



U.S. DEPARTMENT OF ENERGY
SOLAR DECATHLON

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Improving Home Energy Efficiency by Sealing and Insulating

Doug Anderson

US EPA ENERGY STAR Program



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 mean 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

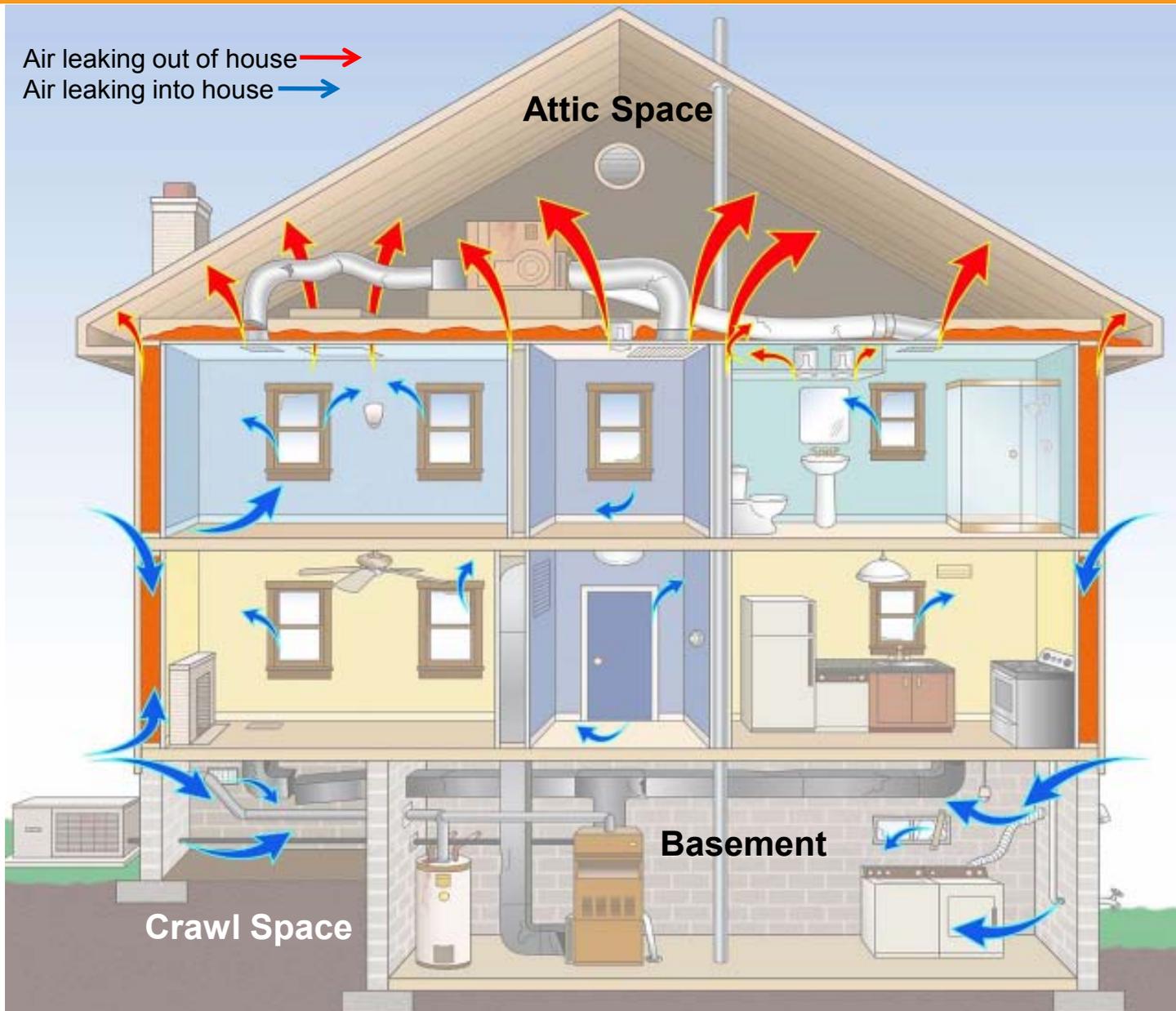
- Air Leaks
- Low Insulation
- Poor HVAC
- Leaky Ducts
- Old Appliances
- Old Water Heater
- Poor Lighting





A House with Winter Envelope Problems

- Air Leaks
- Low Insulation Levels

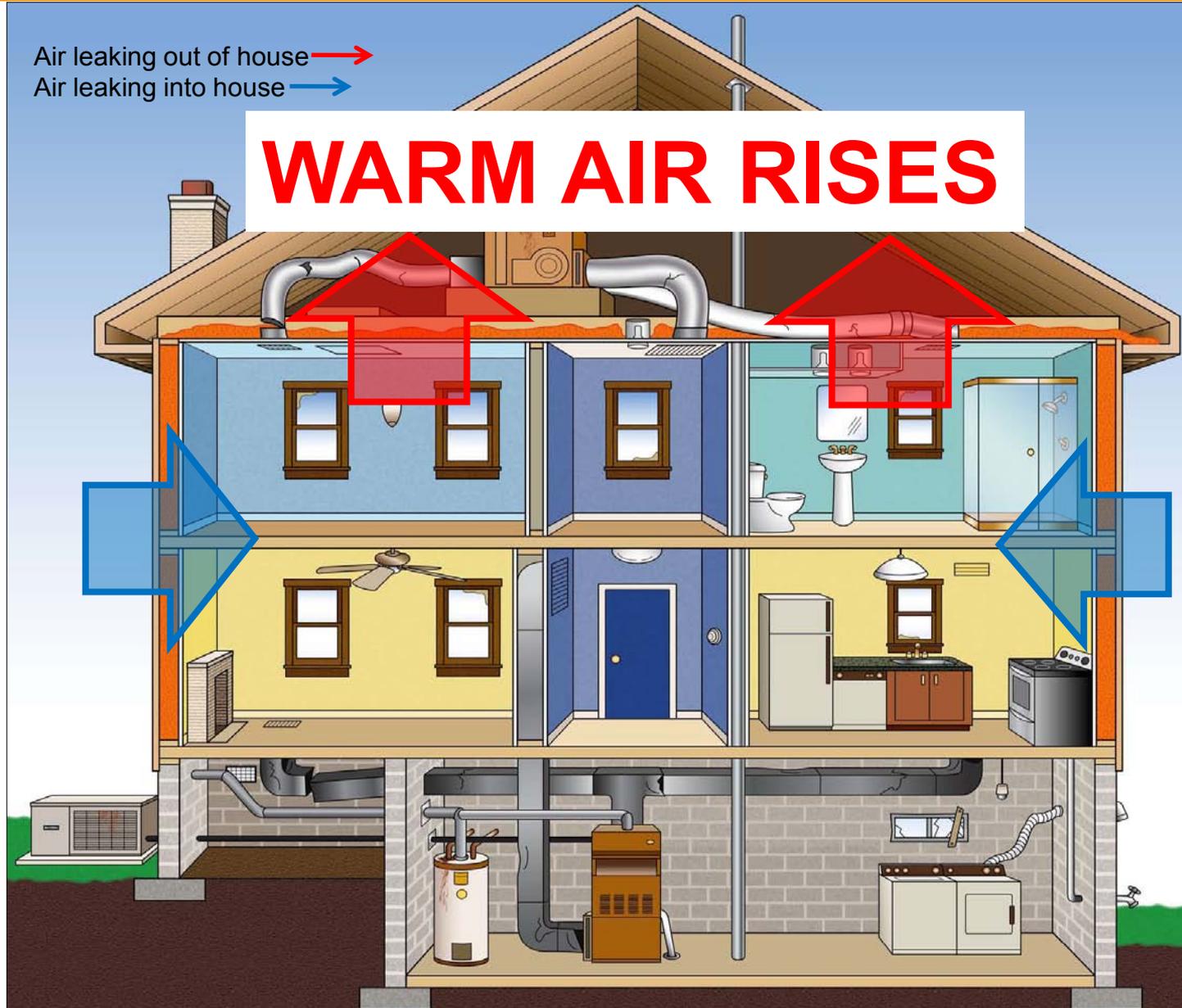




A House with Winter Envelope Problems

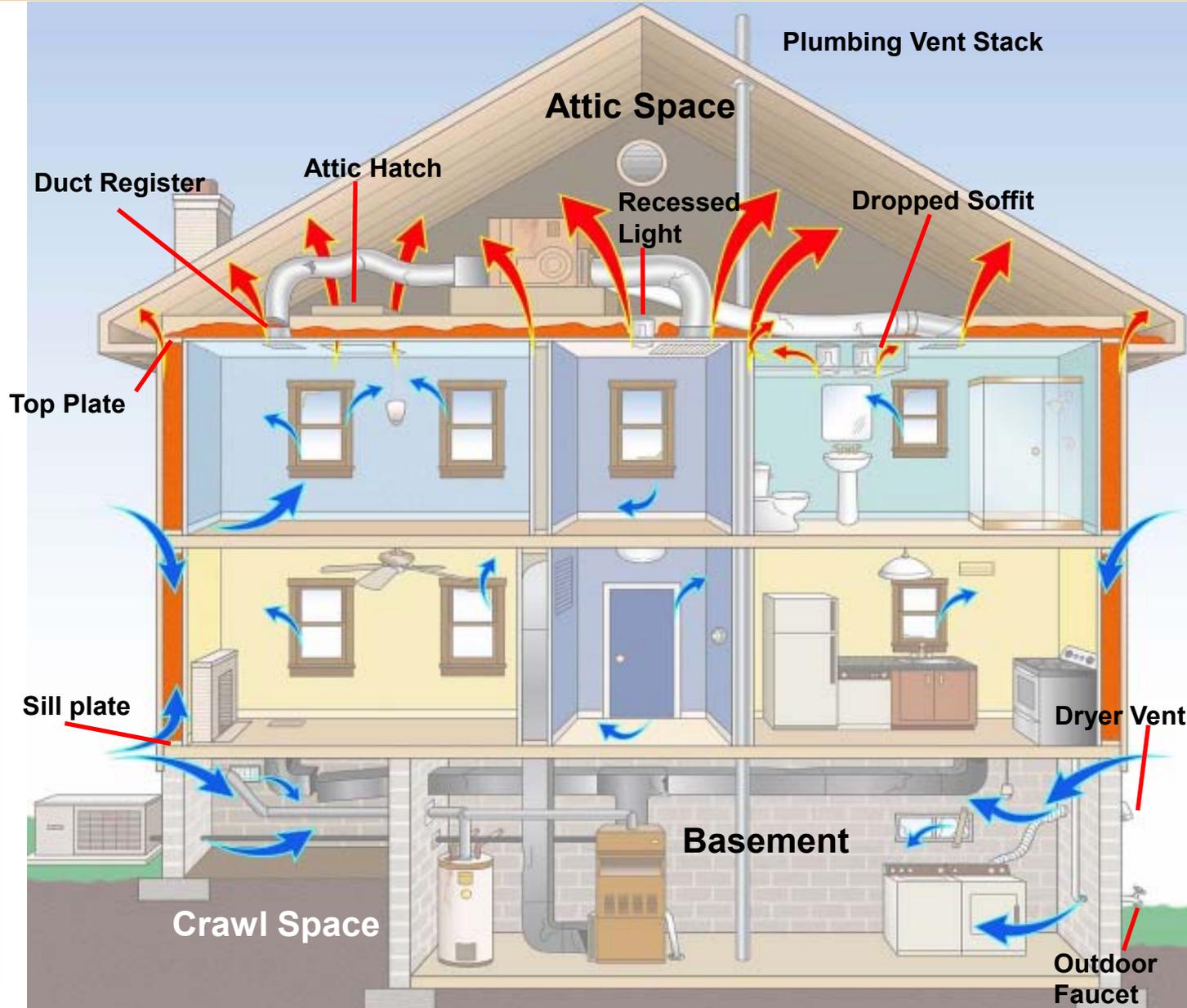
- Air Leaks
- Low Insulation

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

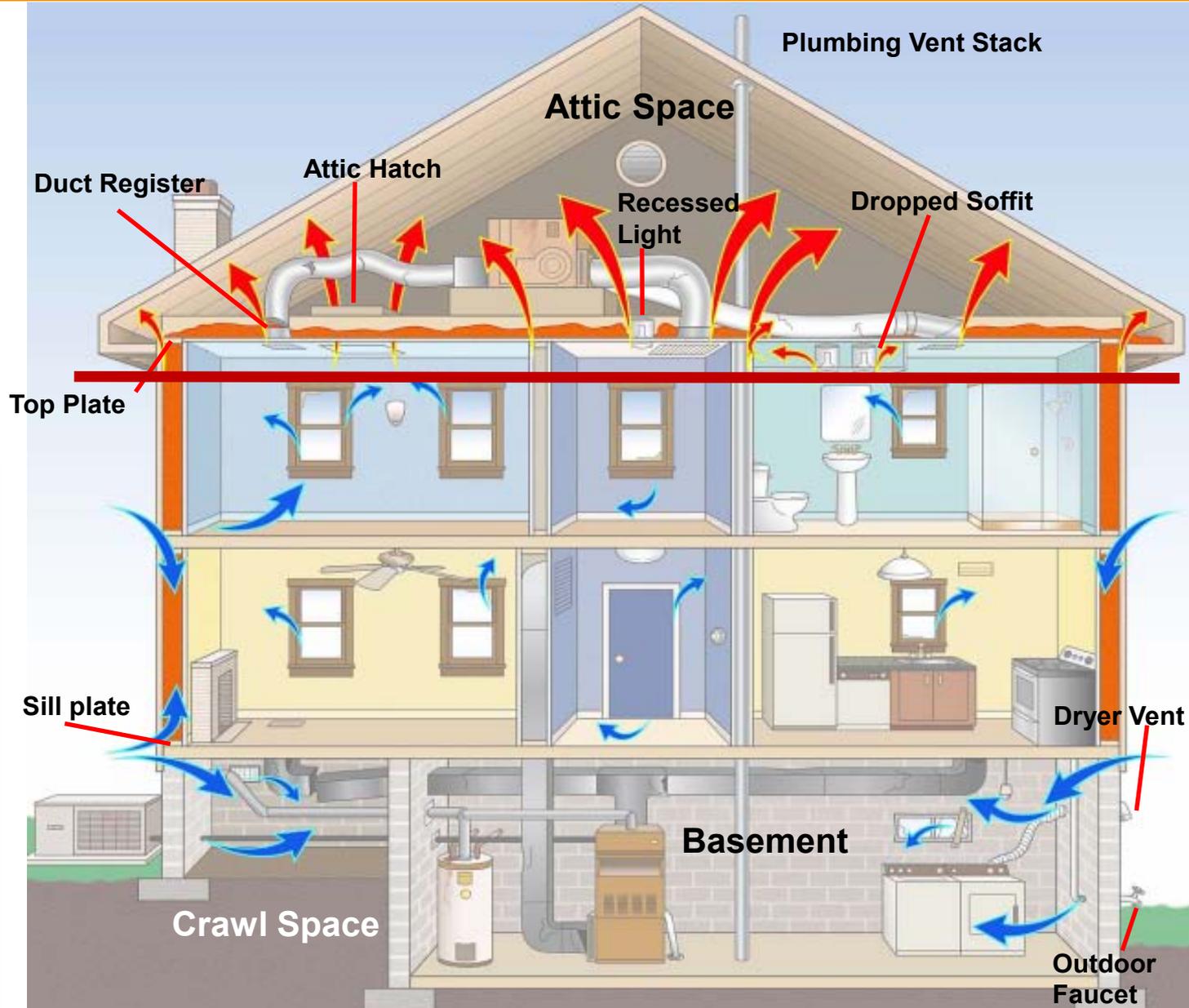


Where are the best places to look for air leaks?

- Biggest holes usually in attic and basement
- Comfort issues around window, doors, baseboards, and outlets



A House with Winter Envelope Problems



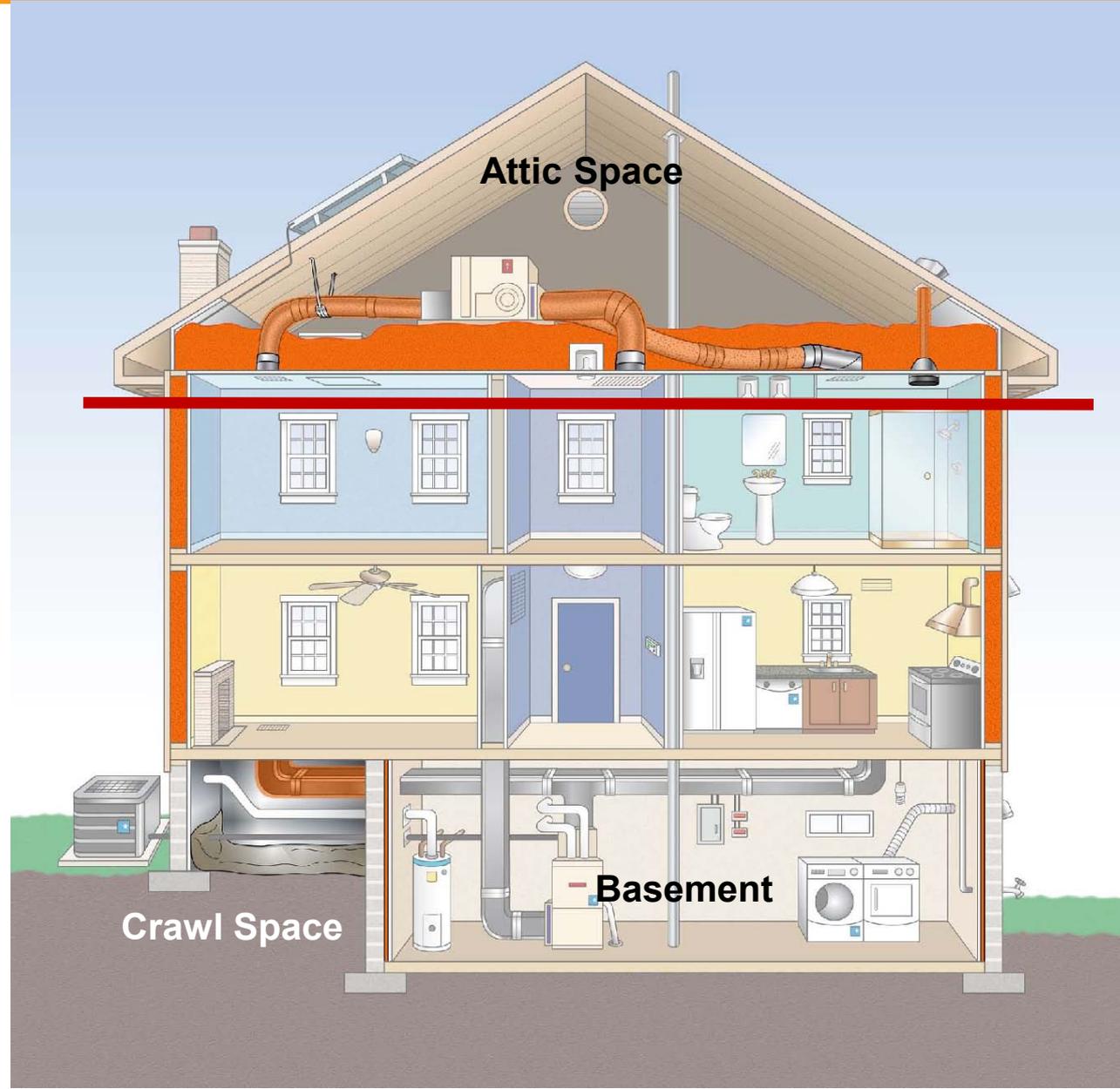
Where are the best places to look for air leaks?

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A House Improved

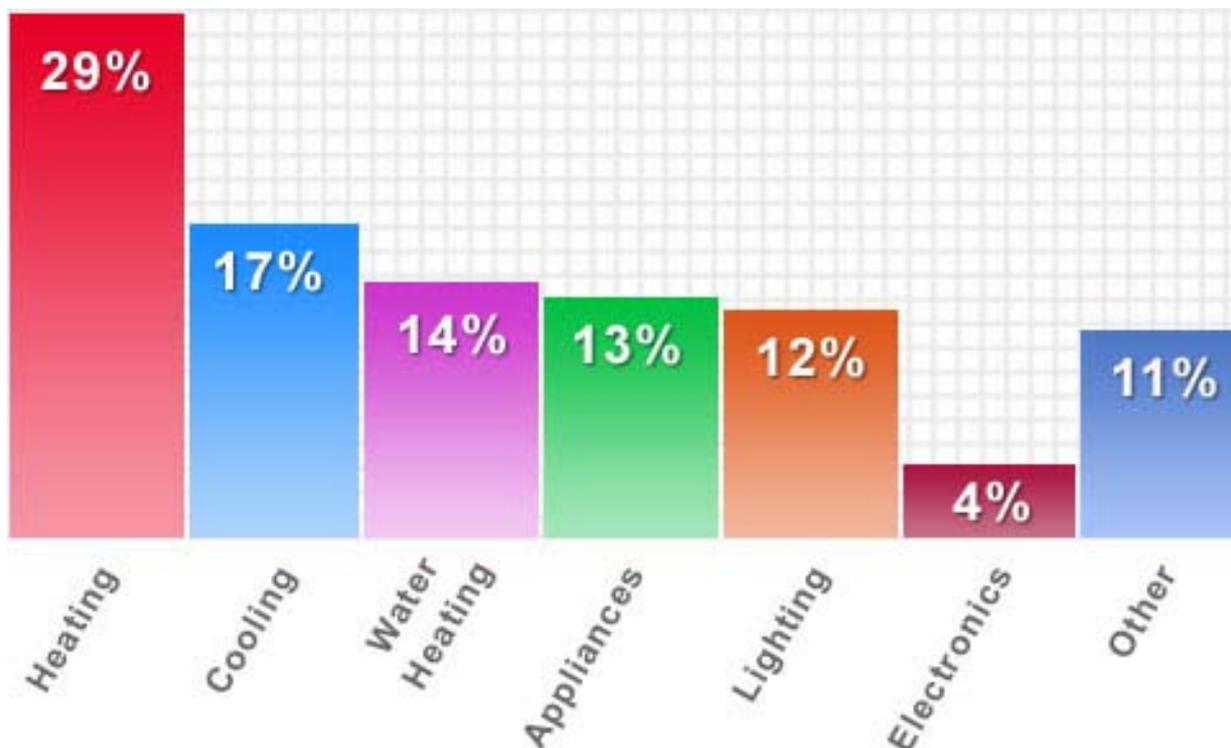
- Air Leaks Sealed
- Insulation Added





Typical Energy Use in a US Home

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



29% + 17% = 46%
For heating and cooling costs

- 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.



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.





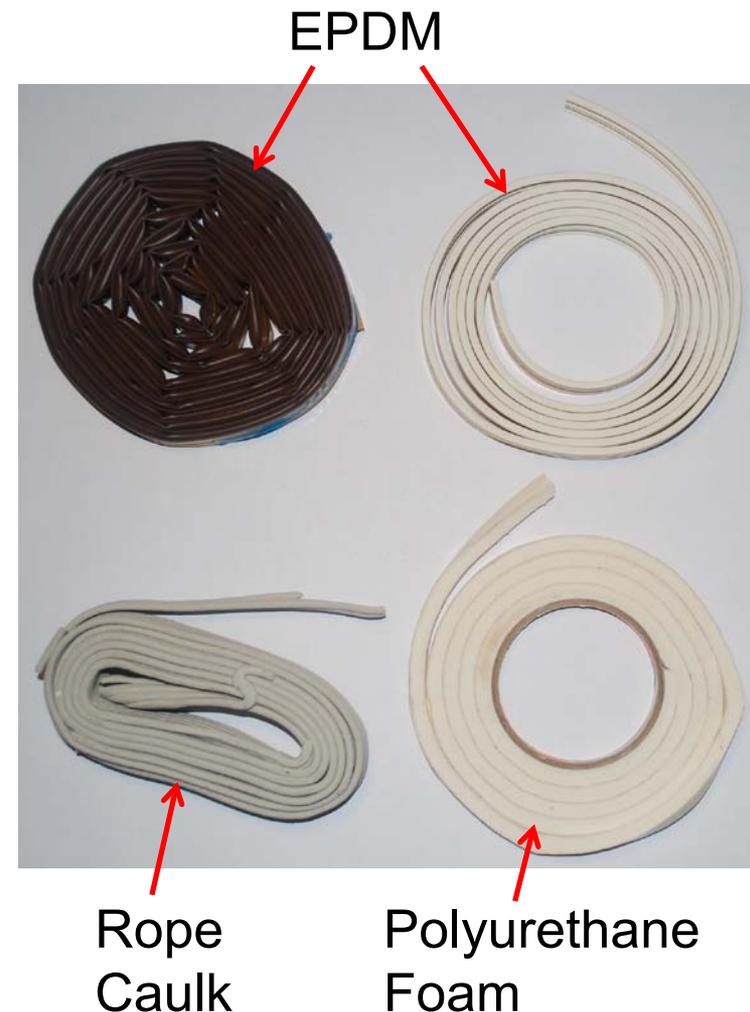
Sealing Air Leaks – Caulk and Gun

- 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 ~ 1/4 inch
- Reduces holes for air leaks, water, and critters
- Clear caulk helps with color matching



Sealing Air Leaks – Weather Stripping

- Peel 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



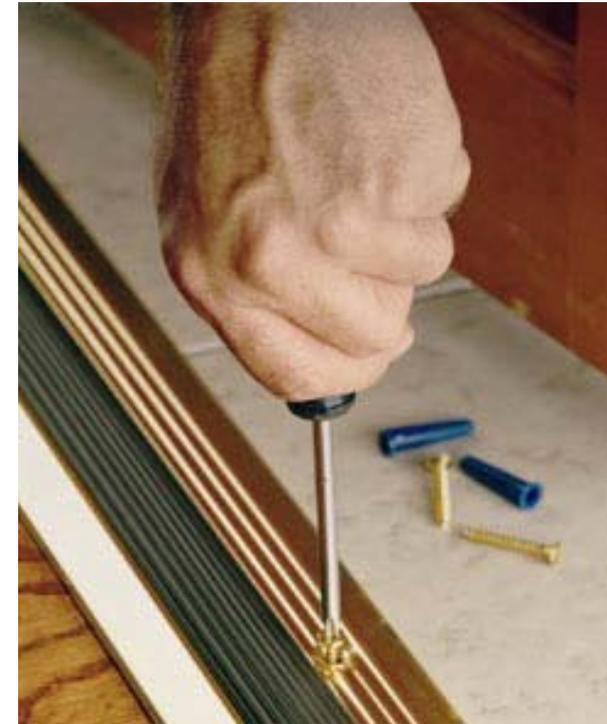
Door Stop





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 1/4” to 3”**

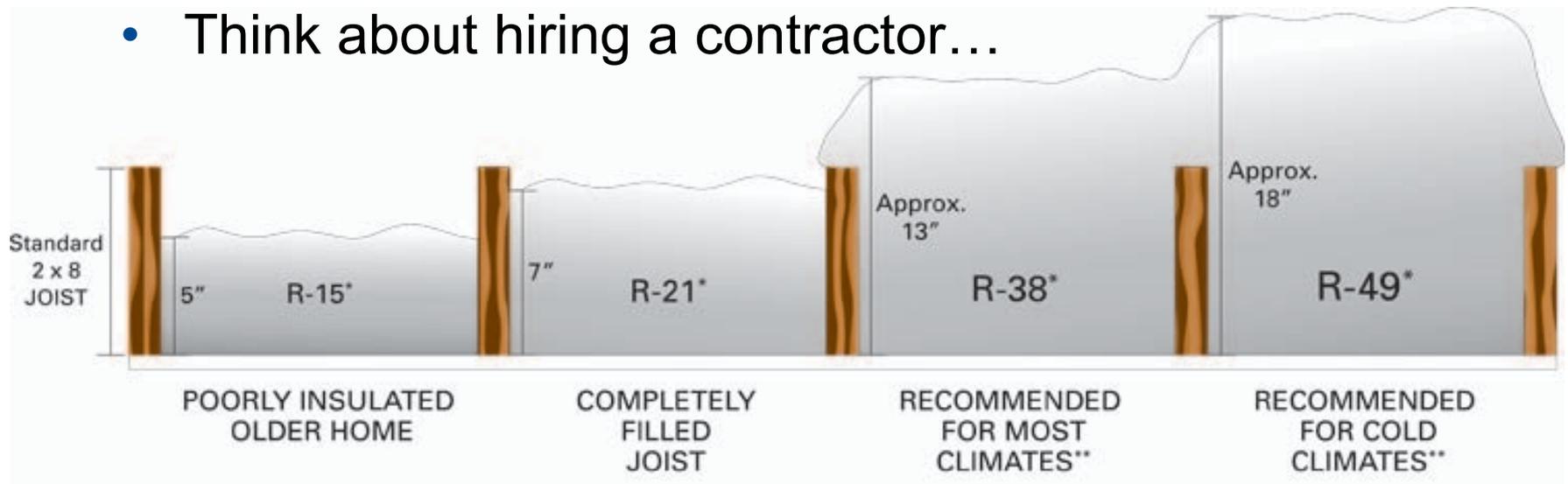
- **Both Types - Reduces air leaks, water intrusion, and keeps out the critters**





How Do You Add Insulation to the Attic?

- Determine out 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...



*Blown insulation has an estimated R-value of about R-3 per inch

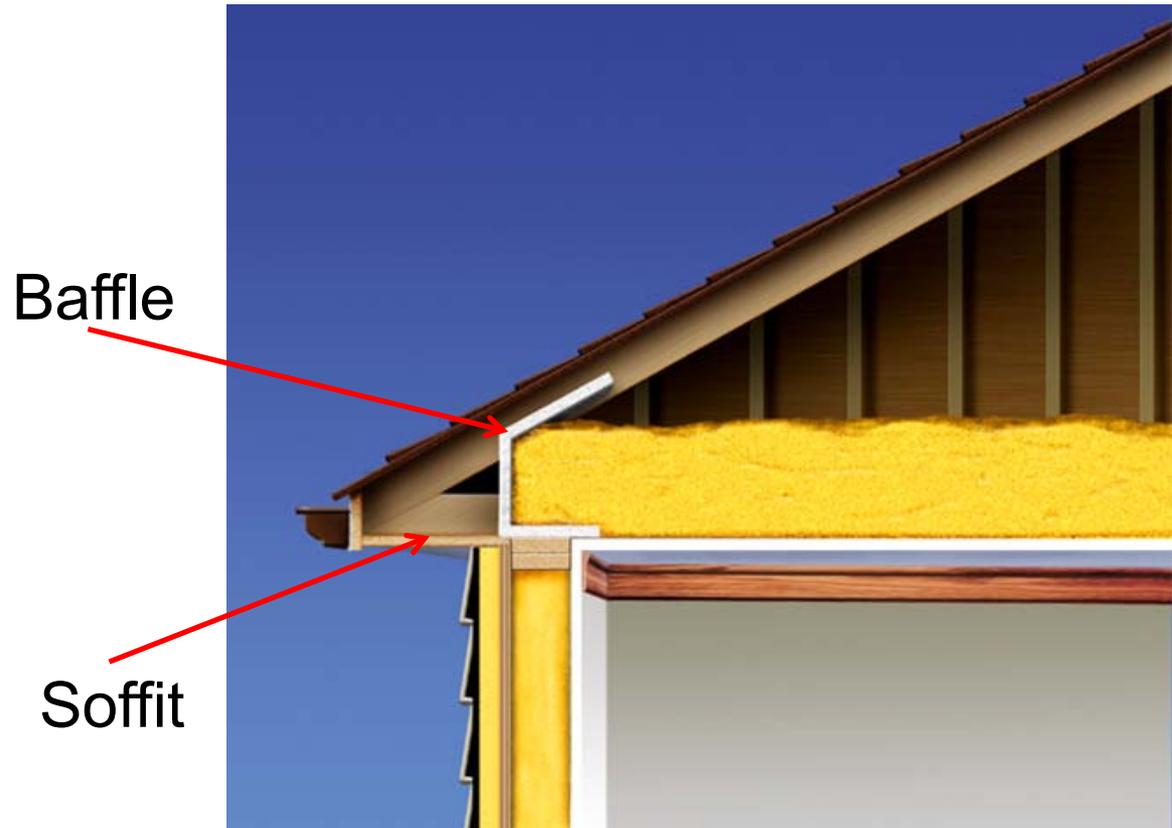
**Recommendations come from the Department of Energy (DOE)



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)

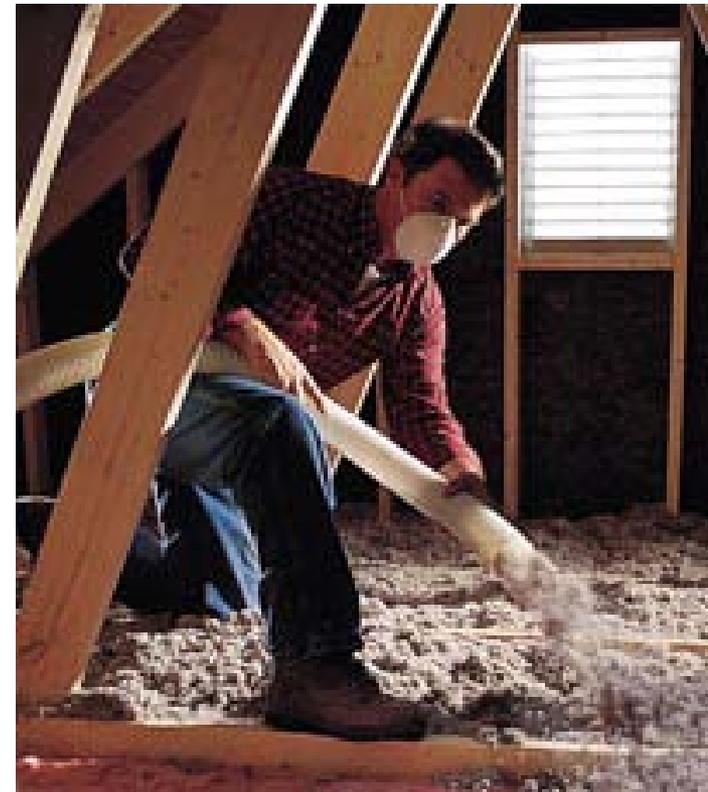




How Do You Add Insulation to the Attic?

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

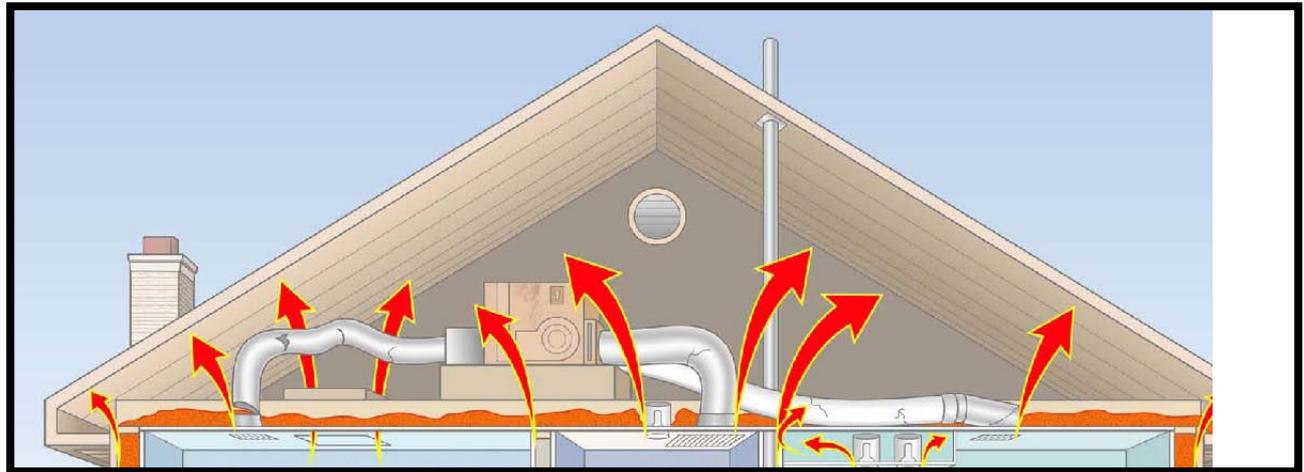
- Contractor needed
- Hazardous chemicals



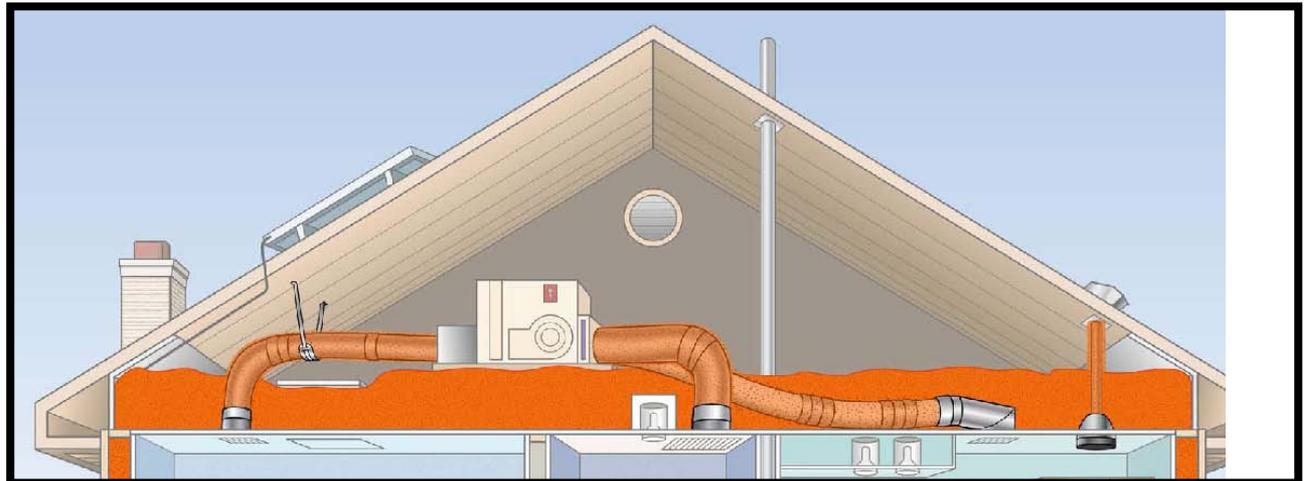


Take Away: Sealing and insulating the attic is a very cost effective energy saving improvement for many homes

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]

Doug Anderson
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