BY MIKE MACFARLAND

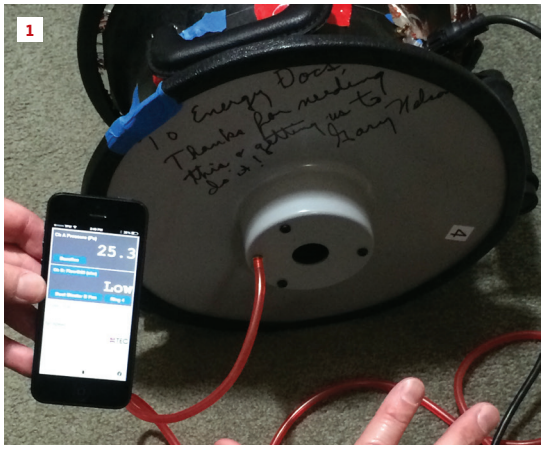
Making the Case for Zero-Leak Ducts

Maybe you've heard about the upcoming building code changes that will allow all new residential plumbing pipes to leak up to 6% of their water supply and waste products? A recent court case in Pathetic County, Calif., found that since the Title 24 state energy code allowed brand-new residential HVAC ducted distribution systems to leak up to 6% of total system airflow, plumbers and other trades cannot be held to a higher standard than HVAC contractors. Homeowners receiving mild shocks from their electrical outlets can no longer hold electricians to a "shock-free" standard as long as they don't exceed typical static electricity levels, and framers are soon expected to build almost-as-strong housing using up to 6% fewer nails.

Of course none of the above is true. The mere suggestion of these imaginary code changes is preposterous, but only because we can see, touch, smell, and feel their negative impacts. Aren't the same problems taking place in every home with code-legal duct leaks, and we simply aren't paying any attention to them? With the advent of building-performance test equipment, we've been able to identify and quantify many of the effects of poor installation practices, but we are still installing ducts to a very low standard.

BENEFITS OF A HIGHER STANDARD

Installing ducted distribution systems that fully contain and deliver all of the air that moves through to the intended locations offers many benefits for the builder, homeowner, installing contractor, and the environment. The builder benefits by earning a reputation for supplying the highest-quality workmanship, which translates into premium prices received for his product. The homeowner benefits by enjoying reduced operating costs, lower maintenance costs, increased comfort, and better indoor air quality. The installing contractor benefits from an easier commissioning process, fewer callbacks, and greater job satisfaction. The environment benefits from decreased energy consumption and reduced greenhouse gas emissions.



1. Until this year, a fourth ring for a Duct Blaster didn't exist. But it was recently released (the one at right is signed by Gary Nelson of the Energy Conservatory). Extreme duct tightness can be verified by an iPhone app that converts the manometer pressure into cfm (the manometer has programming only up to ring 3), reading "Low" to indicate total leaks of 1 cfm or less.

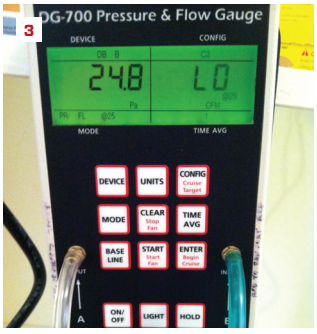
Photos: Energy Docs

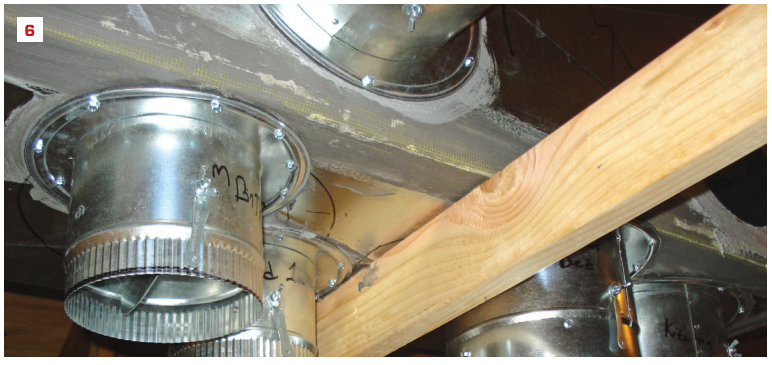
Most contractors I've had contact with have expressed pride in building something better than anyone else. Maybe it's the high-quality finishes, or the granite countertops and stone floors, or the decorative flatwork that sets their product apart from "industry standard" builders (the "other guys"). None of these folks would ever allow their plumbing systems to leak or electrical systems to shock, and they would fire any subcontractors who installed systems that did so. So why is it OK to adopt a minimum code standard of allowing leaks in any system that isn't intended to leak in the first place? I think it's because many HVAC installers don't think they can do it, and builders haven't considered the penalty.

THE RING 4 CLUB

In 2010 I began an unofficial experiment to see what would happen if the ideal target—unmeasurably low duct leakage—was clearly identified to HVAC technicians on replacement duct installations. I was running a local pilot project for deep energy retrofits in which 18 HVAC companies were introduced to advanced home-performance installation techniques. I wondered if we could get near-perfect results from these companies without adding any cost to the project, simply by creating a club of installers who had achieved perfection and whose names were listed online for having done so. To be clear, there was no incentive other than to be listed among the best of the best.

Call it pride or competitiveness, but most companies became determined to achieve leak-free ducts once they realized they would be recognized for their efforts. They simply refused to accept that another company was better than theirs.





The exclusive membership sought by these companies is called the Ring 4 Club; its only members are those who have supplied proof of installing ducted systems that don't leak. The origin of the name is from the use of the Energy Conservatory's Duct Blaster to measure duct leaks. The Duct Blaster system consists of a calibrated "fan" that connects to the HVAC duct system **(2)**, and a digital manometer that converts pressure readings into volumetric airflow in cubic feet per minute (cfm).

The fan device has a wide operating envelope for measuring very leaky duct systems. When measuring tighter duct systems, you use one of three numbered adapter rings, whose successively smaller holes increase the fan pressure, which provides greater accuracy when measuring smaller leak rates.

When measuring the tightest duct systems, the user installs "ring 3," the one with the smallest hole. This enables the manometer to record leaks as small as 10 cfm, equivalent to about 1% air leakage for a 2 ½-ton central air conditioning system. When meticulous installers put together ducted systems that leak less than this, the display flashes the word "LO," which is a signal to install the next higher numbered ring **(3)**.

We now have "ring 4" (photo 1, page 41) for the Duct Blaster and have recently instituted the Ring 5 Club as well, for those who can reach "LO" with ring 4 in place.

STANDARD PRACTICES

I'm often asked how difficult it is or how much more time it takes us to assemble ultra-tight, Ring 4- or Ring 5 Club-eligible distribution systems. The answer is that it is no more difficult and takes no more time, and the reason may surprise you. It's because, from the start, our company decided that any leak was too much. We developed standard procedures that make zero leaks an automatic occurrence on every project.

Our crew knows that when metal parts show up on the jobsite, for example, they are wiped down with denatured alcohol in preparation for receiving future sealant. And when supply boots are cut in, they're caulk-sealed and foamed in place before the crew moves on to the next one **(4)**. All adjustable elbows that are installed anywhere there is a planned deviation from a straight run of flexible ductwork are taped, secured, and coated "nickel-thick" with mastic and left ready for flexible duct installation after curing **(5)**. And all plenum attachments and joints are made with lots of screws and collared takeoffs, using jugs of mastic and reinforcing mesh as needed **(6)**.

Because the parts are methodically installed using appropriate materials, the system simply ends up being airtight. In fact, we would have to think about how to make a system leak, which would take us more time than our standard practices do now. So don't you think it's time for you to adopt a higher standard and reward yourself, your tradespeople, and your customers with excellence?

Mike MacFarland owns Energy Docs, a home-performance contracting company based in Redding, Calif.