

EMBRACING ENERGY EFFICIENCY

Old-house owners don't have to choose between maintaining historic integrity and conserving energy. It's possible to have both if you tune up some common problem areas with low-tech materials and a thoughtful approach. **By NOELLE LORD**



As someone dedicated to preserving old houses, talk of energy efficiency gives me nightmares. Living in the snow belt, where below-zero winters are common, I'm haunted by images of dumpsters piled high with original windows and curbs stacked with cast iron radiators. Unfortunately, this picture is more than just a bad dream. It can become a reality when homeowners looking for quick-fix energy solutions meet salespeople seeking to cash in on timely business opportunities. Of course, no one disputes that energy conservation is important, both for the planet and for our pocket-books, but those of us with old houses need to also consider our building's vintage materials and construction when planning energy-saving improvements. In most cases, there is no need to make dramatic changes to the building, just minor modifications such as the following low-tech

upgrades that can produce real returns in heating and cooling efficiency.

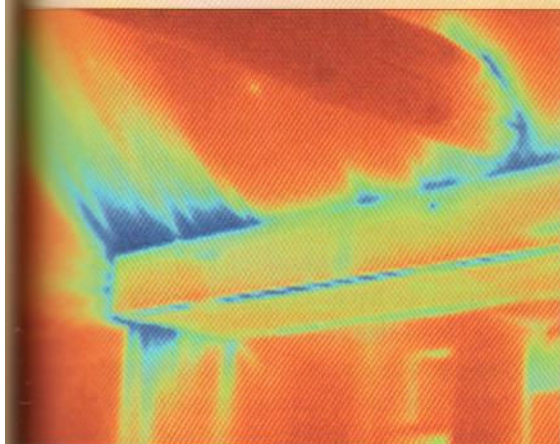
Seal Up Air Leaks

Controlling drafts should be the top priority. Air leaks allow heat to escape from the living spaces in winter (or enter during summer) thereby compromising insulation effectiveness by up to 50 percent. The Department of Energy estimates that by sealing drafts alone homeowners can save more than 10 percent on their energy bills.

Begin by properly caulking and sealing cracks and gaps. Look for leaks inside and out where interior and exterior surfaces meet—the junctures of walls and ceilings, for example, and around baseboards and corner boards that can shift and shrink as they age, resulting in sizeable gaps. A good-sized bead of caulk usually resolves the problem, but if the gap is wider than 1/4" you'll need to insert a piece of foam backer rod first.

PHOTO BY PETER LORD; ARTWORK BY KAREN POLLARD

Energy audits use infrared cameras to uncover energy inefficiencies; the rainbow scale at left tells the temperature story. This artist's rendition (above) shows common areas for old-house heat loss, which can often be lessened through careful caulking, sealing, and insulation.

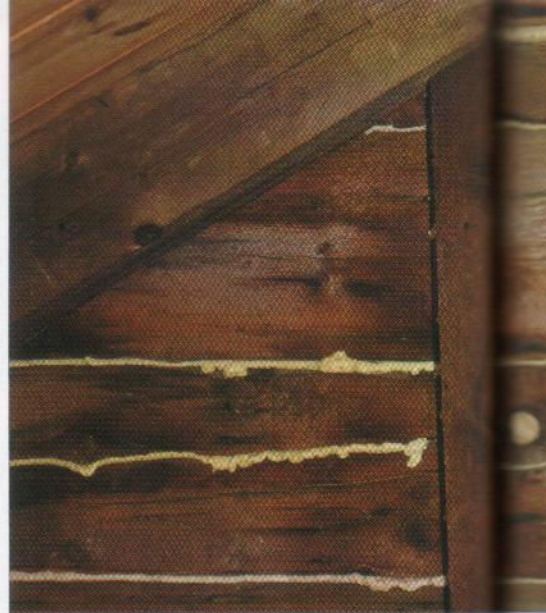
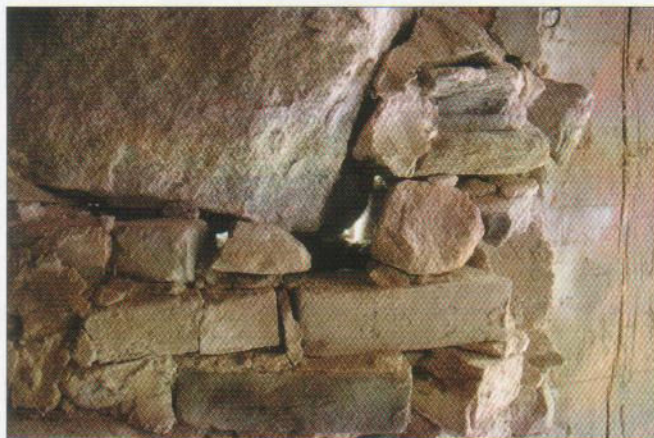


COURTESY OF BILL CALFEE (BOTH)

A true audit photo shows how gaps where ceiling beams meet plaster allow valuable heat to escape the room (left). Careful caulk-sealing these cracks can help.



Adding exterior, top-mounting dampers (above) to these 180-year-old fireplaces sealed them with minimal disruption. Daylight shining through a rubble foundation (right) is a sure sign of an air leak that needs attention.



Make sure your fireplace is not a major draft source. Keep the damper tightly closed when the fireplace or woodstove is not in use, and install a new damper if it's damaged or was never there. You can buy dampers that retrofit to the exterior of a chimney top, and are specially made to fit your flue opening. Stuffing the flue with batt insulation during the off-season helps, too, as does blocking the hearth with fireplace covers made of sheet metal or wood like the ones our grandparents used.

Check the ventilation points of heating and cooling systems. Places where ducts and exhaust units leave your equipment, intersect one another, or exit the building (such as a chimney flue or wall port) can become loose, leading to air leaks and poor equipment operation. Make sure these joints are tight or sealed with heat-proof tape. Utility access points are culprits too. Inspect your house's exterior for gaps where electrical, cable, telephone, and gas lines penetrate the wall. Remember that

wiring—especially updates to phone wiring—can run along the outside of sills and other exterior areas, creating entrance holes that need sealing.

Take the time to plug up foundation gaps and cracks anywhere you can see daylight from the basement side, typically around masonry and stone foundation materials. Repoint masonry where mortar has failed, caulk cracks in mortar and cement, and inject spray foam insulation into gaps and crevices. Spray foam, although not pretty to look at, works well for interior foundation masonry because it expands to fill irregular shapes and sizes and withstands dampness.

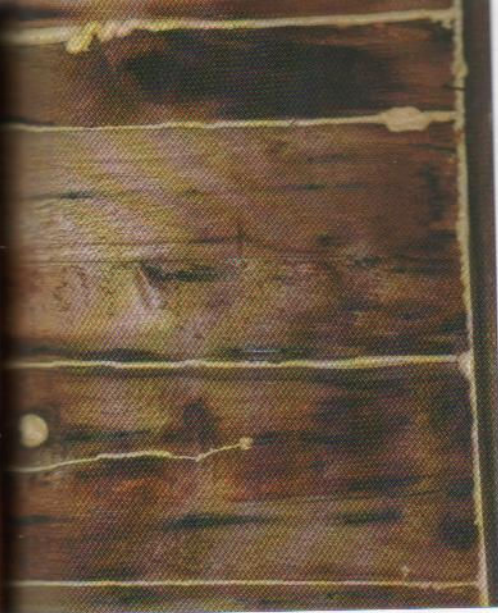
You can identify many air leaks with a simple test. On a windy day, light an incense stick and move methodically around each room of your house, including the basement and attic. Hold the incense in front of window and door openings, utility access points, and around all corners (floor to ceiling) where interior meets exterior.

Drifting smoke indicates drafty air leaks.

Insulate Wisely

Proper insulation can also make a big dent in energy bills and should be your next priority. In the ideal world, all the outside walls and roof of a house are insulated, but those of us with old houses know that we rarely get to operate with ideal conditions. If you happen to have lost a plaster wall, or you are replacing siding, then you have a windfall opportunity to add insulation; however, ripping the building apart just to insulate is not worth the loss in original architectural features. The name of the game here is working with what you've got.

Since the majority of heat loss is through the top of a house, start with the attic. Insulating your attic floor, as well as the access to your attic, is relatively unobtrusive and has an instant payback on your investment—a projected savings of 15 percent to 35 percent on energy bills when combined with sealing air leaks.

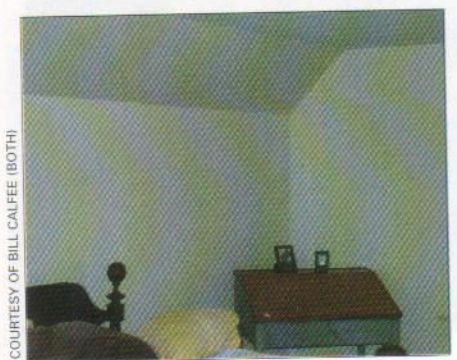
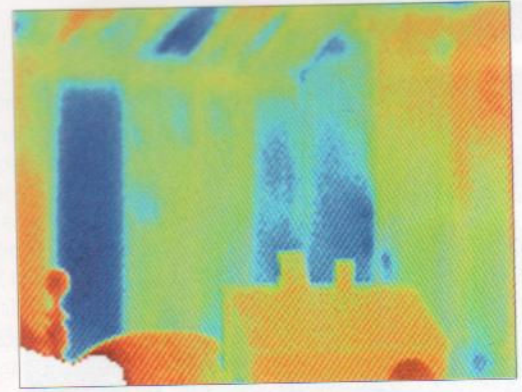


Spray foam insulation can be used on cracks, gaps, and holes in the attic (above) to ensure weatherproofing. Floor drafts can also be reduced with spray foam (at left) or another sealant placed in the gap where structural timber supports and basement subflooring connect.

The concept of energy payback, or how long it takes to pay off your home improvement and get a return on the investment, is clarified in this illustration comparing the cost of different window improvements (below).

If you have no attic floorboards, just open joists, add as much insulation to the bays between joists as their dimensions will allow. If there are floorboards, fill the depth of the joists, but never cram the insulation because that will negate its effectiveness. The attic access is a surprisingly huge area for potential heat loss. Building an insulated trap door above an attic stairwell, or installing weather stripping or foam insulation board on an existing door, helps cut losses significantly.

Insulation is evaluated in terms of R-value, a measure of how much it resists the transfer of heat. The higher the R-value, the better the insulating capability of the material or product. Fiberglass batts, for example, average R-3 per inch of thickness and are sized to accommodate the various spacings of rafters, floor joists, and wall studs. Many authorities recommend insulating walls and roofs to levels of R-38 to R-60, but these numbers are not realistic when trying to retrofit an old house. We recently added R-30, to our attic floor (the most our timber joists could accommodate) and immediately noticed a dramatic



COURTESY OF BILL CALFEE (BOTH)

An audit photo shows cold spots where insulation is lacking in an exterior wall—a good place to add fiberglass batts if opportunities for access ever present themselves.

Let the Numbers Convince You: Do the Math

Window Improvement	Cost	U-Value	Original Window U-Value	Annual Energy Savings (Btu)	Annual Savings Per Window (\$)	Simple Payback (Years)
Storm window over single-pane original window	\$50*	1.10	0.50 (combined)	722,218	\$13.20	4.5
Double-pane thermal replacement of single-pane window	\$450*	0.58	Original window in landfill	625,922	\$11.07	40.5
Low-e glass double-pane thermal replacement of single-pane window	\$550*	0.35	Original window in landfill	902,772	\$16.10	34
Low-e glass double-pane thermal replacement of single-pane window with storm window	\$550*	0.35	Original window and storm in landfill	132,407	\$2.29	240

JOHN VAN PELT

*Cost of 3' x 5' window, installed
 **Assuming gas heat at \$1.09/therm

Source: Keith Haberern P.E., R.A.
 Collingswood Historic District Commission



PETER LORD (ALL)



Maximize Mechanicals

Many good energy efficiency efforts are just sound maintenance. Since neglected mechanical services will operate at less than optimum efficiently, make sure to clean and maintain boilers and furnaces annually, and replace filters on boilers, furnaces, and air conditioners on a regular schedule.

Consider installing some mechanical upgrades, too. A programmable thermostat, timed to reach optimum temperature when you get home from work, quickly pays for itself. Switching to energy rated light bulbs is another small improvement that can add up. And when it comes time to replace larger service items, explore the range of energy efficient technologies, such as tankless water heaters, that are as suitable for old houses as they are new construction.

For a list of **SUPPLIERS**, see page 78.

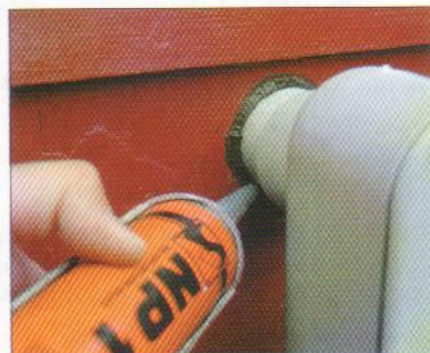


Installing flexible weatherstripping (top left) cuts window drafts. Placing fiberglass batts (above) between existing attic timber joists reduces heat loss; be sure to wear proper skin protection when handling insulation. Building an insulated attic access door (left) is another energy-saving idea.

energy savings.

Remember that wherever you insulate, you need to ventilate. Air carries moisture and insulation changes the way moisture moves through and escapes from the building. When insulating your attic, for example, you must allow the air (and moisture) that reaches the attic to escape through ridge, gable, or soffit vents.

Blown-in insulation can be a good retrofit option in open, horizontal spaces such as in attics, but I have seen little good come from the expense and effort of blowing insulation into old-house wall cavities. The unpredictable framing of pre-1940s construction makes coverage inconsistent, and the insulation itself can settle over



To seal air leaks around utility service entrance points into a building, add a good bead of caulk, which protects against water infiltration, too. If the gap is larger than 1/4" it will need a foam backer rod inserted first, to help support the caulk.

time, leaving large, uninsulated voids in the tops of walls.

Watch Windows and Doors

Traditional wood windows and doors get a bad rap when it comes to energy efficiency. We are bombarded with ads claiming that old windows and doors drain wallets, but that picture can be skewed. If your windows and doors have served the building for 80 or 100 years, there is a good chance they are still going strong. Sure, they probably need a tune up, but when rehabilitated, traditional windows and doors can offer energy benefits comparable to new replacements.

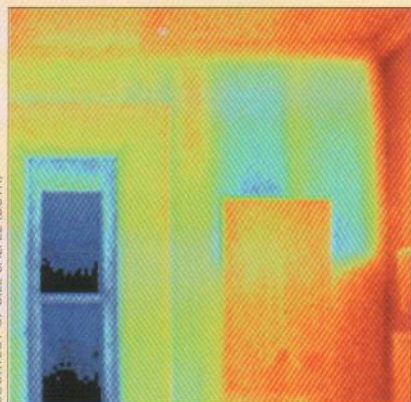
For maximum energy saving performance, you must keep traditional sash and casement properly maintained—that is with sound glass and glazing (putty), sash that shut snug in their frames, and hardware like sash locks to hold them closed tightly. You can refurbish traditional wood or steel windows yourself for the cost of your time and a few materials, or you can hire a professional to restore them for an average price of \$450 to \$1,000 per window, depending on how much work is necessary. The same maintenance ideas apply to exterior doors. If you can see daylight around a door or feel a draft, you need better weather stripping (see below). Simply placing strips in front of drafty doors can help, too.

Once the window is in good working order, the next step is to add or upgrade weather stripping to reduce air leaks. You can spend anywhere from \$10 to \$150 per window on weather stripping, in choices from stick-on foam to interlocking metal. Weather stripping should seal around the entire window sash (side stiles, meeting rails, top and bottom rail), interlock to be airtight, and stand up to the friction of sash movement. It can take many hours to install the more complicated types of weather stripping, so it might be worth hiring a local professional to do this job.

There is no question that storm windows are a sound investment. Adding storm sash to a single paned wood window can make the interior window surface temperature comparable to that of a new

Energy Audits

Before jumping into action with caulking guns or insulation, look into getting an energy audit to assess the energy consumption of your old house. Professional auditors use a variety of techniques and specialized equipment to evaluate a building's energy efficiency, like blower doors, which measure the extent of leaks in the building envelope, and infrared cameras, to pinpoint air infiltration. Audits can also determine the efficiency of your home's heating and cooling systems, show you ways to conserve hot water and electricity, and leave you with a to-do list of practical improvements you can tackle. Look for an auditor who is licensed or certified, and expect to pay between \$250 - \$450. Some utility companies also provide auditing services, although many of them will only focus on issues related to utilities.



COURTESY OF BILL CALFEE (BOTH)



Audit images can show areas where loose cellulose insulation has settled into the bottom of walls, leaving upper areas unprotected, as beside this door.

multi-pane thermal window. Exterior storms can be stock sizes or custom made to match your sash style, and there are many quality versions in wood and aluminum, including storm/screen combinations. Interior storms are another option, but must be installed correctly to avoid condensation on the main sash. Don't underestimate the value of using insulating window treatments like heavy shades and lined curtains, to help contain drafts.

While well maintained traditional windows that incorporate weather stripping and storms can serve your building for generations, the decision to repair or replace them does not rest solely on energy efficiency. Like other original parts of an old house, traditional windows are an essential part of your home's historic building fabric. Discarding them in the name of energy will diminish historic character and value and disregard conservation of another kind—that which recognizes original, hand-made windows, doors, plaster, and woodwork as irreplaceable. 🏠

Web Resources

Visit the following websites for more tips on saving energy.

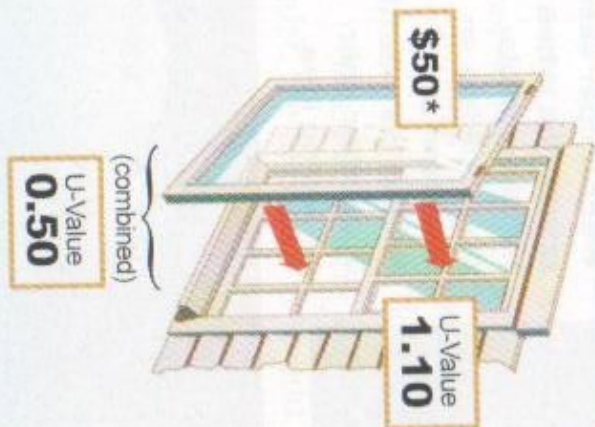
- www.eere.energy.gov/consumer/your_home
- www.eere.energy.gov/consumer/your_home/energy_audits
- www.energystar.gov
- www.aceee.org/consumerguide
- www.home.howstuffworks.com/how-to-make-your-home-energy-efficient

Noelle Lord operates *Old House C.P.R., Inc.* Her recent *OHJ* articles on insulating attics (April '06) and caulking (Feb. '07) are also good resources. Reach Noelle and find more energy tips at www.oldhousecpr.com.

MORE FROM OLDHOUSEJOURNAL.COM

For a related story online, see "All Wrapped Up." Just click to "The Magazine" section, and go to "HVAC & Insulation" in the list of recent features.

Let the Numbers Convince You: Do the Math



TUNE-UP STRATEGIES
Storm window over single-pane original window

ANNUAL ENERGY SAVINGS

722,218 Btu

ANNUAL SAVINGS PER WINDOW**

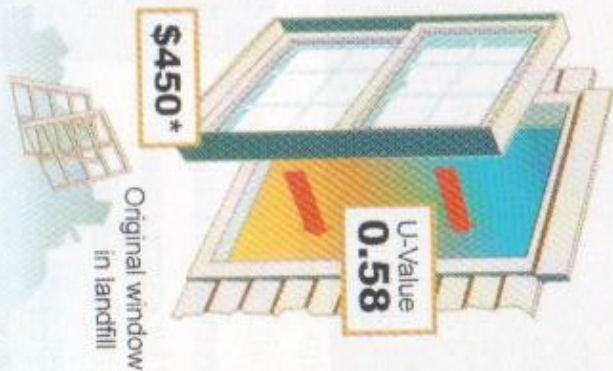
\$13.20

SIMPLE PAYBACK

4.5

Years

\$50/\$13.20 =



Double-pane thermal replacement of single-pane window

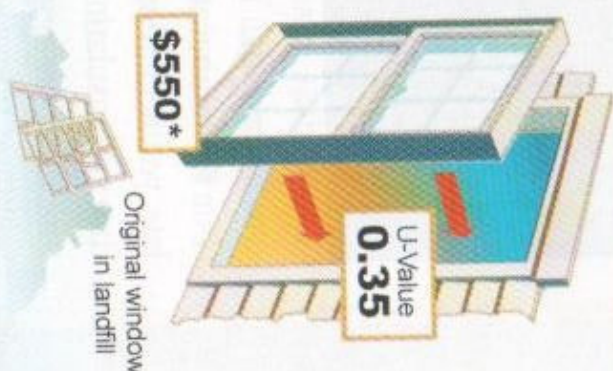
625,922 Btu

\$11.07

40.5

Years

\$450/\$11.07 =



Low-e glass double-pane thermal replacement of single-pane window

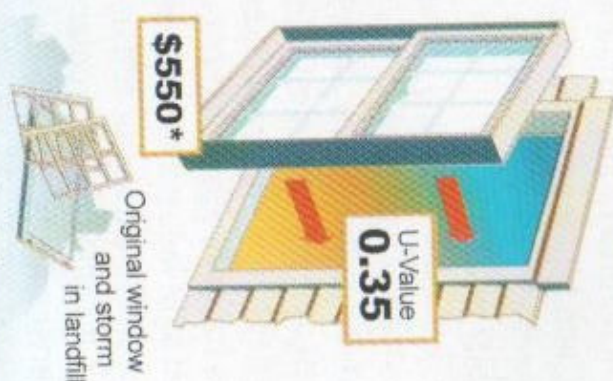
902,772 Btu

\$16.10

34

Years

\$550/\$16.10 =



Low-e glass double-pane thermal replacement of single-pane window with storm window

132,407 Btu

\$2.29

240

Years

\$550/\$2.29 =

*Cost of 3' x 5' window, installed
 **Assuming gas heat at \$1.09/therm