



IDENTIFYING AND SEALING AIR AND DUCT LEAKS

Tips and tricks for increasing your home's energy efficiency

Ensuring that your home's envelope (floors, walls, doors, windows, ceilings) and duct work are properly sealed is one of the **most significant** home energy efficiency improvements that you can make! ^[13]

Air Sealing

- Air leakage or **infiltration** occurs when outside air enters a home through gaps, cracks, and openings. ^[14]
- Infiltration may increase your home heating and cooling costs by 30% to 40%! It also contributes to health and indoor air quality problems such as moisture, pollution, and dust. ^[4,14]
- Homes with infiltration problems usually have higher energy bills and inconsistent temperatures between rooms. ^[5]

Common locations for infiltration to occur include:

- plumbing, chimney or wire penetrations through insulated walls, floors and ceilings;
- fireplace dampers;
- attics
- attic access hatches;
- recessed lights and fans;
- missing plaster;
- electrical outlets and switches;
- dropped ceilings above bathtubs and cabinets. ^[1]
- A home's attic is the most common place for infiltration to occur! ^[7]
- Infiltration problems are addressed through a process called **air sealing**, which involves identifying and sealing gaps, cracks, and openings. ^[2, 5] Professional contractors can quickly identify infiltration problems by performing a blower door test. Blower door tests and other tests performed by professionals will be discussed in the following sections.

Duct Sealing

- Air leakage can also occur within the ducts of a home's heating and cooling system. Holes, rips, or tears in the duct work of a home are repaired using **duct sealing** methods. ^[5,6]
- Ducts must be sealed so that treated air is not lost from the system. Leaky ducts will cause high utility bills! Air must be delivered to interior rooms effectively for the heating and cooling system will run with greater energy efficiency. ^[5]
- Most ducts are made of flexible sheet metal—if the ducts in your home are older than 10-15 years, they probably need to be replaced! ^[6]



National Home Performance Council

- Air leakage from ducts can be assessed by visually inspecting duct work or feeling for air leaking out of supply ducts while the furnace blower is on.^[8]
- Properly sealed ducts can improve a home's heating and cooling system efficiency by as much as 20%.^[6]

Sealing Materials

- The type of sealant to properly seal leaks in a home's envelope or duct work depends on the size of the gap or hole. The use of a combination of sealing materials is usually most effective. Common materials include:
 1. **Caulk**—best used for small cracks and gaps and available in different grades (interior, exterior, high temperature) depending on application^[14]
 2. **Expanding foam**—best for sealing larger cracks and holes. Never fill a gap to the point of overflowing!^[9]
 3. **Backer rod/crack filler**—flexible foam that can be used to fill deep cracks before sealing with caulk.^[1]
 4. **Rigid foam insulation**—can be used to seal large openings around attic hatches, plumbing openings, and chimneys.^[1]
 5. **Weatherstripping**—used to seal doors, windows, and attic hatches^[14]
 6. **Mastic and tapes**—used to seal duct connections and joints
 - mastics and tapes are categorized by UL Standards and are marked for use in intended applications^[10]

*Note: Consult the UL Standards [website](#) for standards listings

*Caution: Caulk and spray foam are very messy! Spray foam cannot be removed from fabric and is not easily removed from skin. Always wear gloves and put down protective coverings on floors.^[9] Do NOT use spray foam near flammable applications or on windows/doors.^[14]

*Remember, despite the name, you should never use duct tape when sealing duct work!^[3]

- With the correct sealing materials and tools, many air and duct leakage problems can be fixed with DIY sealing projects! Air leaks and drafts can be felt easily around windows and doors. Large rips or holes in duct work can be identified visually as well.
- Leaks in attics, basements, and crawlspaces are more difficult to identify and may require an assessment by a professional.^[6] Professional contractors use equipment and tests that measure how well your home's ventilation system is performing in ways that cannot be seen with eyes alone.^[16]
- Most professionals will be able to provide you with a verification of the testing or a certificate listing the results of the duct system and envelope air leakage testing results.^[11]

Benefits of Proper Sealing

- Tightening a home through air and duct work sealing can provide a number of benefits.^[6,11,12]
 1. lower utility bills
 2. fewer drafts and thus improved comfort
 3. less chance of mold because of trapped moisture
 4. enhanced indoor air quality
 5. better performance of the home's ventilation system
 6. possibility to reduce size of heating and cooling equipment capacities
 7. improved durability





National Home Performance Council

Sealing Standards

- The 2012 International Energy Conservation Code (IECC) includes sealing requirements for new construction, additions, or alterations of homes. ^[11]
- These requirements apply where the 2012 IECC has been adopted by state and local authorities. For more information on these requirements and the adoption of the IECC by the states visit the Department of Energy's Building Energy Code Program [website](#). ^[11]
- Duct work efficiency is part of many state energy efficiency programs. These programs will address the specific requirements and manuals to follow when installing/replacing duct work. ^[15]

Looking to hire a professional contractor?

- [ENERGY STAR](#) provides information and tips for homeowners when choosing a professional contractor for improvement projects.
- A professional can test for infiltration using a blower door test or an infrared camera.
- A blower door test uses a fan that is sealed to the entrance door of the home. The fan blows air to pressurize or depressurize and measure the flow-rate of the air escaping through gaps or openings in the home's envelope. The flow-rate is an indication of how well the home is or is not sealed. ^[11]
- Infrared photographs show the locations where a home or building is losing heat. In the following infrared photograph of a recessed ceiling light, the purple color indicates areas of high heat loss. ^[11]

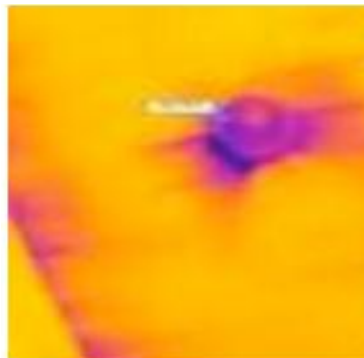


Photo from the Department of Energy's Building Technologies Program [Air Leakage Guide](#)

- Leakage from ducts can be tested by a professional using a duct blower and a pressure gauge. The duct-blower test uses a fan to measure the air leakage rate from the air ducts. ^[16]



REFERENCES

1. American Council for an Energy-Efficient Economy, "Building Envelope", *Consumer Resources*. <http://www.aceee.org/consumer/building-envelope#seal>.
2. Conservation Services Group, "Air Sealing", *Learn the Lingo*. http://www.csgrp.com/consumer/takeaction/lingo.html#close_airseal.
3. Conservation Services Group, "Save Quick", *Take Action*. <http://www.csgrp.com/consumer/takeaction/savequick.html>.
4. EcoBroker, "Sealing the Existing Home", *Green Topics*. <http://www.ecobroker.com/misc/articleview.aspx?ArticleID=20>.
5. Four Walls Home Energy Efficiency, "An Introduction to Air Sealing and Duct Sealing", *Learn*. <http://www.fourwallsenergy.com/introduction-air-sealing-and-duct-sealing>.
6. Green Homes America, "Duct Sealing & Replacement", *Services*. <http://www.greenhomesamerica.com/services/insulation-air-sealing/71-air-duct-sealing.aspx>.
7. Green Homes America, "Insulation & Air Sealing", *Services*. <http://www.greenhomesamerica.com/services/19-energy-efficient-insulation-and-air-sealing.aspx>.
8. Krigger, J. & Dorsi, C. (2009). *Residential Energy—Cost Savings and Comfort for Existing Buildings* (5th ed.). Helena, MT: Saturn Resource Management Inc.
9. Simchak, Tom. (August 10, 2010) . "Living Efficiently with Tom: Air Sealing with Caulk and Spray Foam", *Alliance to Save Energy*. <http://ase.org/efficiencynews/home-tom-air-sealing-caulk-and-spray-foam>.
10. U.S. Department of Energy, "Air Distribution System Installation and Sealing—Proper Duct Installation Increase Efficiency", *Technology Fact Sheet*. http://www.toolbase.org/pdf/designguides/doe_airdistributionsysteminstallation.pdf.
11. U.S. Department of Energy, "Air Leakage Guide", *Building Technologies Program*. http://www.energycodes.gov/publications/resourceguides/packets/al_guide/EERE_Air_Leakage_Guide_WEB_File.pdf.
12. U.S. Department of Energy, "Air Sealing", *Energy Savers*. http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11230.
13. U.S. Department of Energy, "Air Sealing an Existing Home", *Energy Savers*. http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11240.
14. U.S. Department of Energy, "Air Sealing—Seal air leaks and save energy!", *Technology Fact Sheet*. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/26446.pdf.
15. U.S. Department of Energy, "Better Duct Systems for Home Heating and Cooling" *Building America*. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/30506.pdf
16. U.S. Department of Energy, "Retrofit Techniques & Technologies: Air Sealing—A Guide for Contractors to Share with Homeowners", *Building America Best Practices Series Volume 10*. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/ba_airsealing_report.pdf.