our experience on the PP&L weatherization project, we discovered that rodents do significant damage to the insulation and ductwork found in crawlspaces. We also found that the wooden covers used to seal crawlspace access points warp and rot from moisture and can be eaten through.

Just the Right Size

To properly size HVAC equipment, we use infiltration measurements and verify thermal envelope performance using an infrared camera. In most cases, we find that equipment and duct systems can be downsized by half the output of any competitor's design. This downsizing further improves performance by allowing more of the ductwork to be installed inside the thermal envelope. Designed carefully, a duct system can be minimized so that the supply ducts run only as far as the closest corner of each room, further reducing losses.

While we always try to install equipment properly, we follow up our work with diagnostic tests. We like to know what is happening within the entire system, including flows, pressure differences, combustion zone pressures, infiltration rates, duct leakage, and ventilation rates. We do all the testing ourselves both to assure performance and minimize exposure to construction defect liability. The information learned during the tests also teaches our crew where they need to improve on the next job.

Typically, when builders and contractors wish to make homes more energy efficient, they specify and install higher rated products (U-value for insulation and windows and SEER and AFUE for HVAC equipment). A better approach is to select equipment and products that are most appropriate for the local climate, fuel availability, and utility rates. Builders need to always carefully install products and equipment and verify performance with field testing.

At Chitwood Energy, we use the following performance standards to guide our work.

- Air infiltration (measured with a blower door) below 4.0 air changes per hour (ACH) at 50 Pa.
- Insulation that performs as rated, with no air intrusion or convective air movement.

- Ducts installed inside the thermal envelope or in a buffered crawlspace, insulated to R-8 or greater, and system leakage less than 50 ft³ per minute at 50 Pa.
- Room-to-room pressure differences (under worst case conditions) of less than 5 Pa.
- Adequate pressure in combustion areas to prevent backdrafting of equipment.
- Mechanical ventilation capable of providing 0.5 ACH with control options that can be tailored to occupants.

Of course, performance standards are not widely used in today's building trade. The competitive construction environment favors the lowest bidder, with little attention given to performance and operating costs.

While a performance approach may seem unnecessary or redundant to some contractors, we have found that it pays dividends. And it's not just a matter of pride to know that you're selling a quality product. In today's litigious society, it's also reassuring to know that your customer is really satisfied, and that the work you are doing won't someday come back to haunt you.

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