

Restoring Window

Other than a lighted match, nothing will ruin the charm of an old house faster than ripping out the original double-hung windows. But if your windows are old enough to have sash cords, pulleys, and weights—and especially if they’ve fallen into disrepair—you might be tempted by those ads that promise huge energy savings and no maintenance if you replace the windows. What they won’t tell you is that energy-wise, you’d get a much better return on your investment simply by repairing existing windows and adding high-quality storm windows (sidebar p. 89).

From my perspective, it makes no sense to remove window units that have survived for a century or more and to replace them with something that may not last a decade before the finger-jointed wood frame rots or the vinyl cladding deteriorates or the double-glazed seals rupture. Why not spend a little time, and a lot less money, to help your existing windows last another century?

They don’t make them like they used to

Materials vary by region, but most of the old windows that I see are crafted from first-growth, vertical-grain pine. This remarkable stuff is dimensionally stable and highly rot-resistant, far superior to anything available today. Old-growth pine is so durable and forgiving that even though they may look bad, most of the windows I’m asked to repair (or replace) generally require little more than minor touch-ups and a bit of reglazing.

If your house is 100 or more years old and if you’re lucky, you still might have the original handblown glass. This important feature denotes early windows. Depending on when they were made and what raw materials were



Sashes

Yes, they’re worth fixing.

Those old windows were built better (and from better wood) than anything you can buy today.

BY DAVID GIBNEY

REMOVING PUTTY AND PAINT IS THE HARD PART

If a window sash needs major repairs, both glass and paint usually have to come off. To get at the glass, I start by hand-scraping the outside of the frame where the wood meets the glazing putty; removing the overlapping paint helps to break the bond between the two materials. **1** For putty removal, I depend mostly on a Fein MultiMaster (800-441-9878; www.feinus.com), which is set up with a vibrating scraper. Coming in flat over the glass loosens most of the putty, but it can be slow going. If the putty is rock hard, I attack first with my 3/8-in. cordless Makita circular saw, but this process requires a skilled hand. I set the depth of the blade so that it will not touch the glass, then carefully cut alongside the shoulder of the frame. After the saw cut, the remaining putty goes quietly. **2** Once all the putty is gone, I slide a scraper along the surface of the glass to remove the old glazier's points. **3** To cut out any putty embedded between glass and wood, I run a knife blade along the edge of the glass. Then all it takes is a gentle push up from the bottom side to free the glass. **4** I use an electric paint remover (Warner Tool Products; www.warnertool.com; 877-992-7637) to strip the flat sections of the sash. **5** A heat gun in combination with a contoured scraper takes care of the profiles.



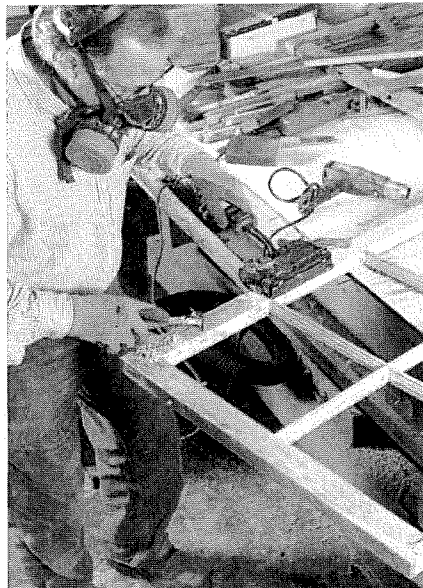
1



2



3

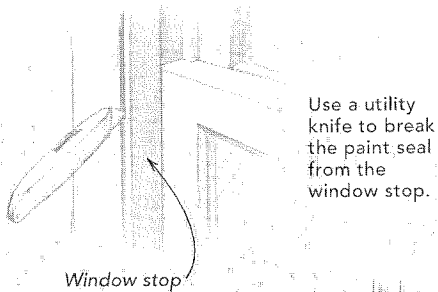


4



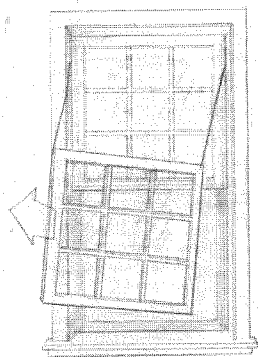
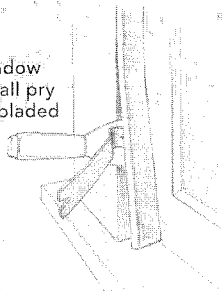
5

REMOVING THE WINDOW SASH



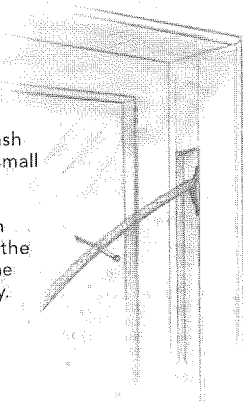
Window stop

Remove the window stop using a small pry bar over a stiff-bladed putty knife.



Pull out the lower sash.

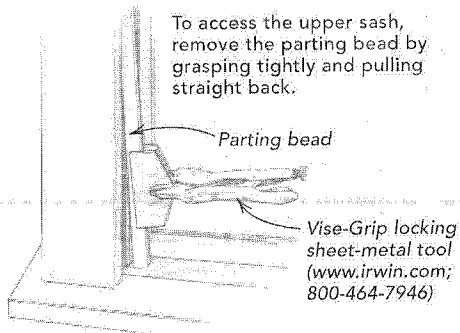
Pierce the sash cord with a small finish nail to prevent sash weights from dropping to the bottom of the weight cavity.



To access the upper sash, remove the parting bead by grasping tightly and pulling straight back.

Parting bead

Vise-Grip locking sheet-metal tool (www.irwin.com; 800-464-7946)



used, some window panes are rippled like the ocean, and others are bubbled or scattered with bull's-eyes. Each pane, though, is unique. On the rare occasion when I find a window that's not salvageable, I always save the glass.

If you're seeking sources for old glass, check first with salvage contractors in your area or with window-replacement contractors, most of whom will be happy to let you haul away the old sashes that they take out. If those options don't pan out, I know of one supplier (Fairview Glass Co.; www.fairviewglass.com; 301-371-3364) that ships glass nationwide.

Window frames rarely need fixing

I inspect the window frames as well as the sashes. Like a dentist with a pick, I use a scratch awl to poke around rotted areas to determine the extent of damage. Fortunately, unless the house in question has suffered from serious moisture problems, the frames are almost always rock solid, which is why so many manufacturers have come out with replacement window units that fit within existing frames. If I find some frame rot, it's usually confined to the end grain where the side jamb meets the sill or to the top portion of the sill itself. These infestations are cleaned out and repaired easily with epoxy (see *FHB* #107, pp. 60-65, or read this article at www.finehomebuilding.com).

If serious damage has occurred, it's most likely to involve the sashes, particularly the lower sash, because they are used and abused the most. If sash rot is minor and localized, I make the repairs in place. But whenever I discover a serious problem such as a severely rotted bottom rail or side jamb, or a broken or rotted muntin strip, I remove that particular sash and make the repair in the shop. Only if the bottom and both sides are missing do I consider a sash to be beyond repair.

Disassembly requires care, especially with old glass

As I remove each sash, I hold it up to a light source and take note of which panes of glass are original so that I remember to take special care to save them. Removing old glass without breaking it is a tedious process at best. Sometimes I find that the old glazing putty is so loose that it just needs a good nudge with a paint scraper to get it off; oftentimes, however, the putty is as hard as rock.

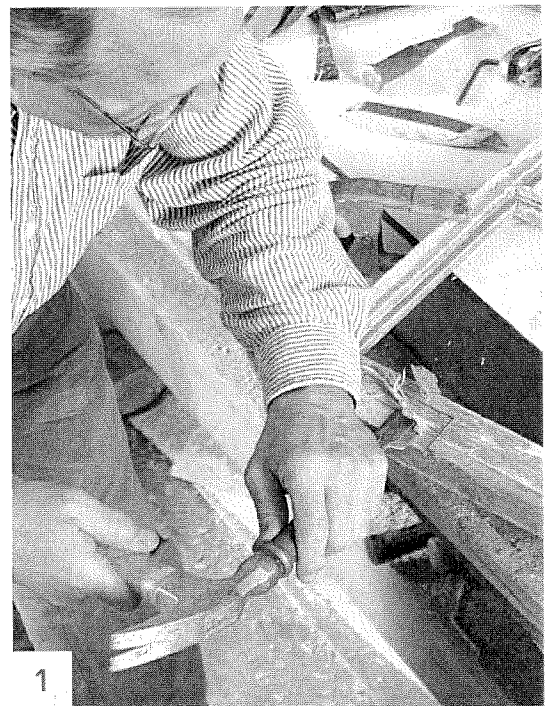
Plenty of tools and techniques are available for removing stubborn old glazing putty, and

none of them is perfect. I've had lots of success using a Fein MultiMaster tool along with a small Makita cordless circular saw to break up old putty, but this process is not for the squeamish (sidebar p. 85).

If you've tried to remove the glass without success, you might be able to find a local window-repair or paint-removal specialist who can help. Or you might attempt the repair with the glass in place. You also might want to check out a new infrared paint-removal tool that claims to be equally effective for removing glazing putty (see *FHB* #150, p. 114).

Epoxy repairs minor damage

After all the glass has been removed and carefully set aside, the built-up layers of paint are next to go. Old windows almost always have at least one layer of lead paint on them, so it's important to take some safety precautions (see *FHB* #150, pp. 66-73, or read this article at www.finehomebuilding.com). If I have an



REPAIR SASH WITH OLD WOOD AND EPOXY

Why not spend a little time, and a lot less money, to help your existing windows last another century?

entire house's worth of windows to repair, I send them to a reputable paint stripper, where the paint can be removed safely. If I have just a few windows to repair, I strip the paint myself using low-temperature heat strippers (photo bottom right, p. 85) or chemicals (Back to Nature Products; 800-423-7733; www.ibacktonature.com).

If the sashes have any minor cases of rot or simple weather damage, they are repaired with epoxy. First, I gently wire-brush the surface free of all loose wood fibers. Next, I carefully warm the wood surface with a heat gun set on its lowest setting. Using a disposable paintbrush, I apply generous amounts of a liquid epoxy (West System; 989-684-7286;

www.westsystem.com); the heat treatment allows the liquid epoxy to travel deep into the wood's fibers, creating a superior bond. As soon as the wood fibers refuse to absorb any more of the liquid, I spread on a fine skim coat of solid epoxy filler to create a smooth finish surface.

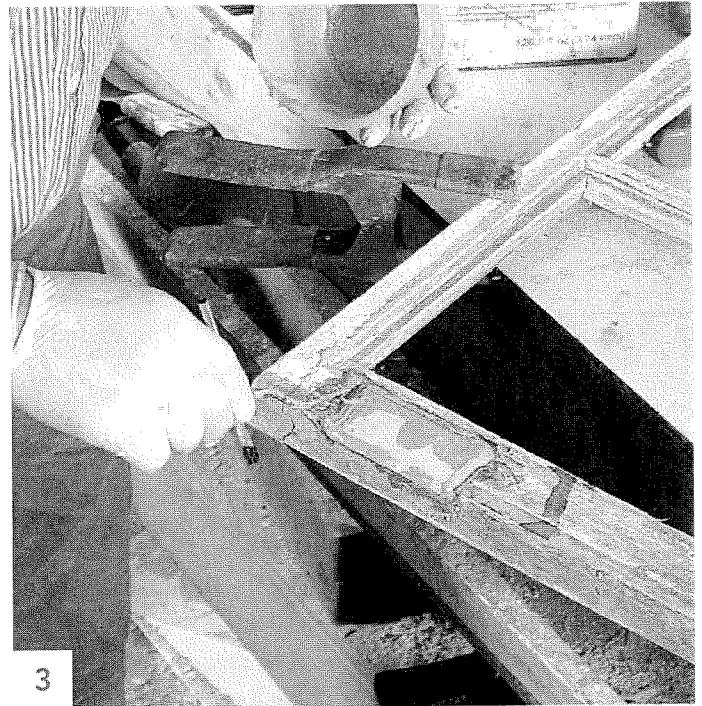
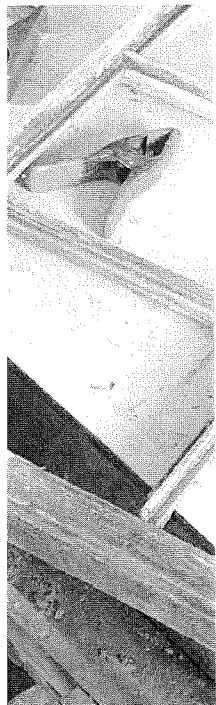
Parts and patches are made from the same wood as the sash

Unlike fixed trim elements, a window sash is subject to a great deal of mechanical stress. To ensure that my repairs last as long as possible, I don't depend on epoxy to fill large gaps; instead, I fashion all but the smallest patches from wood. I rely on a dutchman (a

patch that is made with wood) glued with an epoxy adhesive from West Systems to repair damage that would require more than a skim coat of filler (photos below).

When I have to replace an entire sash part, such as a rail or a muntin strip, I first try to scrounge up a match in a local salvage yard. But if that doesn't pan out, I can replicate the profile using a molding head cutter that fits my tablesaw. (To find out how to make a custom molding cutter, visit our Web site at www.finehomebuilding.com.) If just a portion of the original piece is damaged, I cut back to sound wood and splice new wood to old.

Whether it's a small dutchman or an entire bottom rail, every replacement part should be



1 Deep gouges and rot are carved out and squared up with a chisel to make room for a wooden patch (commonly called a dutchman) that's fastened with an epoxy adhesive. **2** After all surfaces have been wetted with liquid epoxy, a thickener is added to the mix, and a generous helping is applied between

the dutchman and the sash. **3** Cut from the same species of wood as the sash, the dutchman should stand slightly proud of the surrounding surfaces. After the epoxy has cured fully, the patch can be planed and sanded to make the repair invisible.

Old sashes need special attention before painting



Homemade preservative



Shellac-base primer

After the repairs are done, the sash is treated with a generous coating of a homemade wood preservative: one-half mineral spirits, one-half boiled linseed oil. After two full days' drying time, a shellac-base primer is applied. This combination of ingredients ensures that the finish coats of paint bond to a stable, uniform surface.

fashioned of the same species of wood as the sash: first-growth, tight vertical grain, if possible. I maintain a ready stock of raw material for replacement parts because I never discard any old wood.

Whenever large-scale repairs are needed, the sash has to be disassembled. Early sashes (150 years old or more) were joined by a tapered wooden peg driven through a mortise and tenon. To disassemble this type of frame, the pegs must be punched out from the small-diameter side. Don't worry about saving the pegs; they can't be reused. Sashes made in later years substituted glue for pegs; they usually can be separated by cutting through the glueline with a knife, then gently tapping the mortised section loose using a block of wood and a mallet.

After I've completed all necessary repairs, I reassemble the window sash using an exterior-grade carpenter's glue such as Titebond II (Franklin International; 800-347-4583; www.titebond.com). Unlike an epoxy adhesive, carpenter's glue is reversible, so it allows future carpenters the opportunity to take the window apart should they ever need to make repairs. If the joints are loose, however, I have no choice but to use a thickened epoxy adhesive to fill the gaps.

During the gluing process, the frame is squared up, then clamped tightly and allowed to set for at least 24 hours. Afterward, all surfaces are sanded thoroughly to prepare them for paint: I use 60-grit paper to knock down the high spots, followed by 100 grit to polish everything paint-grade smooth.

Preservative and primer ensure that the paint stays stuck

Old wood presents a finishing challenge because it tends to be extremely dry. If left untreated, it will absorb the chemical binders from primer, causing early paint failure. To put some natural resins back into those dried wood fibers, I brush on a generous coating of a homemade wood preservative, a mixture of 50% mineral spirits and 50% boiled linseed oil (photo top left). I let the frame dry for 48 hours before priming it, but I don't use just any primer.

Traditional primers (oil or latex) soak into the wood fibers to create a bond, but they cannot soak into the epoxy patches and thus are liable to fail. Instead, I apply a coat of B-I-N



1

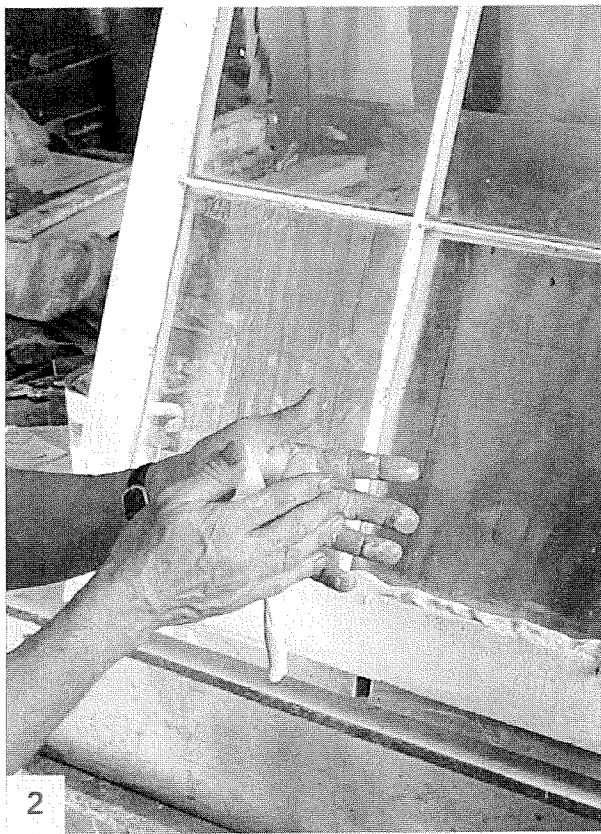
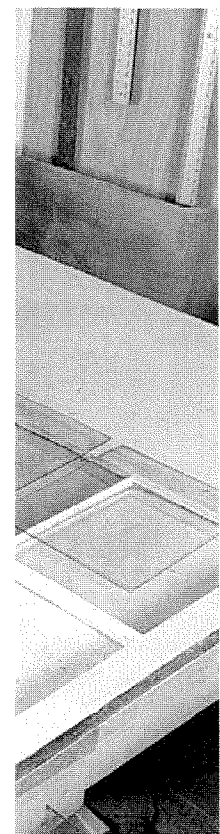
GLAZING TAKES PRACTICE

primer-sealer (Zinsser Co. Inc.; 732-469-8100; www.zinsser.com) over all surfaces (photo bottom left). This product is a white shellac designed to seal knotholes, among other things (see article pp. 60-63), but it forms a strong surface bond that adheres equally as well to epoxy as to wood fibers.

Bed the glass in a bead of caulk

Prior to reinstallation, I thoroughly clean all the original glass. Then I apply a fine bead of latex caulk to the shoulder that will receive the glass (photo above). I "back-putty" the glass in caulk rather than glazing compound because the supple caulk provides a cushion that lessens the chance that the fragile, old glass might shatter as I'm pressing it into place. After all the panes are bedded in the sash, a few glazier's points are installed to secure the glass until the caulk has cured.

The glazing process requires finesse and a steady hand, both of which take practice to



1 To prevent breakage, the author beds each pane of glass in a layer of acrylic latex caulk before he secures them with glazier's points (one point per side is usually enough). **2** With the sash propped up on a homemade easel, he works glazing compound into a

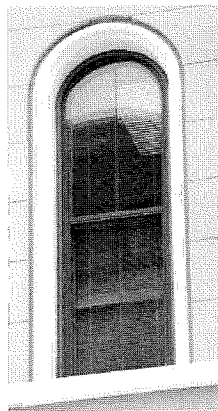
$\frac{3}{8}$ -in.-dia. rope before pressing it into place. **3** After lubricating a putty knife with boiled linseed oil, he tools the glazing compound using an index finger as a guide. Finally, he eliminates minor imperfections in the glazing by wiping downward with a tapping knife.

achieve (photos above). Glazing compound does not hold paint well until it has had a couple of weeks to cure. If time allows, I store the sashes in my shop, then apply two full coats of paint before I reinstall them. When painting over the glazing compound, I've learned that it's important to let the paint overlap the glass (about $\frac{1}{8}$ in.); this overlap prevents water from getting behind the glazing, causing early failure.

Repaired window sashes have a greater life expectancy than new window units, but as with anything that's exposed to nature's wrath, they still have to be maintained. I urge all my clients to open and close each of their windows at least once a year and to examine their windows thoroughly for signs of rot at least every five years. □

David Gibney is a restoration contractor in Smithsburg, Md. Photos by Tom O'Brien, except where noted.

Storm windows and weatherstripping tighten up old windows



By today's standards, old double-hungs are drafty; but that problem is easy to fix. The most straightforward solution is to add storm windows. Triple-track units are the most common option, but they can be bulky and conspicuous. If you decide to go this route, buy from a high-end manufacturer that offers custom sizing and a wide choice of colors.

For a less conspicuous appearance, I prefer the Historic One-Light (HOL) unit from Allied Window Inc. (800-445-5411; www.alliedwindow.com). This low-profile storm (photo left) is essentially a single-track unit in which upper and lower sashes mount one over the other; screens are available, but they must be stored elsewhere. For restoration

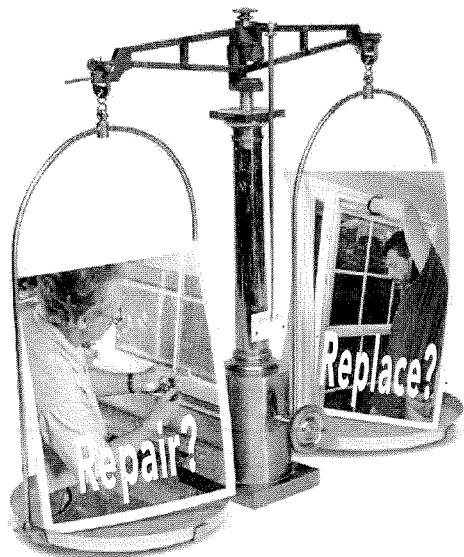
purists who'd rather not see any storm window on the outside of a home, this manufacturer also offers a variety of interior storm-window options.

The windows themselves also can be tightened up. The edges of fixed sashes should be caulked, inside and out, to eliminate air infiltration. If you're willing to remove them from their frames, sashes and stops can be routed and retrofitted with specially designed weatherstripping. Resource Conservation Technology Inc. (410-366-1146; www.conservaiontechnology.com) offers a wide variety of weatherstripping, as well as an excellent catalog that doubles as an installation manual.

Should Your Old Wood Windows Be Saved?

We weigh the options with cost, complexity, efficiency, and preservation in mind

BY ROB YAGID



Old wood windows are as charming as they are maddening. While they offer appealing craftsmanship and an authentic sense of home, they typically leak like a sieve. With rising fuel costs, an unstable economy, and a cataclysmic housing market, it's simply becoming more and more difficult to look at those old units with pride.

If you live in a historic district, you may not have the option of installing replacement windows. If you live elsewhere, however, you may be tempted to ditch the whole preservationist mentality and hop on the vinyl replacement train in hopes of reaping all the green rewards and cash savings of a modern home. Don't—not without carefully considering your options first.

By assessing your existing wood windows and making the right upgrades, you might be able to restore them to rival the performance of a standard replacement—at a fraction of the cost.

Consider the potential of your existing windows

You might make a window-replacement contractor's head spin if you tell him that you're going to repair rather than replace an old, drafty wood window. After all, thanks to progress in building technology, tight windows with astonishingly high insulating values—Serious Windows, for example (www.seriouswindows.com)—are now available. But not every advanced building solution or product makes sense for everyone. For many, repair work is a desirable alternative to replacement.

In a collaborative effort, the Vermont Energy Investment Corporation, the University of Vermont's Department of Civil and Environmental Engineering, and the U.S. Army Cold Regions Research and Engineering Laboratory set out to test the value in wood-window repair. In their 1996 paper, "Testing the Energy Performance of Wood Windows in Cold Climates," they assessed the performance gains accrued through various wood-window upgrades, including the addition of storm windows. Through testing and modeling over 150 windows across the state of Vermont, they found that the difference in annual energy savings between a properly restored wood window and a typical replacement unit amounted to only a few dollars.

The findings that were published in that paper are still supported by experts researching the issue. Michael Blasnik, an independent consultant for over 25 years specializing in energy efficiency, building science, and weatherization-program evaluation, has looked more recently at the energy impact of replacement windows. "The numbers just aren't as high as you would hope to see," he explains. "There

is actually little data that supports the idea that replacement windows save any significant amount of energy in typical homes."

Blasnik studied the energy bills of a small sampling of houses in Upstate New York. He looked at their energy bills before and after replacement windows were installed. No other building improvements were made. The findings were less than impressive. On average, the homeowners saved about \$40 on their annual heating bills. Consider the expense of replacing all the windows in a house, which could cost as much as \$10,000, and replacement hardly seems sensible

or economical. By dividing the total investment by the annual energy savings, you get a shocking payback period: The owners of these Northern homes won't see net cost savings for another 250 years.

Other experts agree. Jim Bunting, senior adviser with Canam Building Envelope Specialists—an Ontario-based firm that has focused on the energy efficiency, health, and durability of homes for 25 years—has reported on window repair: "As windows age, there will come a time when window replacement becomes a preferred option, driven by aesthetic, functional, and property value considerations. The payback from energy savings will, however, be much longer than with repair." His prediction? "[Repair] can be carried out with relative ease and low cost. Combine this with potential energy savings and the forecast has to be for more repairs than replacements in the future."

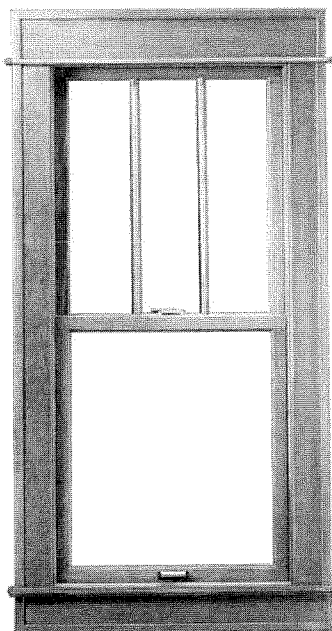
What window manufacturers say

Manufacturers often stress the energy-saving value of replacement windows. The purported savings vary by manufacturer but range from a 15% to a nearly 50% reduction in heating and cooling costs. While window replacement certainly makes sense in a lot of applications—for example, when sloppy window installation contributes to rotting walls or when a homeowner wants the luxury of easy-to-clean modern windows—it's best to look at the numbers carefully and to ask lots of questions.

"We see a reduction in energy cost from 15% to 30% when replacing double-glazed wood windows with our most energy-efficient ZO-E products," says Chris Schield, brand manager for Weather Shield Windows. According to Schield, those numbers are calculated with modeling software, though he couldn't say if the baseline wood window was airtight or had a storm window attached to it. And while a \$1500 federal tax credit for installing new energy-efficient windows will help to decrease the payback period of replacements, Schield recognizes that "payback periods can be lengthy."

Brian Hedlund, a product manager at Jeld-Wen, suggests looking at factors besides energy savings when considering payback

New windows can look old



If your windows must be replaced and preserving the character of your house is important, consider a product like Andersen's Woodwright windows. Prices start around \$600 per unit.

A PROBLEM-AND-SOLUTION APPROACH TO

periods. "It's important to look at the impact window replacements have on the value of the home and its comfort," Hedlund says. "It's difficult to put a definite price tag on those things, but they do affect the pay-back period." Hedlund also says that consumers find comfort in the U-value and solar-heat-gain coefficient (SHGC) ratings applied to replacement windows. "Our customers want guaranteed performance, and a label gives them that satisfaction—something you can't get with old wood windows," he says.

Jim Krahn, an advanced research manager from Marvin Windows, echoes Hedlund's viewpoint, but he takes a considerably hard stance about storm windows, stating that "storms, while they improve the insulation rating of windows in many cases, create other issues with egress and [solar heat gain]." When asked about low-e storm windows, Krahn replies, "The low-e glass that is available in storms is based on pyrolytic coatings that have a high SHGC, which does very little to reduce the cooling costs in the South. Code requirements in the South are for SHGC of 0.30 or less. I am not aware of any pyrolytic coatings that will reach that level."

Assess the existing window to determine the best upgrades

There is good news if your old home still has its original wood windows: They were built to be repaired. According to Jade Mortimer, a window-restoration specialist who operates Heartwood Restoration in Hawley, Mass., "The joinery and construction of old wood windows lends itself to repair."

Restoring and upgrading old windows isn't cheap, but much of the expense is paid in sweat if you're willing to do the work yourself (see "New Life for Old Double-Hung Windows," *FHB* #192 and online at FineHomebuilding.com). According to Mortimer, a professional may charge around \$200 for a complete restoration and upgrade of each window—maybe more, depending on the damage. However, if you do the work yourself, you can generally expect to pay less than \$100 for materials. A storm window can cost as little as \$80 or in excess of \$300. Again, the upgrade can cost much less if you build your own. □

Rob Yagid is an associate editor.

Wood windows built before 1920 were likely made of old-growth lumber, which is more decay resistant and stable than lumber used today. This wood, along with the glass and all the functional parts, can be refurbished. The performance of these old windows and the comfort they provide can be enhanced with storm windows and weatherstripping applied in the right areas.

Problem: A broken sash cord makes window operation difficult, and dangerous for small children.

Solution: Depending on the pulley, you may be able to replace the cord with a sash chain, which is a good option in tough environments, like coastal homes. However, sash cord is relatively inexpensive and perfectly suitable. Don't use any rope other than sash cord, which typically is braided cotton over a nylon core.

Sources: www.smithrestorationsash.com

Problem: The sashes no longer meet, preventing the lock from being used. This compromises the seal between the sashes.

Solution: This most likely occurred because the top sash dropped a bit and was painted in place. Free the top sash, and be sure it's in proper alignment. Chances are the sashes have warped over time, so even with the window locked, the sash won't seal properly. However, replacing the single lock with two evenly spaced locks will provide even pressure across the sashes and create a better seal.

Sources: www.historichomehardware.com, www.kilianhardware.com



Problem: The large gap between the upper and lower sashes creates an extremely drafty window.

Solution: A length of silicone-bulb weatherstripping placed in a routed groove on the top rail of the bottom sash is one of the easiest fixes to make. It also remains hidden at all times. When the sashes are locked together, the bulb is compressed, creating an airtight seal.

Sources: www.conservationtechnology.com

Problem: A worn jamb creates a window that rattles in the wind, allows air infiltration, and is a pain to operate.

Solution: Small strips of wood can be added to each side of the sash to make up the space between the jambs. An applied V-shaped piece of spring-bronze weatherstripping on the stiles will help to prevent air leakage.

Sources: www.kilianhardware.com

Problem: Broken panes of glass not only create a safety and security issue, but they also allow air and moisture infiltration.

Solution: Replace the window pane by using simple reglazing techniques (see "Restoring Window Sashes," *FHB* #161 and online at FineHomebuilding.com).

Sources: www.bendheim.com

Problem: Air and moisture pour through the gap between the bottom sash and the sill.

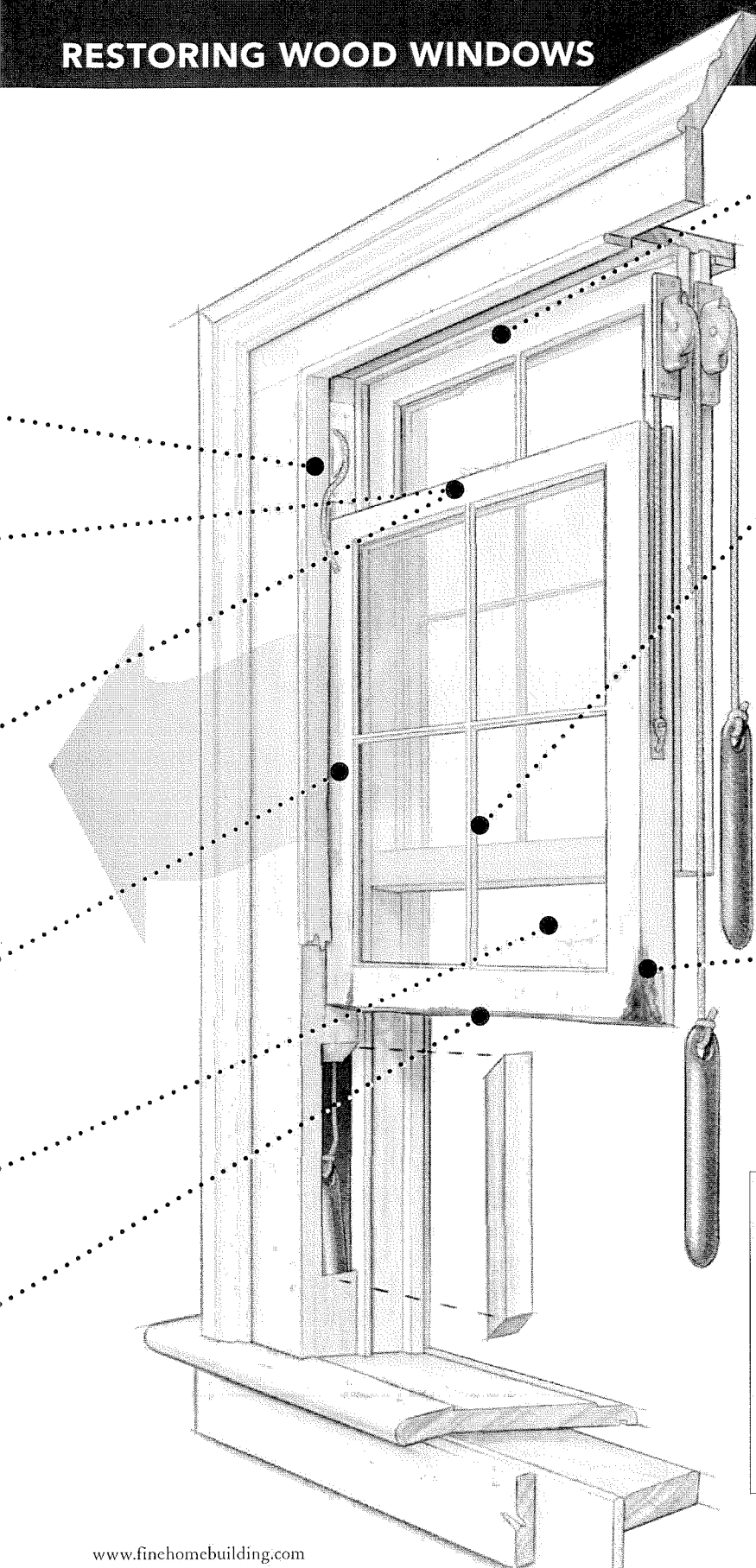
Solution: A piece of silicone-bulb weatherstripping inserted in a groove in the bottom rail will seal this critical area.

Source: www.conservationtechnology.com



Photos this page: Chris Ermides. Photos facing page: top, Tom O'Brien; bottom, courtesy of Spencer Works. Drawing: Bob La Pointe.

RESTORING WOOD WINDOWS



Problem: Too much paint has rendered the window inoperable.

Solution: Expect to encounter lead-based paint when stripping old windows (see "Lead-Paint Safety, at Home and on the Job," *FHB* #150 and online at FineHomebuilding.com). Once the window is completely stripped, repaired, and ready for paint, keep in mind that the pulley, sash cord, jamb, parting bead, and sides of the sash should not be painted.

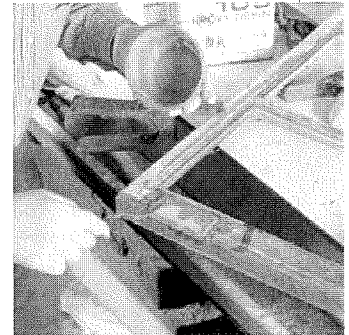
Problem: The glazing putty has deteriorated, which is adding to the leakiness of the window.

Solution: Remove all the existing putty, and take out the pane of glass out. Clean up all the rabbets, and treat the wood with a conditioner and preservative before reinstalling the glass. As a preservative, Jade Mortimer likes to use a 40/40/20 mixture of boiled linseed oil, Penetrol, and turpentine. Her glazing putty of choice is made by Sarco.

Sources: Sarco Putty (800-969-7889), also available at www.winnmountainrestorations.com

Problem: Wood damage, such as gouges, dents, deep scratches, and rot, compromises the structural integrity of the window and its overall appearance.

Solution: While some scratches, gouges, and dents can be fixed simply with epoxy and epoxy filler, others demand more extensive repair. A dutchman is a time-tested fix for rotted or otherwise damaged portions of rails and stiles. In other instances, a complete replacement of the part may be necessary. Look for wood that's the same species and age.



Sources: Mortimer suggests asking a local window-replacement contractor. She finds lots of quality old wood windows in their Dumpsters.

Problem: After all the appropriate upgrades, the windows are still too leaky.

Solution: Install a weatherstripped storm window on the outside of each window. Many old-window owners like single-lite, or one-over-one, storm windows since they offer protection without compromising the look of the home.

Sources: www.spencerworks.com, www.newenglandstorms.com, www.lyonswindow.com, www.alliedwindow.com, www.stormwindows.com

