WINDOW RESTORATION: ALWAYS AN OPTION

An experienced window-restoration contractor asserts that too many building owners and specifiers are unaware of the benefits and economies of restoring pre-1940 windows.

by Gail Wallace, *Restoration Works, Inc.*

The craft of restoring windows on historic buildings has finally come into its own. It is now recognized as a separate and bona fide industry, and there are now a few brave firms out there who are committed to doing window restoration full time.

Just 20 years ago, there was very little professional window restoration being done. Standard practice was automatically to replace windows with something that would approximate the original, unless the building was historically important. This process was further encouraged by the window-replacement companies' very effective advertising campaigns that promoted replacing drafty, peeling old windows with something "maintenance free." Unfortunately, this attitude is still common.

The Hidden Values of Old Windows

Today there is more awareness of the value of saving historic windows. We now know, for example, that original forest pine is dense heartwood and therefore more durable compared to today's second-growth pine. Old windows were generally milled thicker, were larger in size, and had a weight-and-chain balance system. These components have lasted 100 years or more. Many were given wonderfully decorative shapes and were manufactured with superb mortise-and-tenon joinery — even where the muntin bars meet the stiles and rails of the window.

St. Clement's Church in Chicago had badly deteriorated but highly decorative windows. Some were bowed (above), some had shaped multilite patterns (below), and some were multilite. They also wanted to convert the windows to insulating glass, which further added to the problem. These before-and-after shots show the degree of deterioration and what is possible in a high-end restoration program. They also show that, if sensitively done, a conversion to insulating glass is not noticeable.

Original Material

No one would consider replacing Tiffany glass because it looks like it is in need of repair. Yet the irreplaceable resource of original-growth wood is often not recognized. Old-growth material found in original historic windows is inherently more stable and decay resistant than the second-growth material found in today's replacement products. Why is it that Eastern white pine of original-growth forest is better than Eastern white pine of second-growth forest? The answer is in the age of the tree at the time it was harvested. Original-growth trees were hundreds of years old and had time to develop a predominance of heartwood in their material make up. Extracts that collect in the heartwood make it darker in appearance, more decay resistant, and more stable. Empirically, we have noticed that windows with 100 years of exposure without wood preservative and with failed paint are still very stable and viable.

Stability of wood is related to the part of the tree, sapwood or heart wood, from which it comes, and the proportion of existing late wood. Sapwood is not resistant to decay. It was the living part of the tree when it was felled, between the bark and the central heartwood. As a general rule, second-growth trees, used for contemporary milling, particularly fast-growing ones, have as much as 6 in. of radial-thickness sapwood. These trees, containing mostly sapwood, are about all that's available today. As a result, we must use wood preservatives on all second-growth material we buy, to provide stability and decay resistance.

Joinery & Dimension

Often overlooked is the value of preserving the original workmanship. Current market pressures do not allow for the labor-intensive joinery and decorative work found in original historic windows.

Traditional craftspeople used skill and ingenuity to create a joint that did not depend on glue. Making a square hole (mortise), square peg (tenon) with shaped copes is an exacting and labor-intensive process. The result is a joint with only one possible failure factor: the wood itself. Fortunately, these windows were made with very good wood.

Preserving material shapes and dimension is always a factor on historic buildings. Mortise-and-tenon construction requires thick wood members. For commercial-size windows, this meant thicknesses of 1-3/4 to 2-1/4 in. Natural light was an important design element, and by using this strong joint and sash thickness, the daylight size was maximized.

Modern manufacturing technology provides for using small-dimension sapwood, at times glued together to make larger pieces, glued again at the joints and soaked in wood preservative to form the basis of our modern window. If a 2-1/4-in.-thick sash is required to duplicate an original window, gluing for thickness or using a non-traditional wood species is the only option outside of reclaimed material. Pine is not sold in thicknesses of over 2 in. thick rough cut because of the difficulty in drying sapwood of this dimension.

Window Frame

The historic-window market is often defined by the sash component, even though the window frame is really key to the project. Historic windows were built into the wall of the building. Unless the frames are going to be completely removed, their condition and presence will effect the appearance and quality of the final product. The traditional window frame itself is a series of interconnected boards with rabbeted and grooved joints providing the strength to support a counterbalance system of operation. There are layers of decorative trims that provide the interface between the window system and the building. The sill, least understood, experiences the most damaging effects of weathering. The sill is grooved to hold the jamb boards square and parallel to each other. If the sill can no longer provide this vital task, then it must be fixed.

The traditional counterbalance system provides consistency of operation, durability, and repairability. Consistent because the window will be balanced properly today as it was a hundred years ago — there are no springs to wear out over time. Durability matches the life span of the connecting rope or chain. When that element does require replacement, it can easily be replaced with rope or chain found in any hardware store; no special parts are required. Restoration of these components, combined with weatherstripping, will ensure the integrity of the whole frame system.

The replacement-window market would prefer to pan over sills and install plastic jamb liners. If the sill is really in bad condition, is it a good idea to cover it over without fixing the problem? Jamb liners combine the weatherstrip and balance functions into one easy-to-install solution. Aside from the aesthetic concerns of covering over the jambs with plastic, there are real functional questions that must be asked: How long will the springs last? Will the weatherstripping function work if the plastic wears or buckles? If there is a problem, how do you fix it?

The restoration of historic windows preserves the resource we have in original-growth forest material, keeps the related performance advantage, and saves the labor already invested in the joinery.

Even many custom-milling establishments take some exception to traditional construction methods. Muntins are sometimes wider, windows are downsized in thickness, the weight-and-chain balance system is sacrificed, joinery is compromised. Wood species cannot be matched but are substituted with something else. Profiles can get close but are not necessarily exact. It is important to understand the features of a window. If you want an exact duplicate, you may need to visit several custom-milling shops before you find one with the proper skills.

It is true that, if you were to manufacture a window using the old traditional construction methods, including closed mortise-and-tenon joinery, matching the same species of wood, using a weight-and-chain balance system, making lugs, and following all shapes and profiles, the window would be expensive because its manufacture takes more time and skill, and the appropriate wood species might be hard to come by.

Evaluating The Options

How do we help people who want to preserve their windows make intelligent choices about how to get them restored? Are there companies out there that can provide restoration services? Can companies make a livelihood out of restoring windows?

I believe education is the answer to all these questions: education of the client, the historic market, and the service providers. The property owner is paying for the windows and should be made aware of all options: full

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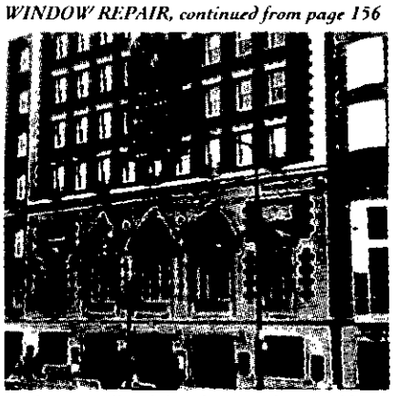

Orchestra Hall and the Chapin & Gore Building (not pictured) were kept as part of the Chicago Symphony Center. Restoration Works, Inc., did a full-window restoration on both historic buildings after much deliberation by the owners.

restoration or partial restoration, replacement of the sash or the entire window unit, etc. Historic agencies that determine qualifications of buildings for tax credits, preservation architects working on buildings that are on the National Register, and owners of historic buildings should always consider window restoration as an option. If "apples to apples" comparisons are made, restoration is often cost effective — in the long term.

DeceivingAppearances

The main reason that people don't consider restoration is because they think the windows are "too far gone." This could mean that the sills are rotted or the bottom rail has severe checking or muntins are missing, etc. Often, neither clients nor professionals realize how far window-restoration techniques have come. Any flaw or defect is correctable under a good window-restoration program, and the remedies are normally cost-effective as well.

Our approach is to run each window through a step-by-step restoration program. A client no longer needs to have his or her architect spend hours doing a window survey to try to catch and delineate every flaw. (Some are always missed anyway.) Restoring each window component step-by-step can catch everything and automatically maximize the service life of the restored window.

In 1995, our firm restored the window system on part of the Chicago Symphony Center. The architect and general contractor were not considering restoration due to extensive deterioration. However, given the uniqueness of the window system, which included large pivot windows with reverse-radius corners and 2-1/4-in.-thick sash, the economics were in favor of restoration. The clients were thrilled at this demonstration that a good window-restoration contractor can save any window.

To properly evaluate options, it's critical to know your original windows' inherent qualities, review different restoration programs, and make an "apples to apples" comparison with other possibilities. Restoration can be more, less, or the same price as replacement; a rule of thumb is that the more complicated the window, the more restoration becomes cost-effective. Everyone with a historic building should give restoration a fighting chance.

Likely Candidates For Window Restoration

Windows for which restoration is most cost-effective usually have some or all of these characteristics:

- Mortise-and-tenon joinery
- Original forest wood/slow-growth wood
- 1-3/4- or 2-1/4-in.-thick sash
- True divided lites
- Multi-lite patterns
- Shaped or bowed windows
- Elaborate brickmold
- Lugs which further stabilize a mortise-and-tenon joint
- Interior hardwood casings & trims

Window Restoration: Low-End vs. High-End

Window restoration has come a long way in the 20 years I have been in the business. Generally speaking, new companies start out making cosmetic repairs. Badly deteriorated window parts are replaced and some epoxy work may be done. As a firm develops more skills, epoxy restoration becomes more extensive. Finishes on windows become more sophisticated. More glazing options are offered. A low-end restoration may include some stripping and sanding; fresh paint on a less-than-smooth surface; and perhaps putty patching or new putty, leaving plenty of worn profiles, dings, dents, and chips (for character); reuse of the original weatherstripping; and fixing of broken chain or cord.

A high-end window restoration will provide: full stripping to bare wood; all wood defects corrected with epoxy; all joinery pulled and consolidated for structural strength; all details, dimensions, and profiles returned to original condition, with extensive sanding including hand-sanding; all usable hardware restored; new high-performance weatherstripping; state-of-the-art reglazing; and factory-applied finishes.

Matching Clients With Window-Restoration Companies

A client should look for a window restorationist with the skills and techniques required to restore the windows to their original condition, or at least to the expectation of the architect or owner. The question of standards is always a problem. Who sets the standards? There is no Association of Window Restorationists. The National Park Service gives us certain generalized historic criteria to fulfill, but window restoration remains highly subjective. As a result, sloppy caulk work, poor paint jobs, and crooked spacer bars can be seen on some "restored" windows.

Levels of restoration vary from job to job: Some windows are not that deteriorated and, in fact, can be repaired by a painter. On the other hand, there are those clients who simply want windows painted when the windows are in dangerous condition, with no putty left to hold in the glass or with joinery so loose that the windows are not safe. The more deteriorated a window system is, the more you need a skilled window restorationist — someone who provides both structural and aesthetic restoration. It is important to match up the needs of the windows with a contractor who has the skill level to answer them.

Evaluating Window-Restoration Contractors:

- ☐ 1. Knowledge and skills with sensitive stripping methods.
- ☐ 2. Knowledge and skills in working with epoxy restoration.
- ☐ 3. Custom milling skills for any required replacement parts.
- ☐ 4. Good glazing skills.
- ☐ 5. High-performance coating skills for a painted or stained finish.
- ☐ 6. Knowledge of window reinstallation, and good carpentry skills.
- ☐ 7. Minimum of 5 years' experience in full range of all the above .

A full window-restoration program is totally integrated and will give the most long-lasting results. However, there are options under a restoration umbrella besides the depth and breadth of the wood restoration. Sometimes only the sash are restored because the frames are in good-enough shape. Sometimes windows become permanently fixed in place. Sometimes the perimeter caulk around the brickmold is in good shape and doesn't need to be included. Every feature on a window and every step in restoration should be thought through to get the best results.

Full Window Restoration

Our firm provides a full window-restoration program for sash only or for the complete window unit. This program consists of stripping to bare wood so that (1) we can inspect for defects; (2) any lead-based paint can be removed; and (3) a smooth finish can be achieved. We do three rounds of epoxy restoration: structural, aesthetic, and fine-line. We use Dutchmen and/or custom milling where appropriate. We reglaze with the original glass, new single glazing, or new insulating glass, using either a custom-milled wood glazing stop or putty. All wood is sanded extensively until smooth, with the final sanding being done by hand. The wood is then treated with a wood preservative. Our spray application of paint combines a smooth, uniform appearance with a high build of coating for maximum protection. The exterior paint is usually oil alkyd or whatever is specified by the architect. If a stained finish is desired, we pigment the epoxy to blend in with the stain. Our stained finishes are commercial-grade and custom-mixed with an Italian catalyzed urethane sealer and a semi-gloss clear coat. New caulking, new weatherstripping, new hardware, and the refurbishment of the balance system complete the full restoration program. When restoration is done properly, everything works the way it is supposed to. The windows are highly energy efficient, they operate smoothly, and they are aesthetically pleasing.

The only time a window should be replaced is when the original windows are missing or if no one is willing or able to restore the windows in your geographic area. However, there are more options and service providers emerging as more demand is made by the historical regulatory agencies to save windows.

The Future

Window-restoration services should — and will — keep growing. Wouldn't it be wonderful if everybody in the United States who owned a pre-1930s property wanted to get their windows restored, and all they had to do was send them to their local restoration facility? And wouldn't it be wonderful never to have objects which are made of slow-growth, original forest wood lost forever in a landfill?

We are attempting to fulfill some of that need. We can pick up windows from anywhere in the United States, bring them back to our restoration facility, restore them, and return them to the owner, contractor, or architect. (At this time, we can send our trucks only if the project includes 50 windows or more.) We are currently restoring about 200 windows per month. We have incorporated new efficiency measures and machinery into our restoration program to keep costs down. Our set-up includes a "state of the art" stripping area, a large epoxy-restoration area, a contained sanding area for both mechanical and hand-sanding, a glazing area, a large finishing room, and a complete custom-milling area for all milling, from parting bead to glazing stops to full window units with true closed mortise-and-tenon joinery. We also provide full consulting services whether we do the work or it is to be done by other local contractors. Turnaround time is roughly four weeks.

We restore bowed windows, Gothic heads, wagon wheels, etc., in various degrees of deterioration. Cutters can be made quickly for the custom milling of missing muntins, new bottom rails, or for whole new missing window units. We only do exact-duplicate custom milling using the existing windows as the template. ■

Gail Wallace started her restoration career in 1982 with the St. Nicholas Hotel in Springfield, Ill., a project consisting of 259 windows that received a good scraping and painting, reglazing, and a lot of custom milling of deteriorated parts. Once her firm (Restoration Works, Kankakee, Ill.) developed epoxy-restoration skills, they were able to take on full window-restoration projects. For example, in 1989, they restored 835 windows on The Rookery, John Root's landmark building in Chicago, and converted all windows to insulating glass — one of the first such large-scale projects in the U.S. For more details, see the listing for Restoration Works, Inc., on the SourceList on p. 160.

Checklist for Full Window Restoration:

- ☐ 1. Strip all components to bare wood.
- ☐ 2. Inspect all wood for infirmities.
- ☐ 3. Epoxy-restore wood, including all joinery, splinters, dry rot, checking, holes, worn edges, worn profiles, dings, dents, and scratches. Provide dutchmen or other custom milling for larger sections of missing wood.
- ☐ 4. Sand extensively until wood surfaces are smooth.
- ☐ 5. Apply wood preservative.
- ☐ 6. Glaze with appropriate glass and glazing techniques.
- ☐ 7. Coat with a two-color system for the interior and exterior, including priming and painting or staining and clear-coating.
- ☐ 8. Refurbish pulley wheels, and weight-and-chain balance system.
- ☐ 9. Provide high-tech weatherstripping.
- ☐ 10. Restore or replace hardware.
- ☐ 11. Remove all old caulk around window perimeter and install new caulk.