Air Sealing Your Home

Overview

Air sealing is a strategy to reduce heat loss in a home where possible leakage areas between the outside environment and the indoors exist. Spaces such as crawlspaces, garages and attics are considered 'outdoor' and may have cracks, holes or gaps in materials, which allow outside air to leak into the home. Some new homes, but especially older homes, often have major air leakage problems. This leakage may not be readily visible to you but the impacts are substantial on the comfort, air quality, and durability of a home. Sealing these air leaks has considerable financial and comfort benefits to the homeowner and occupants.

Definitions

Air Changes per Hour (ACH) - *Describes how often all the air in your home is replaced with outside air through leakage or ventilation. The number is either presented as "normal" (ACHn) to estimate leakage under normal conditions, or with a subscript number, such as 50 (ACH_{50}). The 50 indicates 50 pascals of pressure – a standard pressure for air leakage measurement.*

Blower Door Test - *A specialized procedure that measures and quantifies the total air leakage in a home. The test can calculate the air leakage under normal conditions (ACH_n) or at a standard pressure (ACH_{50}). Either number can help you estimate the leakage and potential for improvement, comply with code or third party rating systems, and compare a home's leakage to other similar homes.*

When is Air Sealing Applicable?

For existing homes: When building an addition, performing a substantial renovation, or just making minor improvements. For best results and safety, it is highly suggested you work with a general contractor or home performance contractor. However, a handy homeowner can do much of this work.

For new construction: The 2012 Washington State Energy Code (WSEC) requires new homes to test at less than or equal to 5.0 ACH_{50}.

A blower door test during construction measures the home's air leakage at a standardized pressure. Source: O'Brien & Company

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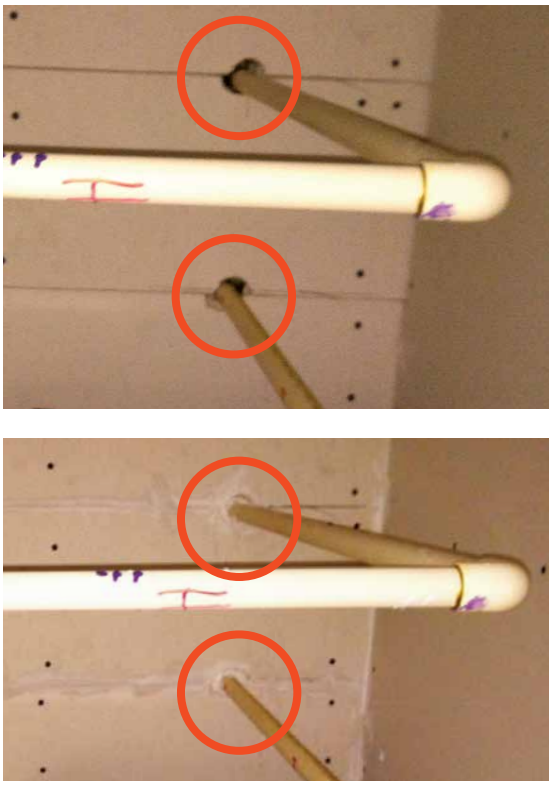

These pictures show before and after air sealing efforts at plumbing penetrations.
Source: O'Brien & Company

What Makes it Green?

Air sealing is a fundamental part of making your home more efficient, comfortable, and durable.

- Energy and cost savings from reduced operation of heating and cooling systems.
- Reduces energy use for heating and cooling, which decreases environmental impacts and air pollution from producing power or burning fossil fuels.
- Increases comfort by reducing cold air drafts and loss of conditioned air.
- Improves indoor air quality by keeping out dust, pollen and vapors from outside, garages, crawlspaces and attics.
- Enhances durability by preventing moisture-laden air from condensing on cold surfaces, creating opportunities for mold.
- Closes openings that can invite insects or rodents into your home.
- Leakage rates lower than 5.0 ACH_{50} contribute towards meeting prerequisites and earning points in LEED for Homes, and Built Green. The Northwest ENERGY STAR homes program requires even less leakage at or below a rate of 3.0 ACH_{50}.

Best Practices

When air sealing your home, consider the following guidance.

Minimize air leakage and control air changes through ventilation.

If you are inclined to do the work yourself, begin by learning more about air sealing and how to do the work safely with the Seal and Insulate with Energy Star website and the DIY Guide.

Consult with a general contractor or home performance contractor for increased safety and effectiveness.

Wear personal protective equipment, including eye protection, respiratory protection, and body & clothing protection, like gloves and coveralls.

Target the largest leaks first – the most common large air leaks are:

- Plumbing penetrations, like around tub, toilet and sink drains and where plumbing supply lines come into cabinets in kitchens and bathrooms

In a kitchen or bathroom remodel, or new construction, sealing plumbing penetrations is easy and effective. Source: O'Brien & Company

- Electrical penetrations, like where wires run through top plates, bottom plates or other wood materials

In an addition, new construction or a gut remodel, there are many opportunities to seal electrical penetrations and top and bottom plates. Source: O'Brien & Company

- Around chimneys and flues (be sure to use non-combustible sealing materials in these areas)
- Around bathroom fans and kitchen range exhaust
- Around doors (and sometimes windows)
- Between an attic access hatch and drywall
- Behind attic kneewalls
- Rim, or band, joists although these are often hard to access in existing homes

Air sealing with expanding foam or caulk at a rim joist is an effective means of sealing leaks. Source: O'Brien & Company

- Use the right sealing material for the size of the leak; for gaps smaller than 3/8" use caulk, for 3/8" to 1" use 1-part expanding foam, and for leaks larger than 1" begin by adding a solid backing like foam board insulation or plywood before sealing with caulk or expanding foam.

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- Seek out low VOC and low emitting products to reduce offgassing of vapors while working and when products dry/cure.
- Ensure the sealant you use is compatible with what you're sealing.

This picture shows the "flash" portion of a "flash and batt" installation. The flash coat of spray-in-place foam insulation creates a tight air seal. Source: O'Brien & Company

Applicable References/ Standards

Energy Compliance Form: This required form includes tables of information for required insulation levels in different framed elements of your home. It also includes a description of the air barrier and insulation installation criteria for each component in your home in Table R402.4.1.1.

Resources / Incentives

For the complete King County Green Building Handbook and individual Green Sheet PDF files, please visit our website at: http://kingcounty.gov/property/permits/publications/greenbuild.aspx. For additional information, please email dperwebinquiries@kingcounty.gov or call 206-296-6600.

See these related DPER Green Sheets (GS):

- Duct Sealing, GS Number 11
- Fresh Air Ventilation, GS Number 14
- Furnace Replacement, GS Number 18
- Insulation, GS Number 13
- Right Sizing Heating/Cooling Systems, GS Number 17
- Routine Maintenance, GS Number 5

Seal and Insulate with ENERGY STAR: A comprehensive, guided approach to choosing the scope of your project and how to get started on each part. Partner this with the Seal and Insulate DIY Guide and you're ready to go.

Puget Sound Energy; Energy efficiency rebates and offers: Current offers for rebates on a variety of items, including energy use evaluations on existing homes.

EcoBuilding Guild Technical Flash Cards: This project includes easy-to-use flash cards on specific topics. This link takes you directly to Air Sealing where you can choose topics such as "Air Seal Cove Ceiling" and "Seal Soffit at Ceiling Plane."

Air Sealing Video: This WSU Extension Energy Program video walks through air sealing details of an old home.

Air Leakage Guide: This Department of Energy Brochure provides a resource for understanding air leakage requirements in the International Energy Conservation Code (which could potentially be adopted by King County), as well as best practices and case studies.