Seal Ducts; Save Energy

Sealing ducts is a cost-effective energy-efficiency practice that offers a high return on investment.

By Steve Easley

Most of us are now aware that 25% of all carbon emissions in our country are the result of home energy use. Heating and cooling costs can easily be 40%–60% of total home energy use. For every kilowatt hour of electricity we consume, roughly 1 lb.–1.5 lbs. of greenhouse gasses are released into our atmosphere.

For every therm of natural gas (100,000 BTUs) consumed, 11.7 pounds of greenhouse gasses are released. Multiply that by 100 million-plus homes, and it's easy to see why energy efficiency is a major component to green building programs and green living.

High-performance building practices offer the biggest bang for the buck for builders and consumers. This means that we put as much thought and effort into how products are installed as we do into selecting the products. Nowhere else is this more true than with a home's heating and cooling system. Often homes look "good on paper" with regard to energy efficiency but fall far short in real-world performance simply because of the way the HVAC system was installed. Pay attention here because this is some pretty low-hanging fruit in the biggest-bang-for-the-buck department. Improper duct installation leads to:

Excessive energy use. Often 15%–25% of heating and cooling energy is lost through duct leaks. The goal is not to pay to heat or cool the great outdoors. If you were building cars and 15%–25% percent of the gas leaked out, you would not be in the car building business long.

Comfort complaints caused by duct leaks. The whole idea of a heating and cooling system is to deliver a specified amount of conditioned air to rooms to provide comfort for the occupants. Duct leakage reduces delivered air flow, which results in wide temperature swings from one room to the next, irritating customers.

Pressure differentials across the building enclosure that can lead to infiltration and exfiltration of air. Air contains moisture. When that moisture-laden air moves through building assemblies, it can condense on cold surfaces and wet building components, which leads to mold and decay.

Pressure differentials across the building enclosure that can lead to dangerous back drafting. Combustion appliances, like water heaters and fireplaces, can back draft—and the results can be fatal. Duct leaks can cause the home to be under a negative pressure, which can cause back drafting of combustion appliances.

Indoor air quality issues. Unsealed ducts draw in air, dirt, and other particles from undesirable places.

Energy codes, green building programs, and the Energy Star program are starting to address this serious issue. The 2009 IECC energy code requires that duct leakage to the outdoors be less than 8 cubic feet per minute (CFM) per 100 square feet of conditioned floor area.

Don't strangle your ducts. Supporting ducts as shown in photo 1 results in a significant loss of air flow. Photo 2 shows a correct installation.

Photo courtesy Georgia Pacific

California requires that duct leakage to the outdoors be no more than 6% of the blower motor's air flow. So, for example, if your furnace/air-conditioner had a blower that produced 1,200 CFM of air flow, the system could not have more than 72 CFM of duct leaks as tested with a duct blaster. Energy Star requires that ducts be third-party tested and have less than 6 CFM of duct leakage per 100


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square feet of living area. The pictures in this story illustrate some of the most common installation mistakes I see:

Note the duct is folded in half in photo 3. Duct runs should be straight without kinks or bends that restrict air flow.

When hanging flex duct, avoid strangling the air flow with the hanger. The pictures on the previous page


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show the incorrect and correct ways to support suspended ducts (photos 1 and 2, respectively.)

A common mistake is to fold ducts around framing members severely restricting air flow (see photo 4). Install flex duct to have long sweeping turns.

Notice in photo 5 that the flex duct is held to the boot with two screws. This will leak. Flex should be connected with


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draw bands and UL181 approved tapes or sealant.

Return air duct connections and seams need to be sealed. See photo 6 for a look at a proper sealing.

Do not use framing cavities for duct chases, as in example 7. They are difficult and labor


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intensive to seal.

Notice the plumbing is pinching the ductwork in photo 8. Work out duct locations with your HVAC contractor before construction to avoid this costly mistake.

Picture 9 shows Georgia Pacific's XJ 85 floor joist that has precut opens so that ductwork can be run perpendicular to the joists allowing greater flexibility in running


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mechanicals. Last, be sure to test for duct leaks. Measuring leakage with a duct blaster is the only sure way to evaluate system leakage.

Proper training and inspection—and following these guidelines—can substantially reduce energy use and callbacks and increase the comfort of your homes. Whenever possible try to locate ductwork and air handling


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equipment indoors.

The good news is that sealing ducts is one of the most cost-effective measures for reducing energy use and an easy best practice to add to your building process. GB

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Photo 9 courtesy Georgia Pacific