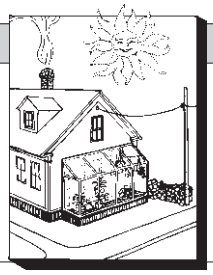

Quick Energy Check

by Alex Wilson

How energy-efficient is that house you just finished? Why does your own home cost $1,500 per year to heat? How can you measure the effectiveness of weatherization measures on the house you are renovating? Right now, answers to those questions are pretty hard to get, but if John Spears has his way, it will soon be a whole lot easier.

For the past several years, Spears, the Program Manager for Energy and Indoor Air Quality at the NAHB National Research Center, has been developing a fast, accurate, and simple test for measuring the energy performance of buildings. From a single night of testing, according to Spears, it will be possible to accurately determine both the heating load of the building and the heating system's efficiency.

The Way It's Been Done

A number of different techniques have been used up until this time to determine building performance. The simplest alternative is an audit of fuel bills. A year's worth of fuel bills, or, even better, several years' worth, can provide a rough estimate of the energy-efficiency of the house, as long as you know the efficiency of the heating system and are able to separate out heating from other uses of the fuel. Obviously this approach doesn't work for new buildings since they have no heating track record.

Math calculations can also be used to simulate and predict building performance. These vary from very quick and simple hand calculations to sophisticated computer modeling programs. With these, all sorts of measurements are made and plugged into equations, taking into account such considerations as passive solar gain. Unfortunately, even the most sophisticated models haven't done a very good job of predicting actual fuel bills.

The most accurate way to measure the performance of a building is long-term monitoring. This requires wiring the house with all sorts of temperature probes, putting flow meters on fuel lines (or separate meters for various electric uses), and collecting data over a long period of time. Accurate energy performance monitoring can cost thousands of dollars per home. The Department of Energy's "Class B" Monitoring Program was an attempt during the early 80s to carry out such monitoring, as inexpensively as possible, on a large number of passive solar homes.

Simple and Practical

The new method, developed by the NAHB National Research Center, uses a combination of actual measurements and simulation modeling. It uses "the best of both worlds," according to Spears. "It's what Class B wanted to be when it first started." John Duffy, of the University of Lowell, in Lowell, Mass., who has been working with Spears to develop the test procedures and mathematical modeling, notes that most components of the test have been around for a while. What sets this test apart is its simplicity and practicality, from the user's standpoint.

How the Test Works

On a night when the temperature will be 40°F or lower, a technician sets up electric resistance heaters which are wired through a separate meter. While the house is kept at an even temperature, electric consumption is measured and indoor and outdoor temperatures are recorded. Tracer gas testing is carried out to measure infiltration while the other tests are being run.

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A separate blower-door test is run so that results can be extrapolated to an annual heating load. All the data is fed into a computer either manually or through a microprocessor datalogger. The end result is the building load coefficient, which can be expressed in Btu/square-foot°F, or Btu/square-foot degree-day.

Next, either later the same night or the following night, the test is run again, only this time with the house furnace used to maintain the constant indoor temperature. Fuel use is carefully measured for the period. By feeding all the information into the computer, and comparing the results with the previously measured building load coefficient, the actual heating system efficiency is calculated, taking into account such factors as combustion efficiency, duct loss and increased infiltration due to furnace operation (which other measures of heating system efficiency do not usually consider).

Spears envisions other components being incorporated into the test down the road, including measurement of radon, formaldehyde, carbon monoxide, and humidity. It would be a single test providing a wealth of information about the house and how it is working.

A blower door will be used along with a "tracer-gas" test to measure house tightness.

Where the Test Will be Used

As Spears sees it, there are two broad applications for the test. In new construction, it will be useful as a rating program for utilities and energy offices which sponsor energy-saver home programs. In addition, some builders may want to use it for marketing purposes—a certified "Building Performance Rating" could make their house more appealing than one down the street.

The second primary application would be to evaluate weatherization programs, and determine the cost-effectiveness of energy retrofit measures.

How the Program Might Work

How the program will be set up is uncertain at this time. It may be franchised by the NAHB National Research Center, which would license the equipment and technology to companies around the country (much as Princeton Energy Partners franchises its House Doctor services, see *[NEB,]* 9/86). Or, it may be totally turned over to private companies.

How the program is eventually commercialized will largely depend on further testing and packaging being done this heating season and next. NAHB Research has contracts with a number of utility companies and energy offices to try out the system and is hoping for others, especially builders, to further field test the concept.

For additional information, contact John Spears, NAHB National Research Center, 400 Prince Georges Center Blvd., Upper Marlboro, MD 20772; (301) 249-4000. ■

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