Maintenance and Repair of Historic Wood Windows
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Editor's Note: *This is the third in a series of four articles on retaining, repairing and upgrading traditional wood windows in historic buildings. The first article was an overview entitled "Windows in Historic Buildings: Sustainable, Repairable" by Susan D. Turner. The second, "Repair or Replace: Windows in Historic Buildings: Arriving at a Sustainable Solution" by Andrew Powter and Craig Sims, examined myths usually associated with window replacement, durability of traditional window systems and the standards by which window performance is measured in Canada. This article describes the common maintenance and repair techniques for typical traditional wood window problems. The final article in the series will address loose-fitting sash and other thermal performance matters.*

The most common reasons for repairing wood windows are operational problems (they won't stay open), failure of joints (especially at the meeting rail), broken glass, deteriorated glazing putty, decayed sills or sash, and failing paint. Most of these problems can be avoided with regular maintenance—such as painting. If you are already facing one or all of these problems it is comforting to know that your windows can be repaired. Before phoning your local "window replacement specialist," remember that traditional windows are usually maintainable—nearly anything that goes wrong with them can be fixed. The so-called "maintenance free" windows on the other hand, will not have the traditional problems associated with historic windows, but they will introduce a host of new ones. Vinyl welds may break, proprietary hardware and other components may not be available in five years time, the coating on the aluminium or colour of the vinyl will fade or scratch, the vinyl will emit toxic fumes if it is burned, and the seals in the insulated glass units will fail.

You don't have to set your traditional windows by the curb or add to our landfill problems!

Getting Started

Whether you plan to hire a contractor or do all (or some) of the work yourself, it is important to get organized. People often make the mistake of reacting to the one or two windows that are in the worst condition. It's better to approach the maintenance and repair of historic windows as a long-term program.

First, number all of the window openings and record these numbers on simple floor plans and later, on the windows themselves. Window W1-1 (the first window on the first floor) will carry that name for all time. If pieces are disassembled (for example, storm windows), number them for the window they came from. Next, take an overall look at the windows. Most of the required repairs are covered in this article, so use it as a guide. Prepare a list of the repairs you need to make and the materials necessary to do them (for example, the number and size of broken glass panes or the number of failed meeting rail joints). It will help you decide what to do yourself and what to contract out. It will also help to focus your discussions with your contractor.

Methods of Assembly (or Methods of Disassembly)

For quality results, sash should be removed for most repairs—an operation that is usually best carried out from the interior. *Double-hung sash* are held in the frame with *stops* and *parting strips*. Removing the interior stops (Figure 1, previous page) allows removal of the lower sash; removal of the parting strips, the upper sash.

To remove a sash that has been painted shut without damaging the wood, it must be freed from the *stop* and the *stool* and lifted about one inch. Simply tap a small, sharp pry bar along the joint to break the paint (Figure 2), or use a heat gun (shield the glass) to soften the paint so that a flexible knife or spatula (an artist's palette knife) can be inserted.

Now remove the interior sash stop, usually held in place by small nails. Once the sash can be raised a little, slide it out of the frame and detach the sash cords (if present). Tie them off so they don't fall into the weight cavity. It might also be necessary to soften the paint seal on the exterior.

Removing the parting strips to access the upper sash is more difficult; they are friction fit (meaning there are no screws or nails) and they are usually heavily over-painted. Again, break the paint seal, and pull out the parting strips using vice grips with cushioned jaws (leather or popsicle sticks). If the parting strips split, new ones are easily made. When the upper sash is free, remove it inward again, taking care to tie off the sash cords. In the future, your sash could be removed more easily and quickly by fastening the interior sash stops on one side with screws and grommets (Figure 3).

Traditional sash windows, whether they are double-hung or *casement*, are made up of a number of specialized "sticks" referred to as *rails*, *stiles* and *muntins*. They are connected with *mortise and tenon joints* (Figure 4). They can be disassembled, with some care, if required. Disassembly involves drilling out and replacing the hardwood *pegs* that hold the joints together. Sometimes the tenons are also *wedged*, creating a locked joint. These will also need to be drilled out with a small drill bit.

Installing Replacement Sash Cords

Most traditional double-hung wood windows are counter-balanced with weights. *Sash weights* are located in a wood channel behind the frame and are connected to the sash with *sash cords*, or chains in larger windows. The existence of a small pulley or wheel at the top of the sash track is sometimes the only visible indication that the counter-balance system is in place. Sash cord is very durable, but once painted it becomes brittle and eventually breaks as it passes over the rollers. The actual sash weights are usually still in place in the pocket. To install new sash cords:

- Remove the sash as described above.
- Find the *weight pocket* cover (also usually encrusted with paint) and remove it. Be careful with this part—our ancestors had many devious ways to install these—sometimes a small screw or finishing nail or a bevelled joint is used to hold them in place. Other times, it's the parting strip.
- Feed the new sash cord over the roller at the top of the frame and tie it to the weight.
- Take care in cutting the cords to length—if they are too long, the weight will "bottom out" before the lower sash is raised to the desired height; if too short, the sash will not close.
- Connect the cord to the sash through the slot or hole provided. Traces of the old cord may remain to guide you.
- Before reinstalling the sash, rub the edges with a block of paraffin wax to reduce friction (this works on your dresser drawers too—better than soap!)

Repairing Exterior Wood Work (Figures 5, 6 and 7)

The range of required sash repairs can be extensive. It can include repairing a damaged rail or stile, the bottom of a mortise (or the top in the case of meeting rails), a damaged muntin *glazing tongue*, and replacing a deteriorated tenon. More extensive repairs can include either splicing new ends on stiles or rails or replacing them entirely. One must consider the point at which full, matching sash replacement is the more logical approach.

General principles

- *Back priming*: Exterior wood work should be primed on six sides (including end grain). Back priming minimizes the risk of warping or twisting. The only exceptions are sash rubbing surfaces and surfaces which will be glued. Prime after gluing.
- *New wood*: Always try and match the species and grain orientation of the piece of wood being repaired. Using recycled old-growth wood from architectural salvage is recommended. It will be

more compatible with the hardness, density and decay resistance than new wood. Plantation-grown wood: Watch out for nails!

- *Adhesives*: Do not use PVA (polyvinyl acetate—the white or yellow glue commonly called "carpenter's glue") for exterior work. Use epoxy-based adhesives formulated for outdoor wood work repair. They have good adhesive and cohesive strength, making them good gap fillers.
- *Heartwood*: Use heartwood, the inner part of the tree, whenever possible. The outer sapwood is less dense and less decay-resistant. The orientation of the grain is important for avoiding "cupping" (Figure 8).
- *Profiles*: Sash components have a wide range of moulding profiles which are specific to the date and location of the building. Try to maintain and match the profiles of existing historic moulding. If necessary, custom cutters can be fabricated.
- *Joints*: Never glue the entire joint. Apply glue only to the shoulders of new wedges.
- *Repair pieces*: Apply slightly oversized patches, then plane and sand to final shape.

Glazing Windows

Glazing is the installation of glass in sash (Figure 9). Reglazing is necessary if the glass has broken or the glazing putty has deteriorated. If the putty has deteriorated to the point that the glass pane rattles when tapped, then the glass and all the putty in the rebates should be removed and redone. If the glass is tight and only the outside bevel of putty is missing or has deteriorated, then it is possible to remove the damaged putty from corner to corner and replace it.

Remove loose deteriorated putty with a chisel. If the old glass is intact, use great care. Heat guns will soften the putty but they can crack the glass, so shield it (aluminium foil around a piece of cardboard) to avoid breakage1.

Installing new glass

1. With a sharp chisel and coarse sandpaper, clean the glazing rebate (or rabbet) notch to bare wood.
2. Using a large artist's paintbrush, apply a coat of boiled linseed oil2 and turpentine (mix 1:1) to the rebate and allow it to dry for 24 hours. This application reconditions the wood, prevents it from drawing the oil out of the putty prematurely and provides an excellent bond for the putty. Putty should be oil-based. Follow the manufacturer's instructions; if it comes in a tube, it is not glazing putty.
3. Apply a bed of back putty and press the glass into it; the putty will ooze out around it. The glass should be sized about 1/16" smaller than the rebate on all sides—more for larger glass. Install *glazing points* to hold the glass in place.
4. Install the exterior bevel of putty neatly and evenly so that it lines up with the edge of the sash or muntin bars. Tip: To avoid leaving a furrow of putty on the glass that requires removal later, angle the putty knife so that the edge of the blade forms a bevel with the narrow end against the glass.
5. Trim off the excess back putty and allow the remainder to cure, or at least "skin over," before painting (about 3 days). In cold weather, placing the sash in the sun will speed up the process. Both interior and exterior paint films should lap onto the glass by about 1/16" to seal the glass/putty edge. Use an alkyd primer on the putty; latex paint causes oil-based putty to wrinkle.

Sill Repairs

Window *sills* require special attention because they have a broad surface facing the sun and weather. It is important to differentiate between decayed and weathered wood as the repair for each is different. Decay is caused by wood-destroying fungi which, when moisture and temperature are right, consume the cellulose in the wood, causing it to lose its structural integrity and soften. Decayed wood should be removed. Weathered wood breaks down from the surface due to the effects of ultra-violet light, wetting and drying cycles and other weather effects. Weathered wood is normally grey and may be cracked or

checked, but is still structurally sound. Use a penknife to pry up wood fibres; if the fibres come up as long splinters the wood is sound, but if the fibres break in short little pieces it is decayed.

Case 1

To repair sills that are weathered grey but without serious checking or decay:

1. Scrape away all remaining paint and loose, friable surface wood fibres; use a heat gun if required.
2. Sand smooth.
3. Paint the sill with one coat of boiled linseed oil and turpentine (mixed 1:1) and allow it to dry for 24 hours. This step reconditions the wood and acts as a water repellent, while keeping the sill dimensionally stable and preventing the dry old sill from drawing all of the solvent out of the primer.
4. Paint with an alkyd-based primer before applying two top coats.

Case 2

To repair sills with cracks, checking and/or minor pockets of internal decay:

1. Scrape away all remaining paint.
2. Use scrapers and gouges to remove all dirt and decayed wood down to sound wood. Use a vacuum cleaner to remove loose debris.
3. Fill the checks and former pockets of decay with an epoxy system3 formulated for architectural wood repair. The best of these consist of a liquid epoxy which is applied first to saturate and consolidate the surrounding wood. Follow the manufacturer's instructions accurately.
4. Apply a paste patching epoxy formulated to bond to the consolidant and fill gaps and holes. Tool and sand once it is cured.
5. Paint any weathered grey portions of the sill with one coat of boiled linseed oil and turpentine (mixed 1:1) *after* application of the epoxy repair and allow it to dry for 24 hours..
6. Paint with an alkyd-based primer, then apply two top coats.

Don't forget, a good paint film is the key to a successful and durable repair.

Case 3

To repair sills with very large checks or pockets of decay: Badly deteriorated sills may have to be replaced in part or entirely. Full sill replacement can be complex due to the way some windows are constructed. Fortunately, total replacement is seldom necessary. If it is, remember that the frames are often set into angled grooves or rebates in the top of the sill and are usually fastened by nails up into the frame from below. All fasteners need to be cut in place without damaging the frame bottom. The sill will probably be destroyed in the process of removing it, so take all measurements needed for the new sill carefully.

Where decay or severe checking is limited to the outer portion of the sill, it can be cut back and a new "nose" applied to the remaining section (Figure 10). The new piece should be fastened to the old one with waterproof epoxy adhesives and brass or stainless steel countersunk screws. If possible, the joint should be located under the lower sash to protect it.

If you notice that the sills are flat or even back sloped (toward the building), take this opportunity to introduce a slight outward drainage slope on the replacement. If your sills are a bit short, causing water to run down over the face of the wall below, extend the sill slightly (even 1/2" will help) and introduce a drip into the underneath edge.

Remember, epoxies are fillers, paint systems are coatings. Do not apply large epoxy patches as a surface coating; they will fail, especially over poorly prepared surfaces.

Surface Preparation and Painting

Complete all wood work repairs and glazing before beginning surface preparation and painting. Be very particular about safety—use safety glasses over your prescription lenses, ensure that ladders are well braced and tied, and that you have suitable dust masks or respirators that fit snugly. Have a supply of work gloves and recommended chemical-resistant gloves on hand. Read manufacturer's instructions and then do what they say.

Preparation

1. Remove, bag and label all hardware. Clear paint-filled screw slots with a few oblique taps from a sharp screwdriver.
2. Break the wood/hardware bonds with a utility knife or heat and spatula.
3. Once removed, heavily painted hardware can be stripped in vinegar in a double boiler—this is acidic, so if the hardware is historically significant, test a piece first.
4. Collect all removed paint material and dispose of it according to local hazardous substance disposal regulations. Do not let it fall into your garden.

Should all old paint be removed?

Old paint that is well adhered and is not alligatored can be lightly sanded, wiped down with a weak solution of TSP (trisodium phosphate) and repainted. A 100-year-old window may have 15 or more coats of paint. Full removal may be necessary if the paint is poorly adhered or is so thick that it obscures moulding profiles or interferes with their operation. An infra-red stripper is best as it allows careful control of surface temperature, but a carefully used heat gun can also work. These tools soften the paint, allowing it to be removed with scrapers. To avoid gouging, use scrapers suitably shaped for the surface you are scraping. Chemical paint strippers are an option but it is difficult to collect the residue for disposal and they must be neutralized after removal. In our experience, most appear to contribute to premature paint failure. Paint removal is tedious and time-consuming, but requires care. Be fussy and take pleasure in your work. Do *not* use open flame devices—they are dangerous to historic buildings.

Removing paint

Before removing paint, choose a protected area to investigate the original and subsequent paint colours. Remove a small sample for your records. Also, select one or more small areas of a window where paint coatings are not removed and identify them in your records. This will allow future owners to rediscover the building's colour history.

Painting

As in most things, with paint "you get what you pay for." Always use the best quality paint you can afford, with both finish and top coats from the same manufacturer. Avoid "no-primer necessary" materials. Durability and long-term performance-in-service information are not yet available for these materials. Remember, the purpose of paint is first to protect the wood from weather and light, and second, to decorate. It is not a cure for decayed wood.

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