Indoor Air Quality

and what it means to you.

GEORGIA POWER

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Southface

Responsible Solutions for Environmental Living

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Southface
Responsible Solutions for Environmental Living

Southface promotes sustainable homes, workplaces and communities through education, research, advocacy and technical assistance.

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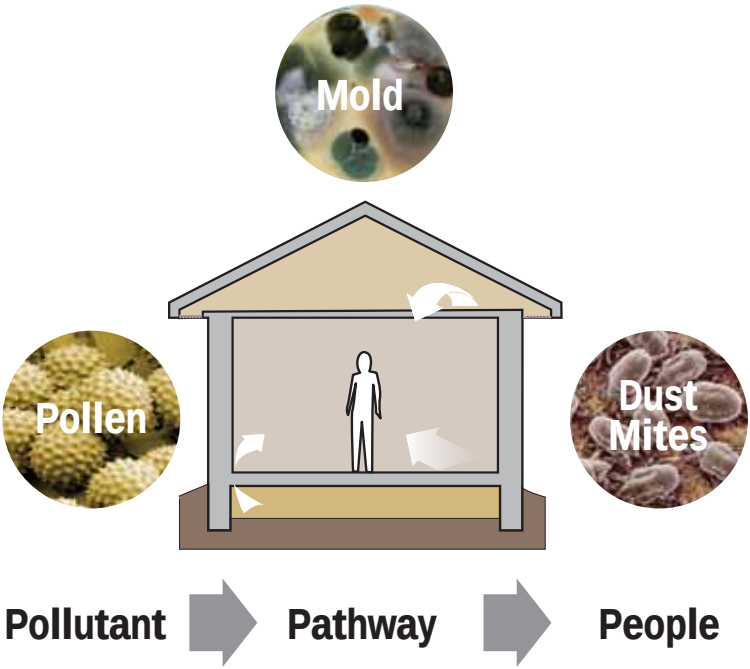
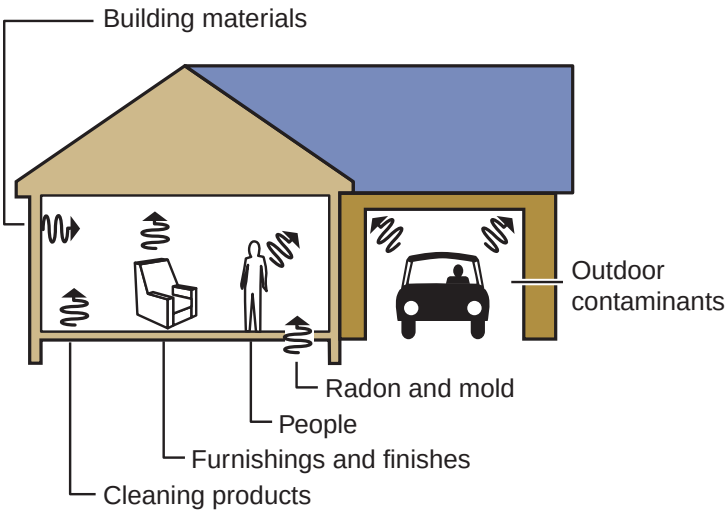


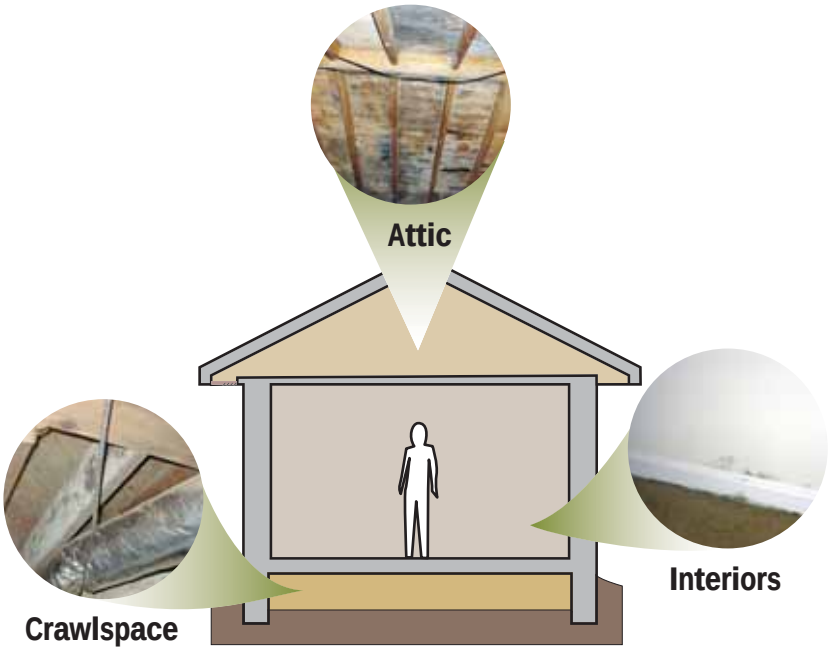
Why is indoor air quality important?

Americans spend approximately 90 percent of their time indoors. Studies conducted by the Environmental Protection Agendy (EPA) show that indoor air can be two to five times more polluted than outdoor air. Therefore, many people face greater risks to their health from the air they come into contact with indoors. Families suffer from respiratory problems, allergies, and other health problems due to the quality of their indoor air. The Center for Disease Control (CDC) released a report noting that asthma rates among children are at an all time high, putting them at an even greater risk of suffering from poor indoor air quality.



What causes poor indoor air quality?

Poor indoor air quality results from pollutants that have a pathway to people. Air quality issues are resolved when the pollutant is removed or if the pollutant no longer has an easy way to reach the occupants' lungs. Organisms such as dust mites and mold thrive when moisture levels rise. Some materials inside homes release or off-gas pollutants that are harmful to the respiratory system. There are also naturally occurring pollutants, such as radon, that can creep into homes and combustion gases that can create health risks due to poor venting.



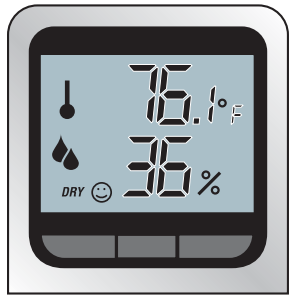
Mold

Mold is a common indoor air pollutant that can cause allergies, trigger asthma attacks, and in some cases produce mycotoxins that can be harmful to health. An outbreak requires mold spores, organic food sources such as wood, carpet and drywall, typical room temperatures, and high moisture content (above 70 percent relative humidity) to thrive. Because mold spores and food sources are everywhere, the humidity inside the home must be controlled to prevent mold outbreaks. Wet or water damaged areas inside the home should be dried immediately to prevent outbreaks. Mold can grow everywhere, but it tends to flourish in areas that are dark and have poor circulation.

Trisodium phosphate

If a mold outbreak does occur, it is important to take care of the moisture problem before cleaning or replacing infested areas. Without moisture control, the mold can easily return. Porous and absorptive materials, such as drywall and carpet, must generally be removed if an outbreak does occur while wood studs, joists, and other non-porous materials can often be wiped down with a mixture of mild soap and water or water and trisodium phosphate (TSP).

Small mold problems can usually be handled by individuals, but larger outbreaks typically require experienced professionals. Be sure to hire a professional with experience in mold remediation and to check references. Ensure that remediation efforts do not allow the further spread of mold spores throughout the home. In general, mold testing is unnecessary unless required for insurance or legal purposes. Mold outbreaks are visible, though they may be behind drywall, in the attic, or crawlspace.



An indoor hygrometer is a useful tool for monitoring indoor humidity levels

For more information, visit the U.S. Environmental Protection Agency's website for indoor air quality at www.epa.gov/iaq/

Photo by Eric Erbe; digital colorization by Chris Pooley. www.ars.usda.gov

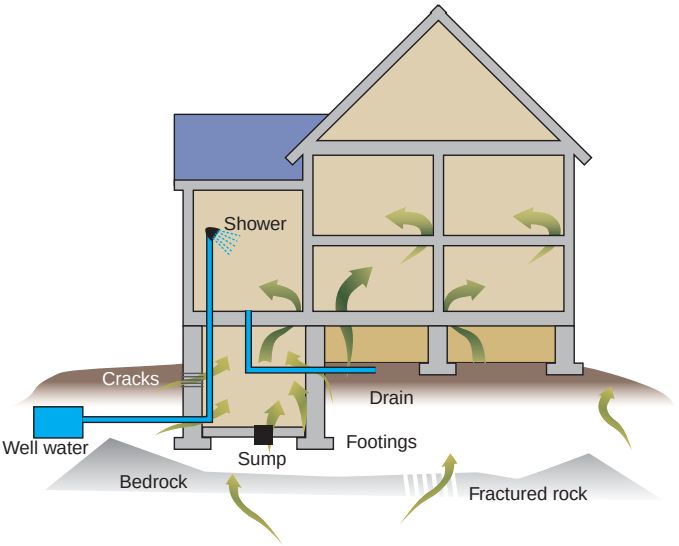
Dust

Dirt and dust can be comprised of many different materials including pollen, insulation fibers, and dust mites. Dust can typically be controlled by properly sealing the living space and filtering incoming air, but dust mites are often generated internally. Dust mites can eat just about anything organic and flourish in homes with above fifty to sixty percent relative humidity. Dust mites are microscopic animals that can cause allergies and aggravate asthma. Moisture control is again the best solution, but better filtration can help the problem. Filters must be changed regularly, but remember that filters only cleanse the air that passes through them and are therefore, at best, a partial solution. Good housekeeping helps keep dust under control. A properly functioning vacuum cleaner can make the job much easier.

Vacuum cleaners

Vacuum cleaners remove dirt and dust from the home, improving the indoor air quality. Many vacuums release much of the fine particles they pick up back into the air. Vacuums equipped with HEPA filters do a superior job of filtering air before it is released into the home. The Carpet and Rug Institute has a “green label” program that certifies vacuums that meet stringent dust removal requirements.

www.carpet-rug.org



Radon sources: Radon seeps into homes through a variety of gateways.

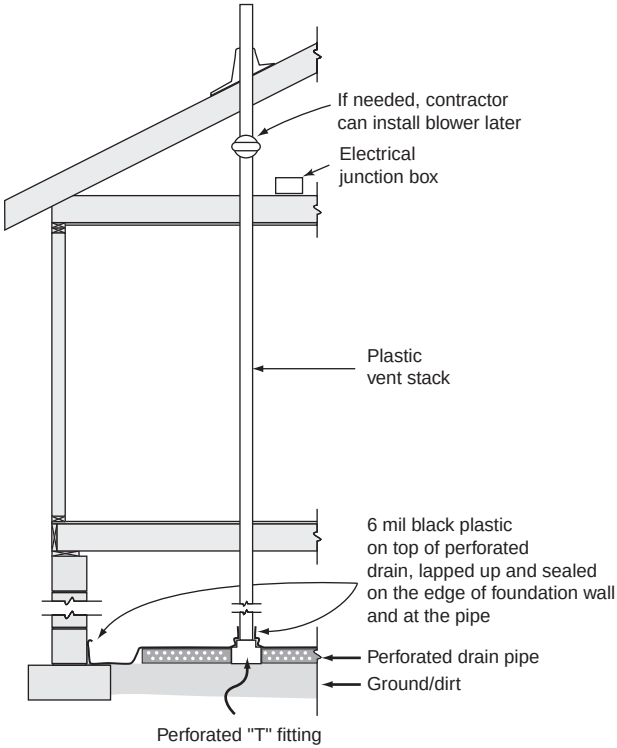
Radon and soil gases

Radon is a colorless, odorless, naturally occurring gas created by the breakdown of radioactive materials in the earth. It is the second leading cause of lung cancer (after cigarettes) and seeps into homes through cracks and seams in the foundation. The EPA and Surgeon General recommend testing for radon in all homes and reducing radon if levels are above 4 picocuries per liter. Do it yourself tests are available for free in Georgia*. Kits are also available for under twenty five dollars from home improvement stores. Other soil gases that can creep into the home include methane, water vapor, and gases released by pesticides.

Professionals are recommended for radon remediation because of the special technical knowledge required. Remediation

*See page 21 for information on receiving these kits

depends on the type and source of problem, but the main strategy involves sealing the entryways through the foundation and providing an easy path for the gases to be diverted from beneath the house



Crawlspace with passive radon-resistant technique

Add value to your home by installing a healthy anti-radon system.

Building radon-resistant features into a home costs only $100-$300 for an average new home. If the home buyer does find high radon levels, making the passive system active by installing an inline fan is less expensive for them.

Chemicals

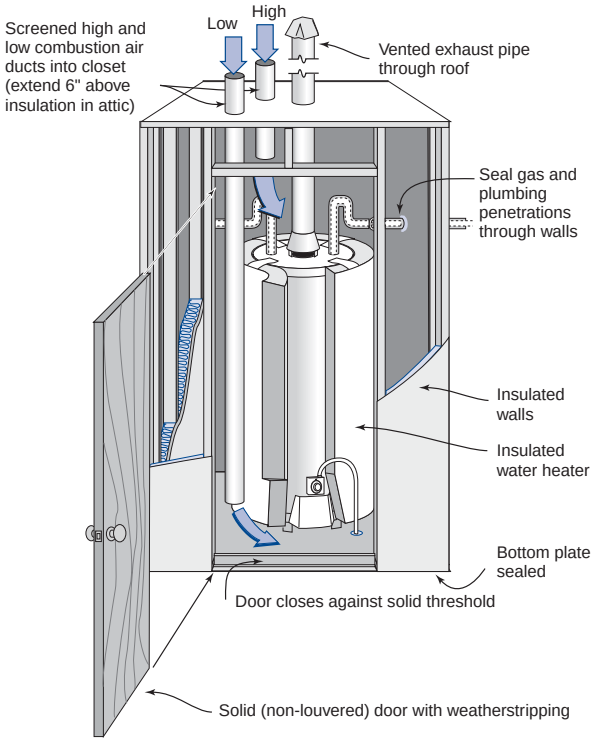
Some chemicals inside the home can be hazardous to human health in high concentrations. Volatile organic compounds (VOC's) vaporize under normal conditions and can enter the lungs. VOC's are emitted by a wide variety of products, including: paints and finishes, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, craft and construction materials including glues and adhesives, permanent markers, aerosol sprays, and wood preservatives. It is important to be in a well ventilated area while using products known to contain VOC's and to ventilate areas where products containing VOC's are being stored.

VOC's can cause a number of symptoms. These include headache, nausea, throat and eye irritation, and loss of coordination. Excessive exposure to VOC's can lead to damage to the kidneys, liver, and the central nervous system.

Low VOC paints are becoming more readily available for consumers.

Today, many alternatives are available. Almost every major manufacturer carries a line of low-VOC paints at little or no cost premium. Several carpeting options are available with low-VOC glues and are made with natural fibers, such as wool. Look for the CRI Green label *(see page7)*. Caulks and adhesives are also commercially available with no added VOC glues. And while many solid surface countertop options are available, tight budgets can still utilize laminate surfaces if the substrate has low VOC's or is sealed to reduce off-gassing.

Be cautious with room air fresheners. These products may mask odors, but do not remove any pollutants.



Sealed combustion closet safely isolates combustion appliances from people.

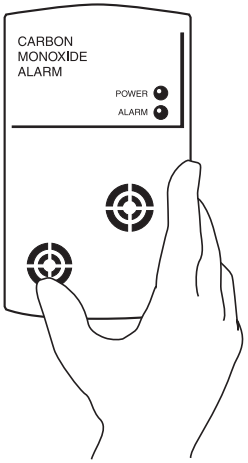
Combustion Safety

Combustion requires oxygen from air to sustain itself and creates by-products that can be harmful to people. Possible health effects range from headaches, dizziness, sleepiness, and watery eyes to breathing difficulties or even death. The pollutants from combustion include nitrogen and sulfur oxides, water vapor, carbon dioxide, and carbon monoxide. A good rule to follow is that combustion air and breathing air should NEVER be allowed to mix. Following that rule means that combustion appliances such as water heaters, space heaters, and furnaces should always be located in a non-conditioned space or be sealed combustion, direct vent.

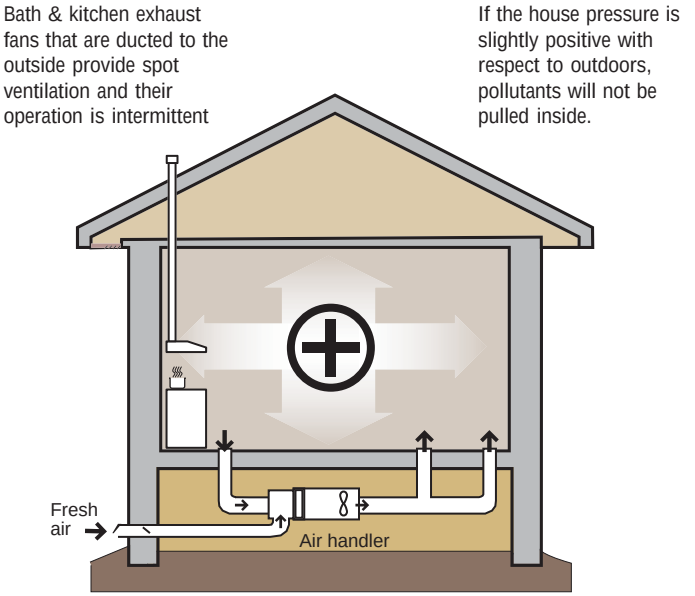
This combustion closet draws air through a louvered door, this is not recommended.

Combustion water heaters and furnaces located in attached, louvered closets can vent improperly and cause backdrafting. Backdrafting occurs when air from the outside is sucked backwards down the flue pipe due to lower air pressure inside the home. Combustion appliances located inside the conditioned space should be sealed off from the rest of the home and provided with combustion air directly to the appliance *(see diagram)*. Other sources of carbon monoxide include attached garages, which should have an exhaust fan and should never be conditioned by the central HVAC system.

Carbon monoxide detectors help ensure that combustion appliances are venting correctly and alert homeowners of dangerous conditions. Another form of combustion is smoking. The health affects of second hand smoke are well documented. Smoking inside affects all the home's occupants. Unvented gas log fireplaces are dangerous, a bad idea, and should not be used since there is no pathway for exhaust gasses to be expelled.



A carbon monoxide (CO) detector gives early warning in the event of a CO hazard



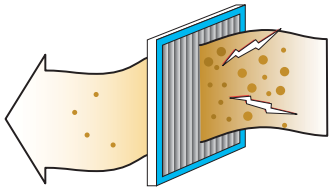
A small outside duct connected to the return creates desirable positive pressure and can be controlled to operate regularly

Ventilation, Filtration, and Pressure

Most homes heating and cooling systems only circulate air and rely on random leakage to exchange air with the outdoors. Ventilation intentionally exchanges air inside the home with air from the outside, bringing in fresh air for the occupants. Since outdoor air is usually less stale than indoor air, the introduced air will be cleaner and will dilute existing pollutants. Unfortunately, air often enters accidentally through cracks in the home's envelope and originates from undesirable locations such as the attic, crawlspace, and garage. Ideally, the air will enter though a fresh air intake connected to the duct system and will be filtered before entering the home.

There are a number of mechanical ventilation devices, ranging from outdoor-vented fans that intermittently remove air from a single room, such as bathrooms and kitchen, to air handling systems that use fans and ductwork to continuously remove

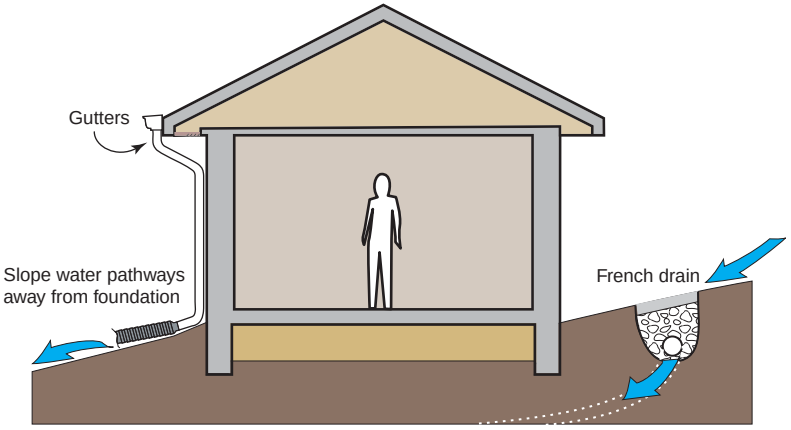
indoor air and distribute filtered and conditioned outside air to strategic points throughout the house. When there is little leakage, natural ventilation, or mechanical ventilation, the air exchange rate is low and pollutant levels can increase. However, a leaky house in particular can have poor indoor air quality due to leakage from random places. Every home should have intentional ventilation.



Air filters help to remove pollutants from indoor air. It is important to follow manufacturer's instructions and replace filters in a timely manner to keep the air clean and allow the heating and cooling systems to run efficiently. Pleated filters that are greater than two inches thick are ideal, but often require modification to the ductwork. Duct tightness is critical to a properly functioning ventilation and filtration system.

Ozone-generating devices are being marketed to the public as a solution to air quality problems. These devices can generate excessive levels of ozone and may contribute to eye and nose irritation or other respiratory health problems for users and have been shown to be ineffective at removing pollutants.

Exhaust air from chimneys, exhaust fans, and clothes dryers create a slight vacuum in the house. Acting alone or in combination, these exhaust devices can depressurize a house, leading to backdrafting and drawing in soil gases. The stack effect occurs when warm, buoyant air moves freely up and out of a house through holes in the envelope due to incorrect air sealing. This can cause a home to quickly lose pressure when the indoor air is warmer than outdoor air. The stack effect usually occurs due to gaps around vertical plumbing or ductwork. Powered attic vents are not recommended, because they contribute to house depressurization, cost energy to operate, and provide negligible benefit to building materials.



Moisture Control

Moisture control helps to keep homes comfortable and free of unwanted organisms that can cause health problems. Here are three steps that can be taken to reduce moisture inside the home.

First, it is important to keep rain and groundwater out. The basic principle is to layer materials in such a way that water is directed downward and away from the building. Utilize gravity to allow water to drain away from the building, preferably down a slight slope where the home connects to the ground. Flashing should be placed above windows and doors, which often leak, to direct water away. Housewrap and building paper are the most common water barriers. They should be placed just inside the buildings cladding to keep water from creeping into the home's interior.

Second, pressurize buildings. This rule of thumb works for all but the coldest climates in the United States. Forcing fresh air in through the air conditioning system delivers air with low humidity that is also filtered. This strategy works best if the

air is preconditioned to remove humidity and if outside air does not leak freely into the home. Another important component to this step is to have a properly sized air conditioning system. Air conditioners require longer runtimes to properly dehumidify as well as operate at peak efficiency. Oversized air conditioners will short-cycle, providing cool air that is not dehumidified. Make sure contractors perform a Manual J Load Calculation, which is required by law, before installing new equipment.

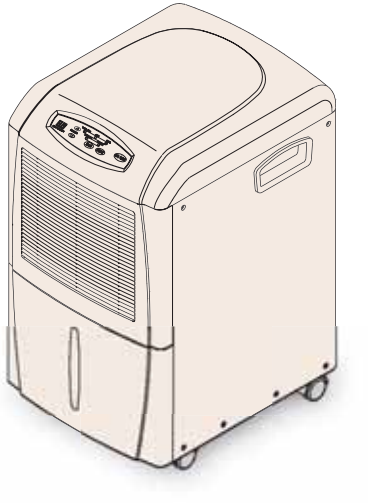
A properly-size air conditioner will ensure adequate run time to dehumidify the air in the house.

An attic "scuttle-hole" is a typical big hole in the building envelope. Sealing the edges with weather-stripping and adding insulation to the top stops unwanted airflow from the attic.

Finally, control unwanted airflow. There should be no big holes in the building's *envelope*, the barrier that separates the conditioned from the unconditioned spaces. This seems like common sense, but it is often a large problem that drives up energy bills and allows moisture and pollutants to enter the home. Warm, moist air that enters the home can quickly increase the humidity, while cold, winter air can over-dry a home.

Relative Humidity (RH)

Relative humidity is a measure of the amount of water in the air compared with the maximum amount of water the air can hold at that temperature. Warmer air can hold more water vapor. Therefore, air at different temperatures can have the same relative humidity, but different amounts of moisture. Humidifiers are band-aids for leaky homes in cold weather, when the outdoor air is dry. When necessary, room humidifiers should be used instead of whole-house units that spray water into the duct system.



Room sized appliances: Dehumidifiers take moisture out of the air; these are common band-aids for homes that are often too leaky or have drainage issues. Ultimately, the cause of the moisture problems should be diagnosed and corrected.

Relative Humidity Percentages and Outcomes

Building decay ..... 100% RH

Interior Mold ..... RH > 70%

Dust Mites ..... RH > 50%

Static Electricity, dry sinus ..... RH < 25%

Ideal Health & Comfort is 30%-50% RH at room temperature (~72° F)

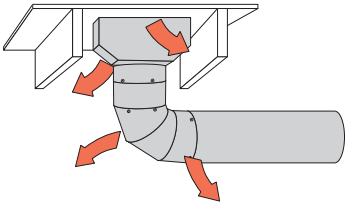
ENERGY STAR - energystar.gov

Sealing the Envelope and Ductwork

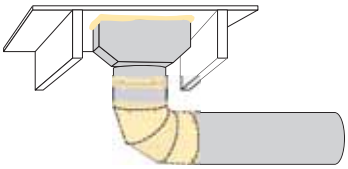
Air leakage is a major problem in both old and new homes. It not only drives up energy costs, but permits the entry of insects, water vapor, and allows the entry of pollutants. Standard insulation products, such as fiberglass, do not create a barrier that blocks the flow of air. Sheet goods, such as plywood, drywall, and rigid foam insulation usually form the air barrier portion of the building envelope. However, air can still leak through unsealed penetrations and seams.

There are a few places where air leakage typically occurs. Gaps are usually found around pipes, ducts, wiring, or where light fixtures pass through the envelope. These spots should be addressed with spray foam or caulking. While looking for holes, be sure to pull back any insulation. Weather-stripping helps prevent air from moving around doors, windows, and attic entrances. Seams that connect different components of the envelope are also common spots for cracks and penetrations and should be inspected carefully. Building

Duct Sealing Details



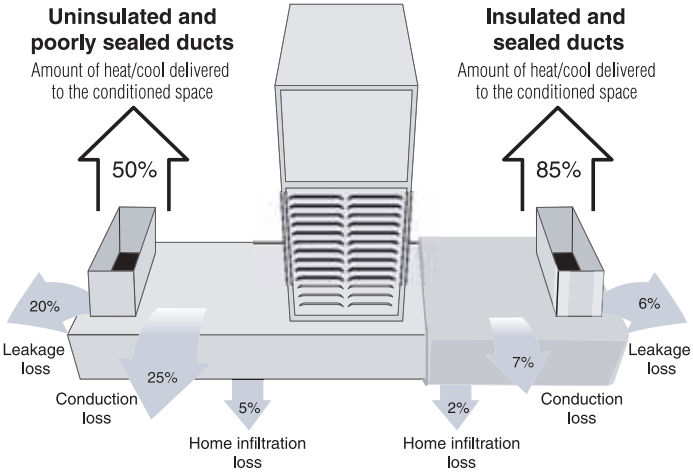
A typical boot and elbow joint will leak air at all bends and where the boot enters the house.



Seal the boot penetration into the house with foam sealants or caulk. Liberally apply mastic sealer to all joints and bends. Insulate all ductwork in unconditioned spaces to R-8 or better.

science professionals use an instrument called a blower door to depressurize the home, locate leaks, and measure the amount of infiltration that is occurring.

Pollutants can also creep in from unconditioned spaces through holes in the ductwork. These leaks create significant pressure differences that allow unfiltered air to enter the house and also waste energy. Duct connections should be sealed with mastic, a thick compound that dries to form a plaster-like, airtight seal at the duct liner.



Information Resources

- ☐ EPA Indoor Air quality resources
  - www.epa.gov/iaq
  - www.epa.gov/mold/moldguide.html
  - www.epa.gov/iaq/homes/hip-moisture.html
- ☐ Atlanta EPA office: www.epa.gov/region 4, 404-562-9900
- ☐ National Institute of Allergies and Infectious Disease-How to Create a Dust Free Bedroom: http://www.niaid.nih.gov/factsheets/dustfree.htm
- ☐ American Lung Association Healthy House: www.healthhouse.org, 800-548 8252
- ☐ Radon - Contact 404-872-3549 in Atlanta, 800-745-0037 outside of Atlanta, or email radon@southface.org for information about free test kits and a list of professional radon mitigation contractors and testers.
- ☐ Green guard - Certifies materials and products for IAQ performance. www.greenguard.org
- ☐ Buildinggreen.com
- ☐ Aerias - Air Quality Sciences - IAQ Resource Center. www.aerias.org
- ☐ Southface - see resource and services/pubications section of website at www.southface.org
  - Air sealing fact sheet
  - Ductwork Q&A fact sheet
  - Combustion Equipment Safety fact sheet
  - Air Distribution System Installation and sealing fact sheet
  - many others

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