RESTORING HISTORIC WINDOWS

On Many Projects, Restoration in Place Is Less Costly and Less Disruptive Than Replacement.

by William Stivale

The author oversaw the complete restoration of over 65 different types of wooden and steel windows in the National Arts Club building (above) in New York City. Careful scheduling kept the costs of repair well below replacement costs.

Unless a building is completely gutted, installing new window units often greatly outweighs the cost of restoration in place. Restoration also preserves the historic character of the windows and surrounds. Keeping within budget takes careful planning. Start by familiarizing yourself with the materials you are working with and the restoration techniques that are available.

The first step in planning is to divide the windows into their basic categories. It is not unusual to have more than one type of window in a facade. How many are double-hung, casement, or fixed transom? Do you have windows that pivot rather than hinge?

What material, or combination of materials, are the windows made of? Are they wood or metal, and what types? It is a common myth that the more ornate wooden windows are made of oak. Although the interior surrounds may be oak, the actual jamb, exterior sill, and sash are usually pine.

It is important to identify the materials, since the success of a repair often relies on the compatibility of the materials. For example, an oak patch scarfed into a pine jamb is likely to come loose, due to the different rates at which the two woods absorb moisture and expand and contract.

One project we managed—the National Arts Club in New York City—involved the complete restoration of about 65 different types of wooden windows, along with two large steel windows. Each type of wooden window required variations in the specs, while the steel windows demanded an entirely new set of specs and the hiring of a different contractor.

The silt, and bottoms of the side jambs where they meet the sill, are often decayed. Typically these can be repaired in place with epoxy. But if the edge of sill is gone, a wood patch is needed as well.

Basic Elements of the Window

The next step is to divide each window into its basic elements and examine each individually.

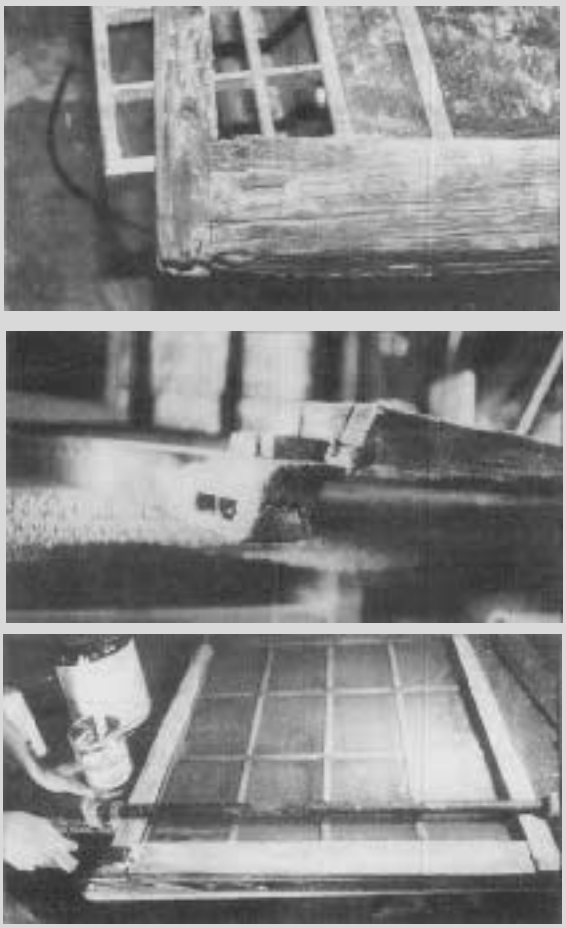
With wooden windows, it is often just the sash that are in poor condition—usually the bottom rail and the bottom of the stiles. These pieces sustain the most damage because of the water they draw up from the sill by capillary action. If this is the only problem, the damaged parts can usually be removed and repaired without disturbing the rest of the window.

Check the joints of the sash. If the mortise and tenon are intact and merely loose or separated, the joint can be pinned with 1/4-inch dowels adhered with resin-epoxy fillers. (One advantage of epoxies is that they are fairly foolproof to mix—most use a one-to-one ratio.) Don't screw or nail the joint together since that will split the wood, and eventually the metal will rust or corrode.

If the entire sash is so decayed that repair is not practical, measure its height, width, and thickness. If it's from 1-1/4 to 1-3/4 inches thick, it can be milled from standard stock. If it is a simple, standard profile, you can probably find it already milled. If it's a nonstandard size or has special details, such as an arch, a restoration artisan or woodworker may be able to produce it for you more cheaply than a mill shop.

Tell the mill how many sash you need of each size, as this will affect the price. Since the meeting-rail details are critical for properly sealing the window, get both upper and lower sash milled when replacing double-hung sash.

In the case of steel sash, try to break it down into its members. Very often the window is made up of a series of simple L- or T-channels and solid bars. If a member is missing or corroded, it might easily be found at a metal shop. Though some of these parts must be welded,



Often it's just the sash that are damaged (top). If the mortise and tenon are still intact (middle), they can be fixed by careful pinning with 1/4 inch dowels. Medium-viscosity resin epoxy is used both to fill the surface and to bond the pins and loose sections (bottom).

many can be reassembled with self-tapping screws.

Next check the sill. If it is rotted, but still has its outside edge and upper outside corner intact, it can easily be treated with epoxies. If the body is intact but the edge and corner are gone, it should be capped with a new wood edge, then epoxied. You can't build up an edge with epoxy alone, or it will come loose. If the sill is totally missing, replace it with pressure-treated lumber and remember to pitch it at no less than a 15-degree angle for water runoff.

I strongly advise against capping sills with metal. Although this hides the problem, it traps moisture and can actually speed up the decay of the wood behind it. Since it is not practical to assume that you can totally seal any part of the window from moisture, beware of any technique or treatment that does not allow the material to breathe and let the moisture escape naturally.

When looking at the rest of the jamb, again try to divide it into elements. With wooden jambs, damage is often limited to the area where the vertical members meet the sill. With double-hung windows, check the parting strips. If damaged, they are usually not worth restoring and can easily be replaced.

Only as a last resort would I remove the entire jamb. The key to window restoration is to avoid disturbing the surrounding architectural or structural elements and details. By removing the jamb you can damage the brownstone, granite, or brick exterior, as well as interior plaster and woodwork. Damage to surrounding areas is critical in comparing the cost of new units to the restoration of existing ones.

I strongly advise against capping wood sills with metal. It traps moisture and can speed up decay.

If the sash or sill has serious rot below the surface, the wood should be saturated with loose-viscosity epoxy (top). If the surface is hard or the rot deep, first drill 1/8-inch holes (above).

Architectural Details

At this point, look more closely at the architectural details of the windows. In many cases you may find basic utilitarian windows (which can easily be replaced) along the same facade as specialty design windows, which would be more practical to restore. When you replace even a basic window, though, carefully match it so you don't throw off the design system of the facade.

Do the sash have multi-lights? If so, what is the condition of the muntins? If they are in poor condition or missing, measure how many linear feet you need. If it is more than 100 feet, it might be worth the expense to have them milled. If it is only a few pieces, an artisan or woodworker can make them by hand.

One side of the muntin is the profile, and the other is the glazing bar. Although the profile is usually a standard ogee, the thickness and character of the muntins can vary greatly. Therefore, always bring a sample to be accurately reproduced.

If it is a steel window with multi-lights, again see if the muntins are a simple channel. If so, are they screwed or welded to the frame? Check the material. Although the perimeter of the sash may be steel, the muntins may be zinc or lead.

Next, look at the glass. Do the windows have leaded clear glass and/or stained glass? If they have simple, geometric, leaded clear glass in poor condition, it is often more practical to have the windows rebuilt. If it is stained glass, a reputable studio can tell you the extent of the restoration needed. Remember that the imperfections in historic glass are what give it character. Although you should save as much glass as possible, it can be replaced with "restoration glass," which is made with intentional imperfections.

Finally, look at the brick mold. This can vary greatly between facades. It is not a structural member, but merely a picture frame to finish off the exterior and seal the window frame to the rough opening. Therefore, if it is badly damaged it can usually be easily removed and replaced.

Since the brick mold is often a standard molding or series of moldings, take a sample to the lumberyard. They may be able to match it or have something altered to make it match. In the case of the National Arts Club, the brick mold was merely standard one-inch quarter round.

Some final things to remember in the planning stage are that restoration of most conventional windows can be done from the inside, thus eliminating the need for costly scaffolding. If you are having other facade work done, do the windows first. This is important since any repointing or masonry patching will usually be brought directly up to meet a rotted sill or brick mold. Finally, plan your project for the spring since many of the treatments used in restoration will not cure at temperatures below 40 degrees.

Treatments and Techniques

The techniques used in window restoration may seem mysterious to both the owner and the contractor. But they can be greatly simplified by breaking down the work into stages.

The first stage is preparation. Without careful preparation none of these coatings or treatments can be expected to perform properly. I don't know of one epoxy treatment or filler that can be effectively used over paint. Therefore, insist that the surfaces of the wood or metal be free of paint and rust. When preparing metal for painting, do the job in sections so you can prime the surface the same day it is stripped and cleaned. Otherwise, the exposed surface may oxidize within four or five hours.

When working on windows in place, I advise against using heat guns to remove paint. These can present a fire hazard since you do not know what type of debris is behind the wood. The use of chemical strippers should also be limited to avoid softening or lifting the wood. With multiple coats of paint, you might use them on the outer coats. For exterior woodwork that will be painted, molding scrapers and 80-grade sandpaper should be your first choice for stripping paint.

The next stage deals with consolidants and preservatives. The first consideration is the consolidation of wood members with serious rot below the surface. This treatment is usually confined to sills or bottom sash rails. It involves saturating the rotted member with a very loose-viscosity epoxy to strengthen and unite the weakened and soft fibers. In members with severe surface cracks, the epoxy can be brushed or troweled in until the piece is saturated.

In cases where the rot is deep or the surface is hard, drill 1/8-inch holes about one inch apart at random angles and depths to create wells into which the epoxy can be injected. This system acts as both a penetrating adhesive and flexible sealant, so applying wood preservatives such as penta is unnecessary. Additional preservative coatings are more suitable for outside decks or basement joists that will not be painted.

For metal windows there are high-tech coatings such as "Incralac" for preserving copper and bronze that will not be painted. A typical steel window, however, merely needs a red-oxide primer, which inhibits rust.

At this point, the surface is ready to be filled. For exterior wood surfaces, I suggest a medium-viscosity (honey consistency) resin epoxy. This system is superior to fillers such as glazing compound since it penetrates the surface, lasts longer, and can also serve as an adhesive for scarfing and/or pinning broken or loose sections. Although you can thicken the epoxy with sawdust, I suggest using a much finer talc-like material such as fumed silica, which will actually be absorbed into the epoxy. These fillers are troweled on, then sanded smooth to feather into the surface.

The minor filling of interior wood surfaces can be done with a standard latex wood filler. This is easily applied and sanded, and will generally take better to stain than a resin epoxy will.

Although structural joints of steel windows must either be welded or screwed, metal epoxies can be used to fill surface cracks and pitted areas. You can also use them to seal overlapping joints of sheet metal. They are putty-like, troweled on, and ground smooth with a fine wire brush.

All of these treatments can become useless, however, unless they are covered properly with paint. Start with a primer coat. This is not merely a first coat, but a particular type of paint that will adhere to and penetrate the unfinished surface. For wood surfaces an alkyd primer is preferred for its strength and compatibility with both latex and oil-based paints. For new, clean metal you can use a zinc-chromate primer, which adheres well to smooth surfaces. For metal that has rusted, use a red-oxide primer with rust inhibitors.

Next, apply the finish coat. Primed wood surfaces can be coated with latex, oil, or specialty epoxy paints. Oil paints are slightly more difficult to apply, but seem to repel water better than latex. Epoxy paints are stronger, but generally much thicker, and have a high-gloss finish.

Interior finishes often change from window to window. Where a stained finish is called for, opaque stains (stain-paints) can sometimes simplify the job. These can be brushed on over either bare wood or primer, then sealed with a glossy or matte-finish urethane.

Both finish coat and primer for steel should be relatively quick drying. Make sure the finish coat is compatible with the primer. Don't drastically tint metal paints, because it will cause them to break down.

Sealants

The remaining steps deal with waterproofing and sealing the window.

Proper glazing is critical for weather protection. For a good seal, you must first remove the glass and clean the glazing bars. Next apply the back bedding, which both seals and cushions the glass.

After installing the glass, insert the push points and remove excess putty. Then bevel the outer putty bead to keep

out rain and help water run off. Remember that these putties will not adhere well to the bare material, so prime the surface with any type of oil-based coating, such as an alkyd primer or urethane, before application.

There is a lot of talk about upgrading historic windows to double glazing. Insulated glass has many merits in new buildings and replacement windows, but usually presents great difficulties when you try to adapt it to existing windows. For example, with double-hung windows the counterweights and sash pulleys might not be able to accommodate the weight. Changing the thickness of the glass—say, from 1/8 to 1/4 inch thick—will cause the same type of problem.

When glazing a heavy steel sash, you should use linseed-oil-type putty, which slowly hardens to match the rigid condition. When glazing wooden sash, use an elastomeric glazing compound (such as DAP-33), which will give with the flexibility of the material.

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The final step in sealing the window is caulking. Three widely used types are latex (also referred to as painters' caulk), silicone, and polyurethane. Latex caulk is good for interior work but will not hold up as well when exposed to weather, and generally does not have the same elasticity as the other types. Silicone caulks are good for sealing the perimeter of fixed sash, protective glass, or storm windows, since the bead can be removed without much difficulty. These are generally clear, and cannot always be painted.

Polyurethane sealants should be used for critical areas such as the perimeter of the window, where wood or metal meets masonry, and where the stiles of the jamb meet the wooden sill. This sealant is usually white, but some brands come in colors and some can be painted. Polyurethane adheres well to both wood and stone. It remains elastic for a longer period, but generally has a shorter shelf life.

When applying any of these caulks, all surfaces must be perfectly clean, and the wood or metal should be primed. Do not fill a space of more than 1/4 inch wide with caulk alone; use a backer rod. In cases where the wood jamb meets the stone or brick, repoint the perimeter before caulking to provide a more solid, even surface for the caulk.

When choosing an epoxy, finish, sealant, or other treatment, consider its compatibility with the window material itself, as well as with the other treatments you have chosen. Look at all the options, and avoid systems that are not reversible.

Although there are many steps in restoration, the labor and cost are minimized by putting as many windows as possible through the same stage at once. This applies to a brownstone with 20 windows that need meticulous restoration—or a co-op with 100 windows that merely need sash repair and sill consolidation. ■

William Stivale manages restoration and conservation projects for the Union Theological Seminary Building Preservation Program in New York City.

This article is adapted from the 368-page *Window Workbook for Historic Buildings*, available for $48.25 from the Historic Preservation Education Foundation, P.O. Box 27080, Central Sta., Washington, DC 20038.