

USING THE BLOWER DOOR: Part I

EA&R editor Alan Meier recently spoke with blower door contractors from New Jersey, California, and Washington about the art of using the blower door. The contractors discuss entering the business, their training, equipment and materials, and communicating with the customer.

Getting Into Business

EA&R: *How many years have you been using blower doors and how did you get into the business? Ken, you probably have the longest explanation. You were at Princeton University, and, if I'm not mistaken, that was one of the pioneer areas for blower doors.*

Ken: Well, I got involved with the blower door through my research at Princeton. We were the co-inventor of that particular device nine years ago. Then I went into business on my own, starting a group of franchises called "Princeton Energy Partners".

EA&R: *And in your case you use your own machine, right—the Gadzco Blower Door?*

Ken: That's right. We make a calibrated, RPM-type door.

EA&R: *That's unusual, because you're a manufacturer as well as a user.*

Ken: Yes. We've gone through about four different models of our own at Gadzco and have also used the Retrotec and the Minneapolis Blower Doors.

EA&R: *What about you, Ray?*

Ray: I've been at it for 6 years, ever since I saw a show on CBS with Dan Rather called "The Energy Crunch". I've probably read every energy book ever written; and I go to the library every six months to see if there are any updates. It seemed that air leakage kept cropping up as a way to help people with their utility bills and their comfort level. The more I read, the more I liked the idea of the blower door, and I didn't feel that this insulation boom out here was going to last.

EA&R: *What kind of door do you use?*

Ray: We bought our first door six years ago—"the Infiltrometer"—from Enercorp.

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EA&R: *And have you switched, or have you been using the same door the entire time?*

Ray: We used the Infiltrometer for about four-and-a-half years, and then we switched to a Retrotec model. It's a calibrated door.

EA&R: *What about you, David?*

David: I've been using blower doors—or "door fans" as we like to call them up here—for a year and a half. We had been doing exterior caulking and weatherstripping as an infiltration company, and it seemed like we needed to start using a blower door in order to really do a good job. We looked at the doors for a couple of years and tried to talk ourselves out of it before we finally decided to buy one.

There was a manual with the door fan, and we basically started working on our house. Pretty soon we started working on our friends' houses and every house we could get our hands. We learned the hard way—by making mistakes.

— David Ott

EA&R: *What kind of machine did you end up buying?*

David: We bought an Infiltec door, which is calibrated. We're real happy we made that decision.

EA&R: *We've got quite a range of experience here, from one-and-a-half to twelve years—an order of magnitude.*

Training

EA&R: *David, you're the most recent blower door convert. What kind of training did you get with your Infiltec door?*

David: I received no formalized training. I went to a seminar that familiarized me with the door fan. A couple of different manufacturers spoke, and somebody from the Midwest who had been



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Sound Conservation
Seattle, WA

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H & L Energy Savers
Upland, CA

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Ken Gadsby
Princeton Energy Partners and
Princeton University
Princeton, NJ

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doing some house doctoring went over the theory very cursorily. There was a manual with the door fan, and we basically started working on our house. Pretty soon we started working on our friends' houses and every house we could get our hands on. We learned the hard way—by making mistakes. We talked with other contractors. Then we scratched our heads a while and called somebody.

EA&R: Ray?

Ray: We had a week's training when we started the Enercorp franchise, and my crew was sent to Winnipeg for a week of training on the machine itself. As for actual applications, I would say that they taught us about 25 percent of what we know right now.

EA&R: Were you given any supplemental educational tools, such as video cassettes, manuals, or things like that?

Ray: Not at all. There was a classroom up in Winnipeg for my crew. They'd take us on a job site for a day or two and show us how to weatherstrip some doors, use the caulking gun, the pneumatic gun, and things like that. Our real training came with trial and error over about a year's span; we were bound and determined to make this thing work.

EA&R: Ken, you're on both sides of the fence. How did you educate yourself, and how did you provide education to your customers?

Ken: My education came through the research of course, but it's more interesting to talk about our Princeton Energy Partners franchisees. In the beginning we were not a franchise organization. We just sold training and equipment. Now we have franchises and an initial 10-day training program. After about a month we spend three days on-site at their place. A month or so later, we have another two-day update on the training, at their site. We supply manuals, and have regular franchise meetings. We share experiences and constantly update our manual.

EA&R: Do you have any video cassettes?

Ken: We don't use video. We're almost a regional outfit, although we do have franchises in Minnesota and North Dakota and in upstate New York. Most people are within a few hours travel of us.

EA&R: How about maintenance, performance, and accuracy problems? How do you know if your blower door is still calibrated correctly? Or do you even use the calibration in the end?

David: Yes I do, and I've checked it approximately every 4 months since I've had it, by testing

for the size of a known orifice, to see how accurately the door measures the size of the hole.

EA&R: *What about you Ray?*

Ray: You'd have to talk to my technician about calibration. I don't operate that machine at all. I am very fortunate in that I had two guys start with me in the beginning. They've gone through the Retrotec and Enercorp programs, and they're the ones that built this whole idea of doing a good job finding and sealing air leaks. We have three blower doors now, and I've never operated one of them. You see, we really try to keep it fairly simple for the customer. The technical aspects of blower doors really confuse people.

Taking the Measurement

EA&R: *How do you use the blower door to measure infiltration? You've already persuaded them that you're going to make some measurements, and now they're going to allow you to take this machine in. What's the next step? Ray said he's never personally done one blower door measurement.*

Ray: I wouldn't even know how to hook it up.

EA&R: *David, how many tests have you done?*

David: I would guess about 120-150 houses and maybe 500-600 tests.

EA&R: *Ken?*

Ken: Since I've been involved in both research and private industry, I've done thousands of tests. I don't know exactly how many.

EA&R: *You don't put notches in your blower door?*

Ken: Well, I tried that for a while, but it fell apart.

EA&R: *I'd like you each to describe your typical customer encounter.*

David: Let me describe the most recent one. A customer called us up after having contacted a utility looking for this service. They were—for our marketplace—a highly educated consumer. It turned out the guy was an energy economist. We went out and tested the house, prior to giving the guy a bid to do the work.

If it's not a particularly leaky house, we'd just as soon not do any work on the home. We don't want to make somebody spend money for a lot of flash without getting much energy or comfort. The way we report our results really varies with the

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homeowner. With some homeowners, we just indicate with our hands about how big the hole is—the equivalent leakage area. If the customer seems to be interested, we supply as much detail as they're willing to follow.

EA&R: *Then what do you do next after you've estimated the leakage area.*

David: Our door fan has two uses. One is for new construction. Typically, we're hired to come out and test the house, and the builder wants to size the heating system based on the infiltration rate. Or he just wants to know how well he and his builders have done at creating a basically airtight house. I'm less interested in the second use—saving energy in the existing housing stock—although that's where most of the institutional support is.

EA&R: *O.K., let's assume that you're retrofitting an existing house.*

David: After we've been hired to do the job, we set up our equipment and take a baseline measurement of the leakiness of the house. Then we determine what a reasonable tightness level is and tighten to that level. As we've gained experience, we've become more concerned with plugging the right leaks, rather than all the leaks, adjusting for stack effects wherever we can.

EA&R: *Ray, what about you? David has described two kinds of jobs. One is measuring the quality of the job in a new house; the other is the retrofit.*

Ray: We don't touch new construction at all. We strictly do older homes. Normally, the first time the customer sees the machine is when work is about to begin, since we seldom do a blower door test before the job is signed up. We do the blower door test, then we seal the leaks and test again afterwards.

How Much Does It Cost?

EA&R: *How much do you charge for a blower door test, Ken?*

Ken: A test costs nothing. If you want your house tested, Alan, I won't come to California to do it; but if you live within a half hour or 45 minutes, I'll come do it for free. We run into some houses that are already tight enough. Houses between one and three air changes at 50 Pascals don't need shell tightening.

Our price varies with the house, of course, but we charge from \$600-\$900 for a typical 1,600-square-foot house with routine problems. We don't just do shell tightening, though, so it's a little hard to put a number on it. We don't believe that shell tightening alone is cost effective for most customers in our climate.

At least I get more respect than that guy. The house he bought has got R-11 walls...



Ray: Our price depends on the situation. Once the customer is convinced that leakage reduction is the way to go, then we do a test. But we do very few jobs other than whole house. We seldom sell leakage by itself or attic insulation by itself or just weatherstripping.

EA&R: *How much does a whole-house job typically run?*

Ray: We charge about \$3,000 on an average home of 1,500 square feet.

EA&R: *Wow! And what does the customer get for that?*

Ray: We do everything—put in a whole-house fan, find and seal the leaks, and put insulation in the attic and walls. We don't really get many objections to this price. Now, if they really want it broken down and say "Gee, I can only spend half of that," then we may just seal the leaks in the attic for them and work out a deal on a whole-house fan.

David: We charge \$150 to test a newly built house. On existing houses, we charge about half a buck a square foot—less on a larger home, more on a slightly smaller one.

EA&R: *That's quite a range I've just seen across the country. From guess fifty cents a square foot to a little less than two dollars a square foot. In fact, I got that range just up and down the West Coast.*

David: At \$2 square foot, he's blowing in a lot of insulation; I'm not blowing any.

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— David Ott

Reporting the Results

EA&R: *How do you report the results of your blower door measurements, Ray?*

Ray: We report our results in air changes and the amount of leakage area in square inches. We really stress leakage area more than anything else. Some people really have a hard time trying to understand air changes.

We really try to sell a whole house retrofit. A lot of people just want attic insulation. If we can get in the door and show them the results we've gotten and some of the news articles, they'll go for our whole package. Why settle for half the banana?

— Ray Hall

EA&R: *So you just take your hands, and describe how big a hole all the leaks in the house would form if they were all put together?*

Ray: Not really. When we're selling air leakage, we tell people that about 40 percent of their heat gain and heat loss is strictly through leaks and has nothing to do with insulation—although insulation is also important. We really try to sell a whole house retrofit. A lot of people just want attic insulation. If we can get in the door and show them the results we've gotten and some of the news articles, they'll go for the whole package. Why settle for half the banana? Most people want the house done once and for all. They don't want to nitpick at it and do half of it today and the other half next year. That's the way we present it to the customer.

Ken: Do you have a variety of financing options to go with your work, Ray?

Ray: We're just getting into financing now. The news articles about our company—over the years we've had 15 newspaper and 7 magazine articles and two TV appearances—have helped a lot, and we also get a lot of business from the yellow pages. We're an insulation company, so when somebody calls in for insulation we get an opportunity to show them our whole package. If they find out about us through a news article or a referral, we often don't have to provide financing, because we've got a lot of credibility. For example, Southern California Gas Company just named us contractor of the year, out of 45 contractors, for our quality work. If you can present that to people, they get their own financing.

EA&R: *Ken, describe your retrofits—your customer encounters.*

Ken: We work not only on retrofits, but also on new construction, and multi-family buildings. First, I'll talk about existing single-family residences. We normally check the shell of the house. We go in with a blower door, an infrared scanner, and all the other nice things, and look around the house to see if indeed the house is leaky enough to deserve shell tightening, or if there are some other problems. We give a quick evaluation, and very often walk away from the house if it's tight enough. Sometimes you come across such a great house you have to give the builder a bottle of champagne or something.

After we sell a job and come back to work, we do a much more detailed analysis of the entire house. We're not just a shell-tightening or envelope-sealing business. We look at the total fitness of the house. We do a blower door test, and, unlike what I'm hearing from you guys, our customers don't seem to be able to understand equivalent leakage area. We talk in volume changes, say 1/2, 3/4, or 1 volume change per hour in the house. Customers seem to be able to understand that better. If we have difficulty with this explanation, we use equivalent leakage area. Mostly, though we talk about *natural* air changes, not just a Pascal number.

Equipment and Materials

EA&R: *How about equipment, tools, and materials you use with the blower door. I assume all of you use a smoke stick. Is that true?*

Ray: Yes, we use one.

David: We rarely use a smokestick, since we depressurize the house and can seal the leaks by feeling the air come in.

Ken: We use a smoke gun actually, rather than a smoke stick. They last longer and are easy to operate. And we use an infrared camera—infrared scanner actually—on all our jobs.

EA&R: *What about you, Ray and David?*

Ray: Just the smoke pencil. We have a negative pressure that shows exactly where the leaks are coming in.

David: I haven't used the scanner at all. I've investigated it, but I haven't seen how I could use it real effectively so far.

EA&R: *Ken, where do you use the IR scanner most frequently?*

Ken: I use it on every job. And of course training is very important with the use of the infrared scanner. Our people are trained to know when they can take advantage of it. We use it in the living space and in the attic, and, less frequently, in the basement.

EA&R: *So you scan from the inside?*

Ken: Yes, you have three times the sensitivity from the inside as you do from the outside.

EA&R: *David, have you considered scanning from the inside?*

David: Yes, I've tried it. We had a sales representative from Delta Thermographics—located near Albuquerque, New Mexico—come by. We tested on a fairly warm day. One of the concerns in this region is that there aren't a lot of days in the year when we can effectively use the scanner. There's rarely greater than a 20°F temperature difference between inside and outside—it's not below 45°F or above 85°F very often.

EA&R: *Ken, do you see that as an obstacle to using the scanner?*

Ken: Not for air leaks. If you are familiar with the ASHRAE and ASTM standards on the use of this equipment, you only need a 20°F delta T if you're looking for insulation voids. For air leakage, you need a 5 or 10°F delta T and a knowledge of how a building works. In fact, we wrote a paper, "Year-Round Use of Thermography and House Doctoring," just to do away with some of

those myths. You have to know when and how to use the IR and have the proper training. Otherwise, you're going to have difficulties.

David: My feeling is that it's something we'll end up using in the future. The market and the energy prices here aren't pushing us into it, and we're basically still on the steep side of the learning curve on the door fan. When we start to get bored with it, I'll probably get real interested in the scanner.

EA&R: *What sorts of materials do you use to seal those cracks and holes?*

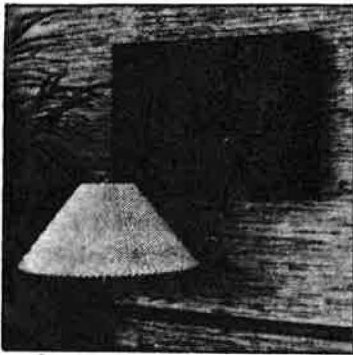
Ken: We use all the common materials—foam, expanding foam, caulk, different plastics.

EA&R: *Backing Rod?*

Ken: Yes, we use whatever the situation calls for—backer rod, tyvek, insulation board, bow board or whatever. Our minimum requirement is that the material will last for at least 15 years, since we guarantee our materials and workmanship for that long. So it has to be good.

Ray: One of the good things that came out of Enercorp—and I think the only good thing—is that they had a lot of materials designed for their pro-

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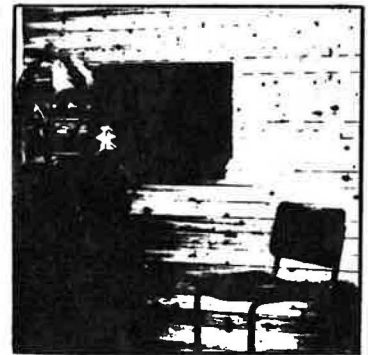
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gram; a lot of different weatherstrippings (PVC-coated and spring-loaded, for example), door jam materials, a lot of sealants and a material called Stuffit, that you could stuff into certain areas and cut easily. The life expectancy of a lot of their products is about 25 years. My feeling is: always buy the best. Charge the customer; our customer is somebody looking for a solution to his problem. You might as well put the best on. I agree with Ken. You've got to use good stuff.

David: We use a lot of sheet rock and patching plaster as well as what's already been listed. Our concern is how to best plug these holes with long-lived materials without introducing a lot of potentially hazardous materials to the home in the event of a fire. So we tend towards rock and plaster.

EA&R: *O.K., any other materials for special cases that you people want to mention? For example, when you discover a duct that seems to have stopped suddenly for unknown reasons, or some sort of air passage that is now partly closed off... Do you use any special design—pie plates or something—to close it off permanently?*

David: Typically, I stuff them, and in the case of the dangling duct I take it back as far as I can and get rid of the insulation that's not needed. I stuff it with fiberglass, put aluminum flashing over it, wrap it up, screw it in place, and caulk around it.

Sometimes you come across such a great house you have to give the builder a bottle of champagne or something.

— Ken Gadsby

EA&R: *Ken, you do a lot more older homes, don't you?*

Ken: Actually, our franchisees do probably 74 percent of their work on new housing. We have a van for the retrofit business that carries 30-40 different varieties of materials: aluminum flashing, sheet rock, foam wood, plywood, other kinds of lumber, whatever ...

David: Traveling lumber yards!

Ken: That's right! You're a mini lumber yard on the road, and you have to be that way because you might need a piece of sheet metal steel, for instance, in certain applications where there's a temperature hazard. In other places you can get away with aluminum, but they're all on board.

In the Nov/Dec issue, the contractors will discuss blower door accuracy and their experiences marketing an air leakage service.

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