HOME

Energy Savings and Comfort

Why Is Duct Testing Important?

Residential duct systems may offer homeowners one of the best opportunities to increase the energy efficiency and comfort to the entire home. Studies indicate that 10-30% of the heated or cooled air is lost along with the money spent to heat or cool that air. In some houses air escapes through leaks in the ducts caused by disconnected or deteriorated ducts and little, if any, conditioned air is getting to your living space.

Testing the ducts can help identify where the leaks are occurring and focus repair work in the right areas. Properly sized, installed and sealed ductwork will make your heating and cooling systems significantly more efficient and will deliver comfort to every room in your house. A properly operating system helps reduce energy use especially during hot summer days when air conditioners are working harder, putting a strain on electric system reliability.

In most residential central heating and cooling systems,the conditioned (heated or cooled) air is delivered to each room of the home through a "supply" duct system,the first half of the duct system.These ducts are used as pathways to deliver air to each room in the home and then the "return" duct system or the second half of the duct system, returns air to the heating and cooling system. The condition of both duct systems is vital to the overall efficiency of the heating and cooling system and the comfort level in each room of the entire home.

Energy loss is not the only concern, however. Duct systems can also affect the indoor air quality of a home. If the return duct system is leaky, it could be drawing stale or polluted air into the duct system and distributing it throughout the home. This air could come from an attic, combustion air from the gas furnace, stove or water heater, or the outside. If the supply duct system is leaky, the home can become depressurized and air from outside may be drawn into the home through infiltration.Either situation may decrease the quality of the indoor air. Research performed in the last 10 to 15 years has established these facts and a steadily growing number of HVAC contractors are addressing these issues in their work.

Now that you know that duct systems can affect both energy usage and indoor air quality, how do you know if your duct system is in good condition? The most reliable and cost effective way to determine this is to have a "duct test" performed by qualified contractors using the proper test equipment.Duct testing is the process of using

calibrated mechanical equipment to measure the amount of airflow that is lost through the duct system when it is pressurized to its normal operating pressure. While some joints or seams may have only small leaks,other sections may be completely disconnected. Duct testing can indicate the relative leakiness of the ducts and help determine if the duct system should be sealed, repaired or renovated.

Duct testing is strongly recommended when a new heating and/or air conditioning unit is being installed.If the existing duct system is leaky and inefficient before the new unit(s) is installed,it will still be leaky and inefficient after the new unit(s) is installed unless the ducts are tested and sealed by a qualified technician.It does not make sense to install a new, energy efficient heating and/or air conditioning unit unless the duct system is also energy efficient and provides the correct amount of heated and/or cooled air to each room.

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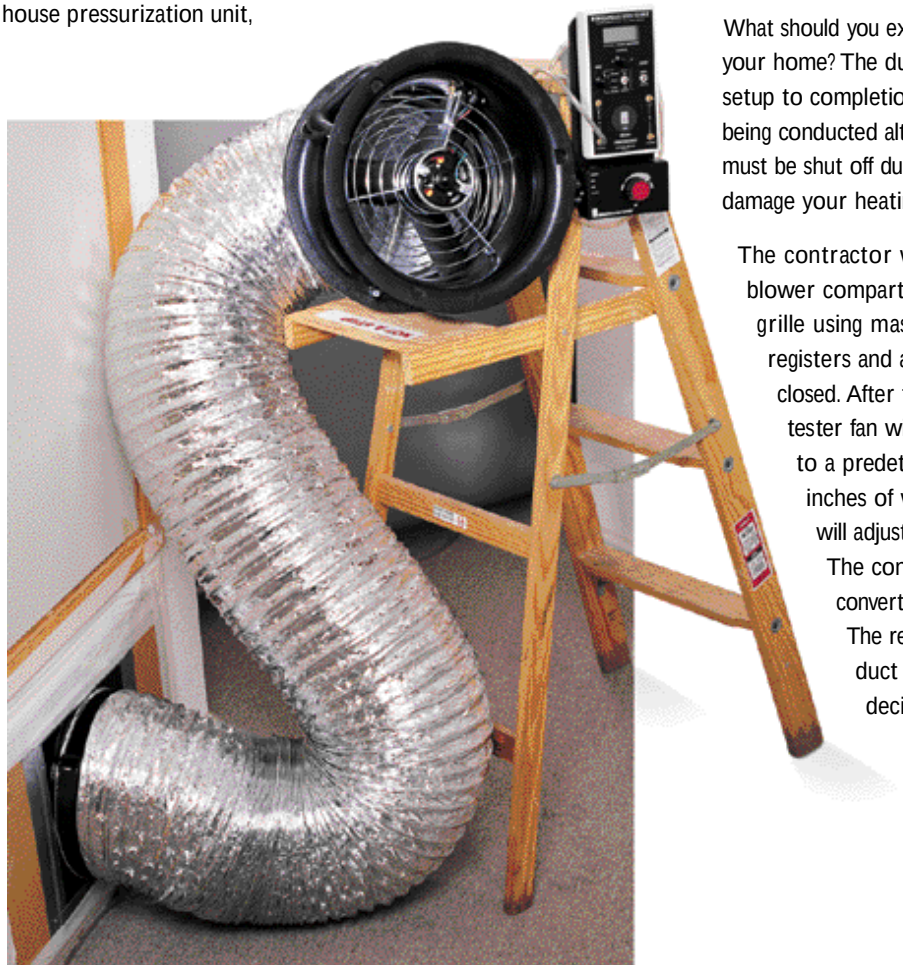
Duct testing is also recommended when a diagnostic tune-up is performed on a heating & air conditioning unit. A diagnostic tune-up can improve the operating efficiency of the heating or air conditioning unit itself. The overall efficiency will still be less than adequate, however, if the duct system is in need of repair. A duct test is necessary to determine leaks, needed repairs and/or renovations.

Keep in mind that duct testing can be performed at any time whether or not energy efficiency measures are being installed in the home. However, the results of the duct test will often indicate that duct sealing, repair or renovation must be performed to achieve an energy efficient duct system.

Duct Testing Methods and Equipment

There are two main methods to test duct systems:the "house pressurization subtraction method" and the "duct tester" method. The first method utilizes a house pressurization unit, a high-powered fan set up in a doorway and connected to pressure gauges,to pressurize first the entire house and then the house with the duct system blocked off. This method is less accurate than the duct tester method and is not used as often.



The duct tester method uses a calibrated fan that gently pressurizes the ducts and "measures" the flow through the duct leaks to indicate total duct leakage. The duct tester consists of a portable fan with calibrated digital pressure gauges that is connected at the blower compartment of the air handler or attached to the main return grille. All of the duct registers and grilles are temporarily sealed and the duct tester fan is adjusted to pressurize the system. The fan pressure is read off the gauges and converted to an equivalent duct leakage rate in cubic feet per minute (cfm). The duct tester method is the preferred method because it "measures" low air flows accurately, and the pressure distribution more closely approximates what occurs when the system is in normal operation.

Duct Testing Procedure

What should you expect when a contractor performs a duct test in your home? The duct test should take about an hour from initial setup to completion. You may stay in the home while the test is being conducted although the heating and air conditioning system must be shut off during testing. A properly conducted test will not damage your heating or air conditioning system or your home.

The contractor will have to attach the duct tester to the blower compartment of the air handler or the main return grille using masking tape *(as shown left)*. Next the supply registers and any remaining return grilles must be taped closed. After the duct system is temporarily sealed, the duct tester fan will be turned on to pressurize the duct system to a predetermined level (usually 25 Pascals which is 0.1 inches of water column) and the contractor/technician will adjust the gauges until the pressure level is stabilized. The contractor then records the fan pressure and converts this to a fan flow in cubic feet per minute (cfm). The results of the duct test will show how leaky your duct system is and help you and your contractor decide if sealing or repair work is necessary.

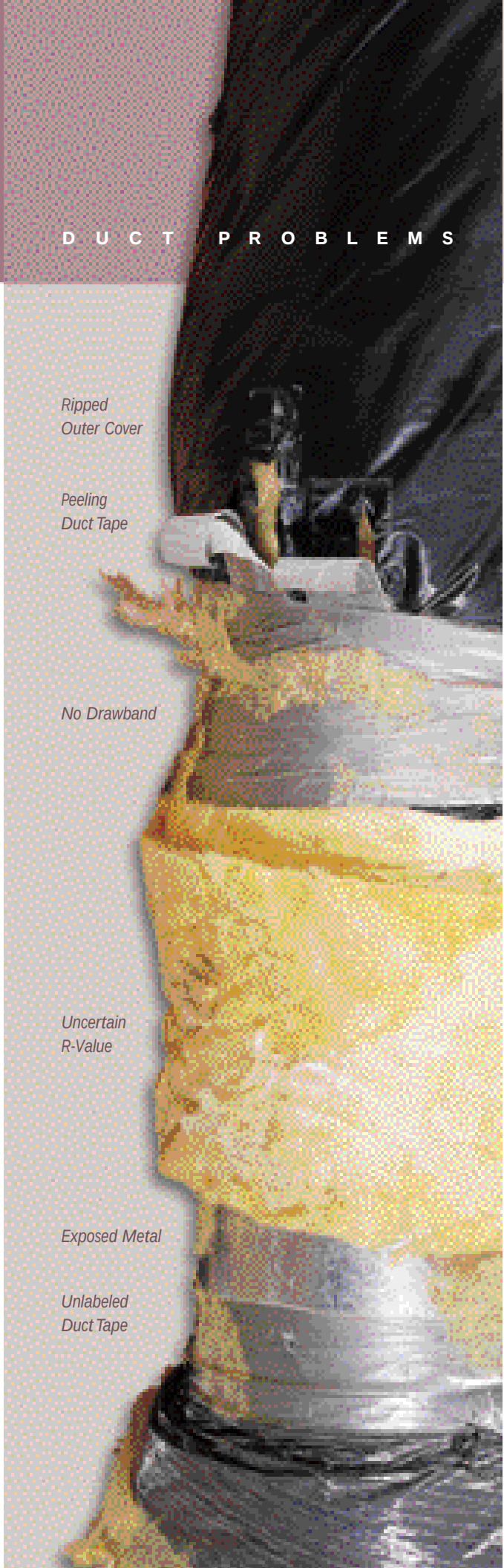
What To Do With the Results

If the test indicates the leakage is greater than acceptable, the ducts should be sealed, repaired, or renovated (replaced). In new homes the California Energy Commission has set 6% of the total air flow as the threshold below which a duct system must test in order to receive the "tight duct" energy credit. In older homes the threshold is usually set by utility-sponsored programs at approximately 12%. In either case the closer to 0% leakage the better.

SEALING

Duct sealing involves using approved materials and procedures to seal air leaks.Locations where sealing is typically performed include the supply and return plenums (which are connected to the furnace cabinet), starting collars (where ducts are connected to the plenums), fittings in the duct runs (wyes - where ducts branch off - and elbows), splices within the duct run, and terminations where the ducts connect to the supply registers. The most important leakage areas are in the supply and return plenums because these areas are closest to the air handler and under the highest pressures when the system is operating.

All sealing must be performed according to local building code requirements and any related energy efficiency program standards. These codes and standards address the type of mastic sealant, pressure sensitive tape, and drawbands used in correctly sealing duct systems and the related CFM leakage that is required. Your contractor/technician should be familiar with and follow the standards and codes for duct sealing.The materials needed are becoming more available and unlabeled "good old duct tape" should never be used.The proper tape used for duct sealing will have a "UL 181" marking or label and the proper duct mastic sealant will have a UL 181 label on the products *(as shown here)*.



REPAIR

Duct system repair involves replacing or repairing any component part, including flexible metallic and non-metallic "plastic flex" ducts, rigid metal ducts, sheet metal duct components, duct supports, register boots and registers. Repair is necessary when the existing duct system is damaged or components are missing or disconnected.

RENOVATION

Duct renovation should be performed if the duct system is in poor condition or improperly sized. Renovation involves replacing a significant portion of the duct system to restore it to proper operation.It is sometimes necessary to replace the entire duct system,but often only a portion of the ductwork needs to be replaced. Another commonly needed renovation is to increase the capacity of the return air ducting since a great many homes have return ducts which are too small, causing whistling filters, noisy ducts and reduced operating energy efficiency. If the entire duct system needs to be replaced, your contractor must correctly size the ducts and registers to make sure it will provide the most comfort and energy efficiency. For more information on duct system sizing ask for the PG&E "Duct System Sizing Tech Sheet"— available summer 2000.

For more information... Check out the SmarterEnergy Web site at:

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