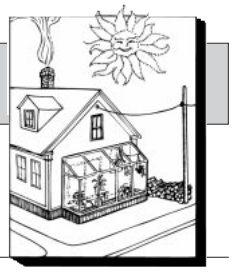
Tighten Up With Air Sealing

by Bruce Sullivan



Done well, air sealing is the most cost-effective energy-saving measure you can take in a new home. Air sealing saves heating dollars. It reduces drafts and winter dryness. Ventilation systems work better in well-sealed homes. Sealing also blocks noise, making the house quieter.

The key to successful, cost-effective air sealing lies in organization. You need to structure the many small tasks that make up the whole job. An hour of advance planning will pay large dividends by avoiding hassles, reducing costs, and increasing the quality of work.

Many firms find it makes sense to put one person in charge of air sealing. At Medinger Construction in Ashland, Ore., Ron Medinger doubles as a finish carpenter and air sealing specialist. He identifies the places to be sealed in each house and makes sure the jobs get done. Sometimes that means coordinating with other members of the crew. Other times, Ron does the work himself.

Ron has tracked total air sealing time carefully and has concluded that a typical 1,200- to 1,400-square-foot one-story home takes about 40 hours to seal, and materials run only about $200. This is for advanced tightening, which targets a "natural" air leakage rate of 0.1 air changes per hour (ac/h). Testing has shown that Ron usually reaches that standard in the finished house.

This air leakage rate is quite low, of course, creating what you might call an extra-tight house. In fact, it is below some mandated indoor air quality standards, which generally call for 0.3 ac/h or above. Levels below that generally require an active fresh-air supply system to maintain indoor air quality.

Getting Organized

Ron's main weapon is organization: He lists tasks, assigns crews, keeps materials to a minimum, and tracks work with a checklist (see Figure 1).

The neglected. Here in the Pacific Northwest, builders in the utility-sponsored Super Good Cents program routinely follow systematic air sealing practices. However, field testing indicates that major air leaks are still missed, often due to scheduling mix-ups. For example, the tops of chimney chases must be sealed before drywall goes up (they can't be reached later) and any airtight recessed light fixtures must be specified in advance. If the wrong models show up on site, it's impractical to return them, wait for the correct ones, and reschedule the electrician.

The unnecessary. On the other hand, you don't want to seal areas that don't need it. On a fully sheathed exterior wall, for example, "house wrap" air barriers add little benefit. Sealing the holes where electrical wiring runs through studs is unnecessary, except at a T-wall intersection where an interior wall meets an exterior wall. By focusing your attention on sealing that's effective, you can make the most of the time and effort invested.

The impossible. Then there are some major air leaks that can't easily be stopped by the builder. An example is the zero-clearance metal fireplace. These often leak air through the "closed" damper and the outer shell, not to mention up the flue chase. Builders are justifiably reluctant to alter any part of a combustion appliance, lest they risk code or warranty violations — not to mention cause a safety problem. The practical option is to make sure the other air leaks in the house are well-sealed to compensate for the inevitable leakage through the fireplace.

Using an Air Sealing Checklist

A thorough checklist is an excellent starting point for an air sealing program. Since a

JOB/HOUSE_____
ADDRESS_____
PHONE_____

	DOES THIS APPLY?	AIR SEALING CHECKLIST *ITEMS IN ITALICS* apply to *ADVANCED* air sealing only
MATERIALS TO ORDER		Brand/Model/Supplier
WINDOWS Standard 0.3 CFM		
Advanced 0.2 CFM		
DOORS Standard 0.2 CFM		
Advanced 0.1 CFM		
WOOD STOVE Airtight doors Outside air supply to firebox		
FIRE PLACE Airtight doors Outside air supply to firebox		
RECESSED LIGHTS "ICT" Double-wall type		

AIR SEALING TASKS	TYPE OF SEALANT: CAULK	GASK	FOAM	ADHES	SHEET	WHO	WHEN	OK
BASEMENT								
PLUMBING/SUMP/DRAINS At floors and walls								
ROUGH FRAMING								
MUD SILL To foundation wall (basement only)								
RIM JOIST To mud sill (basement only)								
SUBFLOOR SHEATHING To rim joist (all floors)								
SUBFLOOR SHEATHING Seal T&G edges								
T&G CAR DECKING Seal cut ends								
SOLE PLATES ON OUTSIDE WALLS To subfloor								
ROUGH PLUMBING At bottom plates/subfloor								
...DRAIN At subfloor								
TUB ENCLOSURE Poly or housewrap								
HEATING BOOTS To subfloor								
RIM JOIST BETWEEN FLOORS Top plate/subfloor								
STAIR JACK ON OUTSIDE WALL Poly or wrap								
...rough opening								

Figure 1. *A checklist helps ensure that all air sealing tasks are covered, even if you have several houses going at once. Shown above is a section from the author's three-page checklist. For a free copy of the complete list, send a self-addressed, stamped envelope to Air Sealing Checklist,* The Journal of Light Construction, *RR2, Box 146, Richmond, VT 05477.*

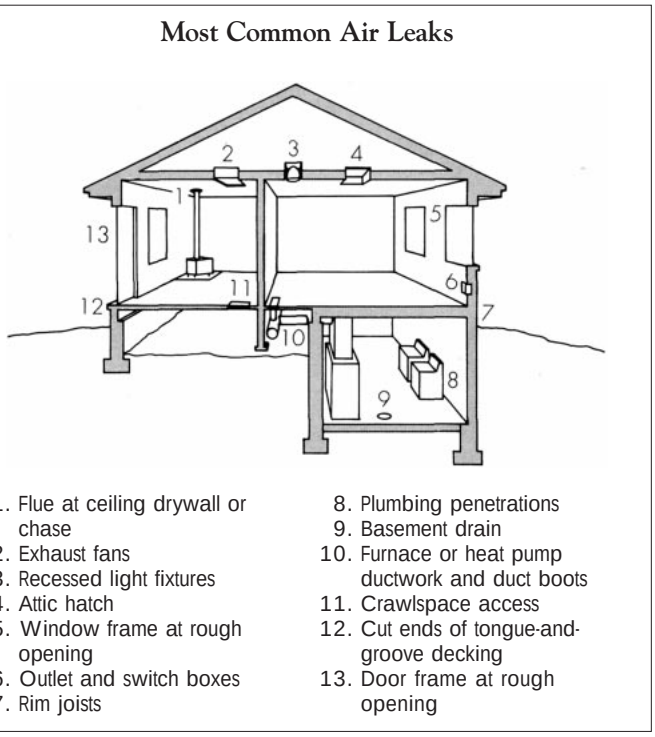


Figure 2. *These are among the most common air leaks in a building's thermal envelope.*

checklist like this includes more items than any one house will typically require, first identify all the air sealing tasks your particular project requires. It may be helpful to trace the house's thermal envelope on a copy of the prints, in both section and plan views. (Figure 2, next page, shows some spots that typically require attention.) Next, move carefully through the thermal envelope marking and noting any likely leakage sites. Then transfer this information to the Air Sealing Checklist, using the checklist to make sure you haven't missed anything. By checking items in the "Does this apply?" column, you can quickly customize the list for each house.

In the checklist's upper right panel, list items that must be ordered in advance, such as tighter windows or wood stoves with an outdoor air supply connected directly to the firebox.

Next, assign each task to the right person. For example, will the framing contractor seal under sole plates of outside walls, or should it be done by a crew member after the house is closed in? Identify the person or group responsible for each task in the column marked "Who?"

Next, decide when each task will be done, so it can be scheduled. For example, will window frames be sealed to rough openings at installation? Or will the finish carpenter install seals along with the window trim? Or will a crew member seal windows as part of doing several other sealing tasks? The best solution will vary depending on how your particular company and schedule work. For each task, write the projected completion date in the "When" column.

Finally, you need to line up your materials. Check off the appropriate sealant for each task. It's best to minimize the number of different materials. By deciding in advance what material will be used for each task, you can select the fewest possible types and order them ahead of time.

The checklist also provides a place to mark off completed tasks. This lets you quickly check the status of any item.

Sealants for All Seasons

It's important to match the sealant to the task. But you don't want to have 20 different sealing materials on site. So reduce the number of different sealants, but keep the best one for each task on hand.

Caulk. One-part urethane caulk sticks to most materials, resists moisture, and maintains its elasticity over time. It's readily available and affordable.

Gasket. Polyethylene backer rod makes a good stuffer for larger cracks and can be applied in any weather. Backer rod is available in 1/4-inch to 2-inch diameters at concrete and mason's supply houses, or through Plateau Supply Company (2401 E. 40th Ave., Denver, CO 80205; 303/295-2170), Applied Extrusion Technologies (P.O. Box 582, Middletown, DE 19709; 302/378-8888), and Majeske Inc. (333 Newtown Rd., Warminster, PA 18974; 215/672-9082). It can also be used to gasket drywall for ADA (Advanced Drywall Approach).

Sill sealer (closed-cell polyethylene) is designed for use between mud sills and foundation walls, but don't use it under sole plates. It is available from Sealed Air Corporation (P.O. Box 6004, Hyannis, MA 02601; 508/775-8444).

Foam. Low-expansion urethane foam in a canister has an adjustable nozzle that helps control the amount of foam dispensed. Products include CB120 Filler Foam (Hilti Construction Chemicals, P.O. Box 21148, Tulsa, OK 74121; 800/879-8000) and Handi Foam (FOMO Products Inc., P.O. Box 1078, Norton, OH 44203; 216/753-4585; ask for the non-expanding version). The low expansion rate is critical, since it reduces overfilling of joints.

Adhesive. Standard construction adhesive can be used to seal subfloor to the top of rim joists and to seal the tongue-and-groove edges of subfloor panels.

Sheet. Patches or boots made from EPDM or rubber are perfect for sealing the hole where plastic vent pipes penetrate top and bottom plates. In the center of a patch, cut a round hole that is slightly smaller than the pipe diameter. Slip the pipe through this hole as it passes through the plate and staple it tightly to the wood. Now pipe expansion will not break the seal.

Another option is to make a boot out of housewrap material: Take a square of housewrap, cut an X in the middle of it, and slip the vent through and tape it, leaving a little slack in this boot to allow for vent pipe movement. ■

Bruce Sullivan is a writer and editor specializing in energy topics for builders, and is the principal of Iris Communications.