be a meeting worth attending for building science researchers, designers, and builders.

This meeting seems to be similar but a bit wider in scope than the *Thermal Envelopes* conference sponsored every three years by the US Department of Energy and the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). The initial list of topics includes weather resistance, windloading on facades, sealants, glass and coatings, masonry wall technology, and acoustics.

For more information, contact Brenda Apted, *ICBEST '97*, Centre for Window and Cladding Technology, University of Bath, Bath BA2 7AY, UK; +44 225 826 541, Fax: +44 225 826 556, E-mail: icbest@bath.ac.uk.

# READERS' FORUM

## On the Glory of Being Trashed by a Fiberglass Manufacturer

Dear Ned:

I look forward each month to receiving an envelope that has Cutter Information Corp. as a return address. I know that it contains the best energy newsletter published in the country. What a surprise to find my name on the front cover with the title "Who is Doug Rye Anyway?" Folks started calling me to say I had made the big time and encouraging me to keep up the good work.

And then I am recognized by the CertianTeed Corp. with a brochure with my name on the front cover. Ned, I believe that your readers are smart enough to figure out why CertainTeed would be trying to stop Doug Rye from telling consumers what he knows. Actually, a more accurate title for the brochure would be "Some Things Doug Rye Says Could Get You **free** Hot Water." You know, using geothermal systems.

And now I am on your front cover again. Wow, who would've ever dreamed it? Ned, people have the right to express their opinion as they will. However, the proof is in the pudding. What more scientific data could one want than having thousands of living units that perform exactly as I teach?

So as CertainTeed continues to spend time and money on negative propaganda, I will continue to help as many people as I can. Keep up the good work at *EDU*.

Sincerely,

Doug Rye
Doug Rye & Associates, Inc.
Mabelvale, Arkansas

### Editor's reply:

As your popularity and influence grow, so will the demands for accuracy in your presentations. For example, I'd prefer that you explain that a geothermal heat pump, like any type of heat pump, can provide "free" hot water using waste heat from the cooling process, but only during those hours when the system is operating in space cooling mode. Most of the time, energy is required to heat the domestic water.

Thanks for your comments and kind words.

NN

# RESEARCH AND IDEAS

## Natural Ventilation Rate in Leaky Houses

Scenario: A building science workshop. At the front of the room is a young lecturer explaining to a room full of seasoned contractors that they should:

1. Spend money and time to seal up as many cracks and holes as possible to make their homes airtight; and then
2. Spend more money and time to install a ventilation system to get fresh air into the building.

As eyes roll upward, one outspoken builder challenges the young engineer, asking why he should bother sealing up those holes in the first place. Why not just leave the house "leaky" so it can be "naturally" ventilated?

The answer is actually quite simple. For outdoor air to naturally ventilate a home, there needs to be not only holes in the building envelope, but also a driving force to push air through those holes. The two natural forces that ventilate a building are the "stack effect," created by warm, buoyant air in winter, and wind. Both are directly determined by weather and may be very strong under some conditions, but near zero under others.

When the outdoor air temperature is the same as the indoor air temperature, the stack effect is zero. And obviously, when the wind speed is zero, there is no driving wind force. So on a mild, windless day, the actual ventilation rate may be zero, no matter how leaky the house.

### Let's go to the numbers — HOT2000 analysis

Although the theory makes obvious sense, the practical reality is even more compelling. Figure 1 shows the calculated natural ventilation rate, in air changes per hour (ach), for leaky homes located in both Minneapolis, Minnesota, and Little Rock, Arkansas. The data are simulated using the HOT2000 computer program, developed by Natural Resources Canada (see review, *EDU*, April 1996). The measured air leakage rate of the home was set to 10.5 ach, which predicts an average natural ventilation rate of roughly 0.5 ach.

Notice that even in Minneapolis, the average natural ventilation rate is below the recommended minimum from April to October. In Little Rock, the home would almost always be underventilated.

This of course is only a computer analysis and cannot accurately depict what actually happens in a specific single home. Nonetheless, the general trend clearly illustrates that leaky homes are not necessarily well-ventilated homes. To provide adequate ventilation for indoor air quality, some type of mechanical ventilation is necessary.

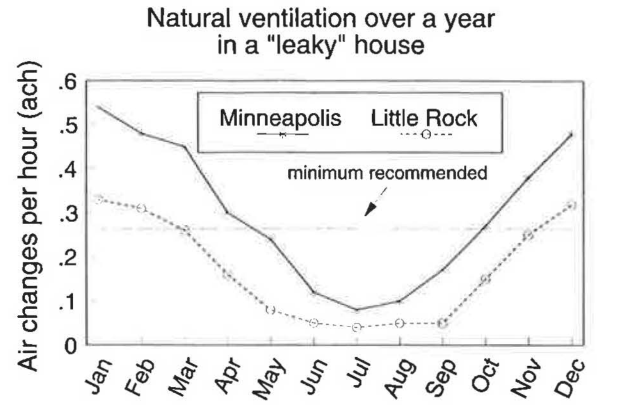


Figure 1 – The "natural" ventilation rate of a very leaky home is very low during mild weather and cannot be relied upon to assure good indoor air quality.

To obtain a copy of the HOT2000 software, contact the Canadian Home Builders' Association, HOT2000 Sales, 150 Laurier Avenue West, Suite 200, Ottawa, ON K1P 5J4, Canada; (613) 230 3060, Fax: (613) 232-8214.

## Best-Case Savings from Worst-Case Lighting Retrofit

The results of a field study performed on a Florida home by the Florida Solar Energy Center (FSEC) show that when almost all light fixtures in the home were retrofitted with energy-efficient bulbs or controls, the total lighting energy consumption decreased by 61%.

An unusual aspect of the home was its high preretrofit lighting energy consumption — over 4,000 kilowatt hours (kWh) per year. (The FSEC's final report indicates that annual residential lighting energy usage in Florida is "guesstimated" at 1,000 kWh per year.) The reduction in lighting energy use resulted in an impressive $200-per-year savings in electricity costs.

The retrofit consisted of a mixture of bulbs and controls, including compact fluorescent bulbs, PAR halogen lamps, motion sensor controls, and incandescent halogen bulbs. A total of 27 fixtures and controls were replaced at a cost of $405.

To determine lighting energy use, FSEC engineers installed lighting loggers that recorded on-time for each fixture. They then monitored total household electric consumption for six months prior and six months after the retrofit.

The results showed an average lighting use of 11.1 kWh per day before the retrofit and 4.3 kWh per day after the retrofit. The 6.8 kWh-per-day reduction translates into 2,480 kWh total in annual energy savings. Given roughly $400 in materials cost and $200 in annual savings, the estimated payback period is about two years.

The results are not surprising, given the well-documented benefits of compact fluorescent bulbs, but the economics are particularly encouraging. Typical lighting retrofit recommendations call for replacing only high-use bulbs — those that operate at least three hours per day — in order to get payback in three years or less. However, the FSEC study ignored economics and strove simply for maximum savings by

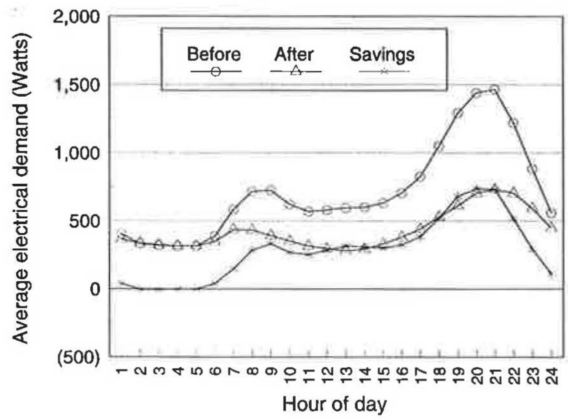


Figure 1 — Pre- and post-retrofit electricity consumption (lighting and plug load) in a Florida home. Source: FSEC.