

Technical Bulletin

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No. 15: AIR INFILTRATION MEASURING DEVICES (BLOWER DOORS)

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PURPOSE: Blower doors can be useful to insulation contractors in two ways. First, they can use them to demonstrate that houses do leak and to pinpoint exactly where the leaks are. From this information, insulation contractors can make suggestions as to how the builder or homeowner may correct these energy wasting flaws. Secondly, they may be used to quantify the air leakage of a building. It is then possible to compare quantitatively the leakiness of different structures. They are also used before and after a retrofit job to quantify the difference in air change rates. This enables contractors to determine savings, which can be attributed to reductions in air infiltration.

They can identify those houses which are tight enough, usually less than 2.5 ACH (air changes per hour) at 50 pascals, to require mechanical ventilation when needed to control moisture and/or pollutants.

Finally, a blower door can be a powerful marketing, sales and quality control tool and add significantly to the professional image and credibility of the insulation contractor.

Many insulation contractors offer their builder customers a seal-up package which includes a "third party" tightness certification which can be used to market the new house.

WHAT IS A "BLOWER DOOR"?

A blower door is a device that is used to exaggerate air leaks in the conditioned building's envelope. It is, more specifically, a high flow fan mounted in a portable panel, which normally is fitted into an exterior door opening. This fan will then either pressurize or depressurize the house, providing a steady air leakage through cracks and openings in the conditioned envelope. Most of these air infiltration devices also supply instrumentation which measures the amount of pressure being applied to the house. The volume of air needed to maintain the pressure is also measured.

HOW IS IT USED?

During use, the blower door typically sucks air out of the house, thereby, creating a partial vacuum inside. The pressure difference between inside and outside is then measured with the blower door instrument provided. Usually the house is depressurized until the difference between outside and inside is 50 pascals. That amount of pressure is equivalent to the force of a 20 mph wind on all sides of the house, thereby minimizing the effect of wind on the test results.

The "Air Changes Per Hour" Method

The pressure drop created within the fan is used to compute the air flow through the fan. This then represents the amount of air flowing into the house. The rate of air leakage in cubic feet per hour divided by the house volume equals the leakage rate in air changes per hour at 50 pascals.

The "Leakage Ratio" Method

Another way to rate buildings from air leakage is called a leakage ratio, LR. The LR is defined as the leakage area, in square inches, per 100 square feet of building envelope area. If you encounter the use of LR to describe leakiness, the following information should put it into perspective:

NOTE: Do not confuse these numbers with air changes per hour (ACH) numbers; they're not the same.

LR Below 1: Virtually airtight construction, requires (HRV) heat recovery ventilation, only cost effective in extreme climates.

LR Between 2-3: Very tight construction, requires intermittent humidistatically controlled ventilation for humidity and odor control

LR Between 3-5: Optimum tightness for comfort, low utility bills, cost effective basis (10-15% lower heating and cooling costs than conventional).

LR Between 5-9: Typical tightness of new homes in the United States non-energy rated/conventional).

LR Over 9: Extremely leaky, typical of pre-1945 homes, drafty and expensive to heat.

OTHER AIR INFILTRATION DEVICES

Another technique to measure air infiltration is known as the tracer gas method. It has been used mainly as a research method. A gas, often sulphur hexafluoride, is injected into the house and allowed to mix well with the indoor air. As air leaks into the house, the tracer gas becomes diluted. The concentration of the gas is then measured with a chromatograph during the dilution process. From that data the infiltration rate occurring at the time the test was performed can be determined. As the natural infiltration rate varies depending on weather conditions, this approach is not useful to contractors. Also, the tracer gas method does not create the pressure differential necessary for leak location.

You can expect the cost to range from \$1,100 to \$6,000 depending on the manufacturer of the equipment and the options offered (computers, training, etc.).