Improving Home Energy Efficiency by Sealing and Insulating

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What is Sealing and Insulating a Home?

“Sealing and Insulating a Home” means to literally seal air leaks around the home and add insulation in cost effective places in the home.

Other phrases you hear....

- Improve the ‘Home Envelope’
- Improve the ‘shell’ of the home
- High performance envelope
- Deep Energy Retrofit
- Super insulated house
- Passiv Haus (German super insulation program)
What is Sealing and Insulating a Home?

• Sealing air leaks means plugging, stopping, or closing holes in the envelope of a home.
  - Infiltration – air leaking in
  - Exfiltration – air leaking out
  - Most common air sealing materials: Caulk, Spray Foam In-a-can, or Weather stripping

• Insulating means to add additional insulating materials to your home in cost effective locations.
  - Cost effective locations – attic, basement, or crawlspace
  - Major home improvements – remodeling, additions, or residing house
  - Most common home insulation materials
    • Fiberglass – roll, batts, or blown
    • Cellulose – blown or dense pack
    • Rigid foam board
A House with Problems

- Air Leaks
- Low Insulation
- Poor HVAC
- Leaky Ducts
- Old Appliances
- Old Water Heater
- Poor Lighting
A House with Winter Envelope Problems

- Air Leaks
- Low Insulation Levels
A House with Winter Envelope Problems

- Air Leaks
- Low Insulation

In cold weather, warm air in a home rises. Air leaks let the warm air escape and cold drafts come in.
A House with Envelope Problems

Where are the best places to look for air leaks?
- Biggest holes usually in attic and basement
- Comfort issues around window, doors, baseboards, and outlets
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A House Improved

- Air Leaks Sealed
- Insulation Added
Typical Energy Use in a US Home

Annual energy bill for a typical US home is about $2,200.

- Based on study by Lawrence Berkeley National Lab in 2009.
- Appliances: Refrigerator, dishwasher, clothes washer, and dryer.
- Other: stoves, ovens, microwaves, dehumidifiers, other small appliances.
- Average electricity price 11.3 cents per KWH.
- Average natural gas price $13.29 per MBTU.

29% + 17% = 46%

For heating and cooling costs
Why is Sealing and Insulating Important?

- ENERGY STAR estimates homeowners can save up to 10% on your total annual energy bill...or about $220 for a typical US homeowner.

- Other benefits
  - Quieter
  - More comfortable
  - Reduces holes for pests to enter
  - Makes a home more durable (prevents moisture from entering walls)
  - Reduces air pollution and carbon footprint
How Do You Find Air Leaks?

Professionals:
• Experience
• Blower doors and smoke pencils
• Infrared cameras

Homeowners:
• Use a flashlight to look for light shining through gaps around doors and windows (a piece of paper can do the same thing)
• Wet fingers on a cold windy day – hold them near a leak
• Watch for curtains being blown on a windy day
• Dirt and dust stuck in insulation up in the attic
• A lit incense stick will smoke. Hold near drafts to spot leaks.
Safety First!

Question: Can I over seal my house (make it too tight)?

Answer: Probably not, however…it is possible. The most important issue is proper venting of combustion appliances:

• Gas or Oil Furnaces
• Gas Water Heaters
• Gas Dryers

1) Avoid sealing air leaks in rooms that have this equipment.
2) Have your Heating and Cooling contractor test the equipment when they visit after you have sealed.
Safety First!

Protect yourself:

• Dust mask for attics and crawlspaces
• Eye protection, Flashlight
• Gloves
• Old Clothes
• Hard hat – nails, pipes
• Watch your step in attics
• Only use products designed for high temperatures near chimneys, furnace flues, and hot dryer vents.
Sealing Air Leaks – Caulk and Gun

- Not all caulks are for air sealing
- Indoor/Outdoor
- Elastomeric (stays flexible a long time)
- UV and heat resistant for outdoor use (Silicone)
- Good for gaps and cracks up to ~ ¼ inch
- Reduces holes for air leaks, water, and critters
- Clear caulk helps with color matching
Sealing Air Leaks – Weather Stripping

- Peal and Stick
- Polyurethane foam: cheap but does not last long
- EPDM foam: more $$ but lasts longer
- Rope caulk: good option
- Needs replacement every 5 years or so
- Important for doors
  - Measure the stop or the jam before
- Hard to use on windows
- Ask window/door manufacturer
Sealing Air Leaks – Weather Stripping
Sealing Air Leaks – Door Sweeps and Thresholds

- Attaches to bottom of door
- Nail, Screw or Stick
- Needs replacement every 5 years or so
- Reduces air leaks, water intrusion, and helps keep out the critters
Sealing Air Leaks – Outlet Gaskets and Faucet Covers

- Simple Foam Products
- Easy to install
- Gaskets can be caulked into place
Sealing Air Leaks – Spray Foam In-a-can
(2 Common Types of Foam)

• **Spray Polyurethane Foam**
  • Wear old clothes, gloves and eye protection
    • Chemicals can be absorbed through skin
    • Use in a vented area!
  • *VERY* sticky, dries hard, fairly durable
  • Different types have different expansion rates – some expand aggressively
  • Discolors in the sun
  • Clean-up – let it dry and scrape up
  • Not for high temperature locations
Sealing Air Leaks – Spray Foam In-a-can
(2 Common Types of Foam)

• **Latex Foam**
  • Wear old clothes, gloves and eye protection
    • Chemicals are not as hazardous
    • Use in a vented area
  • Not as sticky, but not as durable
  • Does not expand as aggressively
  • Breaks down over time in the sun
  • Clean-up – wash with water
  • Not for high temperature locations

• **Both Types** – Good for gaps ¼” to 3”
• **Both Types** - Reduces air leaks, water intrusion, and keeps out the critters
How Do You Add Insulation to the Attic?

- Determine how much (depth) insulation you have
  - Use a yardstick or tape measure
  - Note the type of insulation you have now (R-value/inch)
- Determine square footage of attic floor and calculate the amount needed
- Think about hiring a contractor…
How Do You Add Insulation to the Attic?

Install a baffle before adding insulation

- Prevents wind wash
- Keeps insulation out of soffit
How Do You Add Insulation to the Attic?

Examples of Fiberglass Rolls or Batts (good for D-I-Y)
How Do You Add Insulation to the Attic?

Examples of Blowing Cellulose (Blown fiberglass available)
• Need blowing machine (2 person job)
How Do You Add Insulation to Walls?

Examples of Blowing Cellulose – Drill and Fill
How Do You Add Insulation?

Examples of Spray Foam – crawlspaces, walls, ceilings
• Contractor needed
• Hazardous chemicals
Take Away: Sealing and insulating the attic is a very cost effective energy saving improvement for many homes.

Go from this

To this
Easy to use programs....

EPA and DoE ENERGY STAR Program
- Labels products and practices that save energy
- 60 Product Categories
- 3rd Party Certified Performance (data from accredited labs)
- Also New Homes and Commercial Building Standards

www.energystar.gov

EPA Water Sense Program
- Labels products and programs that save water
- 4 Product Categories: Showerheads, Faucets, Toilets, Urinals
- Products Tested in Accredited Labs
- Also labels for new homes
- Promotion of Certified Landscape Irrigation Professionals
- Considering Commercial and Industrial Programs

www.epa.gov/WaterSense
Any questions?

Thank you for your time!

[For more details get the “DIY Guide for Sealing and Insulating” at www.energystar.gov]

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