

## YOUR HOUSE IS A SYSTEM

Like a well-oiled machine, your house works as a system of interdependent parts. Every component impacts the operation of many others. When the parts all work together in an optimal way, your reward is a durable, comfortable, healthy, and energy-efficient home environment. You can make it happen in just a few steps.

**Careful installation is key.** The time you invest now to control moisture and eliminate air leaks will pay off with lower energy bills, improved comfort, reduced maintenance, and greater durability in the months and years to come.

### STEP 1: Control Moisture

Rain, humidity, condensation—moisture can penetrate your home in several forms. Once inside, it can cause structural, health, and comfort problems. Water seeps through gaps around windows and doors. Moist air flows in through holes in wall cavities, attic floors, and crawl spaces. Water wicks through porous materials (such as concrete slabs) or between small cracks (such as overlapping siding). Water vapor moves by diffusion through permeable materials (such as wood or drywall).

#### SOLUTIONS MAY INCLUDE:

- ▶ Quality construction with durable materials
- ▶ Careful design to divert groundwater
- ▶ Effective flashing
- ▶ Sealing leaks
- ▶ Installing a waterproof vapor barrier material
- ▶ Effective maintenance, such as cleaning gutters and drainage pipes, and using vent fans

### STEP 2: Seal the Leaks

Would you leave a window wide open in winter? Believe it or not, if you could collect all the little gaps and cracks in your home in one

place, they could be equal to an open window! Air leaks can reduce a home's durability, provide entry points for pests, cause drafts, raise humidity levels, and increase heating and cooling bills.

Take the time to properly seal all the leaks between conditioned and unconditioned space to create an effective air barrier. Success requires diligence, particularly in homes with multiple stories and changing rooflines.

#### SOLUTIONS MAY INCLUDE:

- ▶ Installing housewrap over exterior wall sheathing (see Technical Brief on *Walls & Floors*)
- ▶ Sealing penetrations for plumbing, electrical wiring, and other utilities
- ▶ Sealing junctions between building components, such as bottom plates, subfloors, and band joists between conditioned floors
- ▶ Using air-sealing insulating materials, such as plastic foam
- ▶ Sealing bypasses—hidden chases, plenums, or other air spaces through which attic or crawl space air leaks into the home; bypasses are typically sealed at the attic floor with caulk, rigid insulation board, and spray foam (see Technical Brief on *Roofs & Ceilings*)

## HOW TO'S *for the* HANDY HOMEOWNER SERIES

- ▶ Your House is a System
- ▶ Selecting the Right Product
- ▶ Repairing Walls & Floors
- ▶ Repairing Roofs & Ceilings
- ▶ Repairing Windows & Doors

**NOTE:** Contact a professional engineer if there is any evidence of structural damage to the home. If filing an insurance claim related to the damaged area, consult an agent before conducting any repair work. The local building agency can provide further guidance on applicable codes.

## WHAT'S THE BIG DEAL?

It may be tempting to overlook the interconnections in your home and quickly finish your repairs. You may not notice a difference right away—but the results will surface. Consider this scenario...

You repair a damaged wall section so it is structurally sound, but you don't take the time to properly seal leaks and insulate. Months later, dark spots are multiplying on the drywall, the baseboard paint is peeling, and the room is downright uncomfortable. What happened?

Outside air is flowing in, causing drafts and carrying in water vapor. The moisture condenses on the walls, peeling paint and creating a breeding ground for mold. The damp conditions threaten the structural integrity of the wall. Don't you wish you had sealed those air leaks?



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## STEP 3: Insulate for Comfort

Sealing your home makes it air tight; insulation makes it snug. After plugging the leaks, install proper insulation and energy-efficient windows to keep the heat inside in the winter and outside in the summer. Quality installation is key to success. Install R-values equal to or exceeding the International Energy Conservation Code (see Technical Briefs on *Roofs & Ceilings*, and *Walls & Floors*). Provide full coverage and do not compress insulation. Gaps reduce effectiveness and can cause condensation.

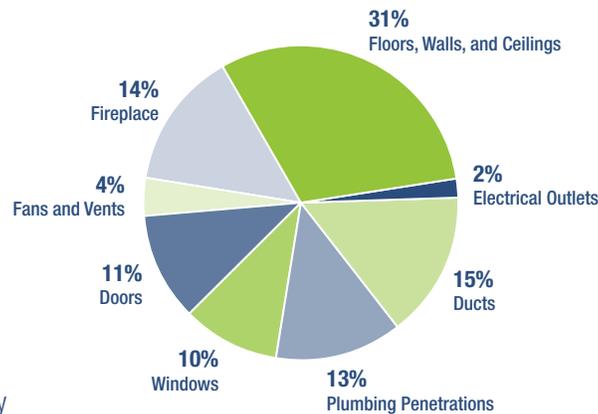
## STEP 4: Right Size to Optimize

An air-tight, well-insulated home offers another bonus: it will probably require a smaller (and less expensive) heating, ventilation, and air conditioning (HVAC) system. An oversized or poorly installed HVAC system can increase utility bills, reduce comfort, and lead to moisture and air quality problems. A contractor can size it right using the Air Conditioning Contractors of America (ACCA) *Manual J* procedure.

Ducts should be designed using ACCA's *Manual D*, located in conditioned spaces (if possible), and sealed with mastic. ACCA's manuals are available through the local library, or online for a fee (see Web site under the "For More Information" section). Treat flexible ducts with special care: make sure they are cut to appropriate length and not kinked, crimped, or otherwise obstructed. Install a programmable thermostat to save up to \$100 per year on your energy bills.



Look for the ENERGY STAR label when purchasing new equipment.



### Install energy-efficient lighting.

Inefficient lighting generates a lot of heat and increases the load on your air conditioner. ENERGY STAR qualified lighting requires one-third the energy of standard lighting, generates one-third the heat, and lasts up to 10 times longer.

**Install and use kitchen and bathroom exhaust fans.** When you make a home more air tight, it is important to exhaust unwanted moisture by installing and using kitchen and bathroom exhaust fans. New, quieter models increase the likelihood that they will be used while cooking and showering (turn off fan 20 minutes after showering). Make sure the exhaust fans are vented to outside and not recirculating moisture inside the house or dumping it into the attic where it can cause mold.

**Maintain HVAC system for continued operation and efficiency.** HVAC systems must be maintained regularly by qualified professionals to provide long-lasting, efficient, and healthy operation.

## STEP 5: Say "No" To Shortcuts

Cutting corners may save time now, but shortcuts will come back to haunt you later. Remember that your home is a system of interdependent parts. Take the time now to ensure it runs smoothly for years to come.

Figure 1.

### ◀ How does the air escape?

Air infiltrates into and out of your home through every hole, nook, and cranny. About one-third of this air infiltrates through openings in your ceilings, walls, and floors. (Source: U.S. Department of Energy, *Energy Savers*)

The material in this Tech Brief was adapted from the following source:

Alabama Builder's Field Guide: *Energy Efficient Building Envelope*, prepared for the Alabama Department of Economic and Community Affairs by Southface Energy Institute, Inc., September 2004

FOR MORE INFORMATION SEE:

ENERGY STAR  
[www.energystar.gov](http://www.energystar.gov)

Energy Efficient Rehab Advisor  
[www.rehabadvisor.com](http://www.rehabadvisor.com)

Energy Savers  
[www.energysavers.gov](http://www.energysavers.gov)

Air Conditioning Contractors of America (ACCA)  
[www.acca.org](http://www.acca.org)