



# Duct Testing

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The ducts that are part of central heating and cooling systems offer one of the best opportunities to increase your energy efficiency, increase your comfort, and manage your energy bills.

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## WHY IS IT IMPORTANT?

Studies indicate that 10%-30% of the heated or cooled air is lost—along with the money spent to heat or cool that air—through leaky ducts. Properly sized, installed, and sealed ductwork will make your heating and cooling systems significantly more efficient. Energy loss is not the only concern. Duct systems can also involve the comfort of your family, employees, tenants, or customers, as well as your indoor air quality. Testing the ducts will locate leaks or damage and focus repair work in the right areas.

A properly operating heating, ventilation, and air conditioning (HVAC) system will help reduce overall energy use—especially during hot summer days when air conditioners are working harder and putting a strain on the electric system—and will deliver greater comfort and cleaner air to every room.

## YOUR DUCT SYSTEM

In most residential and small commercial central heating and cooling systems, the conditioned (heated or cooled) air is delivered to each room through supply ducts and returned through the return duct to the furnace or air conditioner. The condition of both sections of this ductwork is vital to the overall efficiency of your heating and cooling system.

*What can go wrong?* In some buildings, air escapes through poorly connected, disconnected, or deteriorated ducts, which can result in little conditioned air actually reaching your living or work space, leaving the area too warm or too cold. If the return duct system is leaky, it could be drawing in outside, stale, or polluted air and distributing it throughout the building; this air could come

from an attic, a crawl space, or combustion air from a gas furnace, clothes dryer, stove, or water heater. If the supply duct system is leaking, the building can become depressurized, and air from outside may be drawn in to the ducting and distributed into the building. Either situation may decrease the quality of the indoor air. Research performed in the last 10 to 15 years has established these facts, and steadily increasing numbers of qualified HVAC contractors are learning how to eliminate duct leakage.

*How do you know if your duct system is in good condition?* The most reliable and cost-effective way to find out is to have a duct test performed by a qualified contractor or technician 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 at 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 whether the duct system should be sealed, repaired, or renovated.





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## WHEN TO TEST

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 is installed, it will still be leaky and inefficient after the new unit is installed—unless the ducts are tested and sealed by a qualified contractor. 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.

Duct testing is also recommended when a diagnostic tune-up is performed on a heating and air conditioning unit. A diagnostic tune-up can improve the operating efficiency of the heating or air conditioning unit itself, but the overall efficiency will still be less than adequate if the duct system is not in good condition. A duct test is necessary to determine leaks, needed repairs, and/or renovations.

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It is not unusual to find that sealing, repair, or renovation must be performed to complement a comprehensive HVAC installation.



## TESTING METHODS AND EQUIPMENT

There are two main methods of testing. The *pressurization subtraction method* utilizes a pressurization unit (i.e. a high-powered fan set up in a doorway and connected to pressure gauges) to pressurize first the entire space that is heated and/or cooled and then the same space with the duct system blocked off. This method is less accurate than the duct testing method.

The *duct testing method* uses a calibrated fan that gently pressurizes the ducts and measures the airflow through the ducts to indicate total 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 grill. All of the duct registers and grills are temporarily sealed, and the duct tester fan is turned on to pressurize the system. The fan pressure is read from the gauges and converted to an equivalent duct leakage rate in cubic feet per minute (cfm). If the amount of air loss falls outside acceptable limits, sealing will be required to correct the condition. This method of testing is preferred, because it measures low airflow accurately, and simulates what takes place under normal operating conditions.

## TESTING PROCEDURE

What should you expect when a contractor performs a duct test at your home or business? The test should take about an hour from initial setup to completion. You may be present 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 building.

The contractor will have to attach the duct tester to the blower compartment of the air handler or the main return grill using masking tape. Next the supply registers and any remaining return grills 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 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. The results will show how leaky your duct system is and help you and your contractor decide whether 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). The threshold is set by the October 2005 Title 24 Building Code, which requires duct leakage to be reduced by 15% of the pre-work leakage found. In every case the closer to zero leakage attained, the better your duct system will perform.

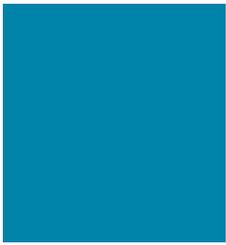
### Sealing

Duct sealing involves following established procedures and applying approved materials 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 (Ys, 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 Title 24 building codes and any related energy efficiency program standards. These codes and standards address the type of mastic sealant, pressure sensitive tape, and drawbands used to correctly seal duct systems. Your contractor should be familiar with and follow the standards and codes for duct sealing. The proper materials are becoming more available, and "good old-fashioned cloth duct tape" should never be substituted. The proper tape used for duct sealing will have a "UL 181" marking or label on the outside surface of the tape, and the proper duct mastic sealant will have a UL 181 label on the product container.

## DUCT PROBLEMS





### Repair

Duct system repair involves reconnecting parts that have become separated, and replacing or repairing any damaged or missing component parts, which could include flexible metallic and non-metallic “plastic flex” ducts, rigid metal ducts, sheet metal duct components, duct supports, register boots, and registers.

### 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 ductwork, either to restore it to proper operation or to increase the capacity of the return air ducting. Some systems have return ducts that are too small, causing whistling filters, noisy ducts, and reduced energy efficiency. If size is not the problem, often only a portion of the ductwork needs replacement. But if the entire duct system needs to be replaced, your contractor must correctly size the ducts and registers to ensure that the new ductwork will provide the most comfort and greatest energy efficiency.

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### Related Fact Sheets:

- A Whole-System Approach to Heating and Cooling
- Heating
- Cooling
- Heat Pump
- What Is HVAC System Sizing?
- Air Conditioner Refrigerant Charge and Airflow
- Buying a Central Air Conditioner? Ask for a TXV!
- Buying an Air Conditioner? Remember the EER!

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**OPTIMIZING THE ENERGY EFFICIENCY OF YOUR VENTILATION SYSTEM REDUCES YOUR ENERGY COSTS AND BENEFITS THE ENVIRONMENT BY CONSERVING OUR NATURAL RESOURCES AND REDUCING AIR EMISSIONS.**

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