Chapter 9

Stabilization and Treatment of Exterior Wooden Trim—Windows and Shutters

John Greenwalt Lee

Introduction

In 1993 architectural conservator John Lee undertook the conservation of several of the window sash and shutters in the model drop area. His methodology drew on both his own expertise and recommendations from architectural conservator Morgan Phillips. The Treatment Report for window 105 gives a sample of a complete sequence of steps for wood conservation. These reports and sketches were translated in the office of preservation architect Charles Phillips into the step-by-step illustrated guide to window conservation that follows.

While this methodology was used in our model drop area, when we undertook the full treatment, we did not remove each piece of glass. There were several reasons. Time and economy factored into the decision but more to the point was caution about possible breakage of glass. Between the time we began work on the drop area and the commencement of the full-scale project we became more aware of the significance of the survival of much of the early window glass. Not only is it several hundred years old but it was also probably made at the family's Wistarburgh Glassworks. In addition we reminded ourselves that our goal was to maintain age value and preserve original fabric. While the fully conserved sash looked wonderful—crisp muntins and renewed molding detail on the shutters—we were taking the wooden trim back to the period when it was first made and painted. This seemed a bit out of step with our overall philosophy. So we decided that the glass would remain in place. By the time we moved to the north facade of the house we had even

decided not to strip the paint down to bare wood on the shutters but rather to remove the peeling paint, undertake any necessary consolidation or repairs, and then repaint. It is all a matter of philosophy and goals. The descriptions in this chapter are very sound conservation practice—they are just not for every site.
—by John M. Groff

Treatment Record

Window 105

Date	Hours	Treatment
4/6/93	8	Initial examination with Charles Phillips, Morgan Philips, Jeff Groff, and Dan Butler. Paint samples taken for analysis (Photo 1). Paint removal from the exterior face of the right shutter was begun with the prototype high-temperature steam unit. It heats the surface and softens the paint rapidly, even on a cool surface in early morning. The softened paint was easily removed by pushing a 1 ½-inch medium flex putty knife diagonally across the surface of the wood. Best results were obtained when the steam jet heated the blade of the knife and the paint directly in front of it. With steam as a heat source the tendency to burn the wood is reduced owing to the lack of oxygen. The small capacity of this unit is a drawback. A larger nozzle and more steam generation would allow the operator to heat a larger area more evenly, speeding the work and reducing spot areas of overheating and surface darkening.
4/7/93	8	Paint removal continued throughout the day using the steam gun, a Black and Decker hot air gun (temperature 500 and 1100° F) and 4-by-7-inch flat plate heating element. In general the most useful hand tools were a 1 ½-inch putty knife and a Red Devil three-sided draw scraper

(flat, convex, concave). For panel sticking, moldings, and rabbeted edges, a combination of dental instruments, small knives, and chisels worked well.

The paint was carefully removed leaving the thinnest possible glazing of old paint embedded in the surface of the wood. Heat-assisted paint removal was not effective on the iron hinges and other hardware. Various chemical paint removers were tested. Several based on methylene chloride worked well, and a product called 5F5 worked best (methylene chloride, tuluol, methanol). Tests with chemical strippers will continue.

The shutter bolt was removed. The screws appear to be recent replacements, set in earlier larger diameter holes. A powdery layer of grayish paint was found under the plate. Samples were taken.

Paint removal on the jamb revealed remaining ends of a cut-off door header. the fragile end grain blocks are still held in place by wooden pins and the sill has an applied edge held in by common wire nails. Circular scratches show earlier leveling method.

4/8/93 8 The sill, jambs, and shutters are in excellent condition. Some areas show weathering and minor surface deterioration. The rabbet on the closing edge of the left shutter was hollow from insect tunnels. Various putties and fillers were removed from these areas. A dilute epoxy resin was flowed into the tunnels and surrounding softened wood. Missing sections were squared off, leveled, and wood dutchman installed.

4/9/93	8	Training session with Jim Derstine on paint removal techniques and surface preparation. Stripped surfaces were lightly hand sanded with 120 grit, dusted, and wiped down with mineral spirits. Kyanoil (alkyd resin, driers, and thinners) was brushed on, repeating until the surface was loaded and then toweled off.
5/11/93	10	The upper and lower sash were examined. Each pane of glass numbered starting with upper sash left to right, one to twenty-four. The type of glass and its condition recorded. The sash exhibited a moderate amount of cracked and flaking paint and glazing putty. There was no obvious deterioration of wood joints at muntin intersections or where the rail and stile meet. Both sash were carefully removed. A temporary window was fabricated from Plexiglas sheet and 1-by-2-inch stock. This two-part window was fitted into the sash tracks along the jamb, header, and sill and secured with screws. Jim Derstine assisted in this work as a continuation of his training. Much of the glazing compound was quite hard, requiring heat to soften it for removal. A heat shield for the glass was made from two sheets of galvanized steel crimped around a sheet of asbestos cloth. The shield was placed on the glass, a sheet of galvanized steel was clamped over the edge of the muntin, and a heating element on a wire stand was set close to the glazing putty (Drawing 1). As a section of glazing putty softened, the heating element was advanced, allowing loosening and removal of the putty and glazing points. The process is simple, but each type of window and putty requires some experimentation to

find exactly the right combination of tools, techniques, and proper heat range. Too little heat and the putty requires so much pressure on the tool that there is a risk of gouging the wood or cracking the glass. The remaining putty will require reheating to remove. There is a risk of burning the exposed wood or overheating the glass. Each time the putty or, for that matter, paint is reheated it looses some elasticity and eventually becomes hard set and requires chipping to remove.

A ½-inch wood chisel gently pushed along the muntin edge was used to remove the bulk of the putty. The points were removed with needle-nosed pliers, and the remaining putty along the edge of the glass was pulled out with a dental scraper after being sliced with a veneer saw.

Jim Derstine worked for several hours removing glass. Even with all of the putty removed many pieces of glass would not release. I discovered that the panes of glass had not been back puttied as is typical. Without the bedding layer of putty behind the glass an irregular gap was visible when the sash was viewed from the inside. On many panes this gap had been filled with a thickened adhesive (looks like polyester or epoxy resin) (see Drawing 2).

The bond was broken by repeated scoring from the inside along the adhesive-filled gap with a sharp knife point and along the edge of the glass on the exterior with a hooked dental scraper.

The glass was removed, cleaned, and set aside. All paint, putty, and adhesive were removed from the exterior of the sash. The sash was lightly sanded and a coat of Kyanoil was

brushed on the exterior and along the glass rabbet. The wood on the exterior of the sash was in good condition with all coped joints tight. There were no signs of rot or softened wood. The grooves for the weight cord were hand planed with a bull nose plane. The muntins, rails and stiles were formed with several planes on a bench. there are slight variations in the width of the glass rabbet on the muntins, indicating the offset of the blade in the tool. All joints are mortise and tenon with locking through pegs even where the muntins are tenoned into the stiles and rails. One unusual feature of the sash is that the meeting rail on the upper sash runs the full width of the sash with the stiles tenoned into it. The sash exhibits first-class workmanship.

5/14/93 10

Work on the sash in preparation for glazing was completed. The glass were carefully examined. Three types of glass were found:

1. Highly irregular, thin upper edge with a thicker bottom edge. Bluish in tint usually held in place by unevenly cut pieces of sheet metal and glazed with a very hard brownish-yellow oil putty.
2. Slight imperfections, more even in thickness. Greenish tint, held in place by a combination of uneven sheet metal points and ungalvanized wire brads set in a medium-hard white putty.
3. Distortion-free modern glass. Greenish-yellow tint held in place by Red Devil type galvanized points and bedded in a soft crumbly white putty.

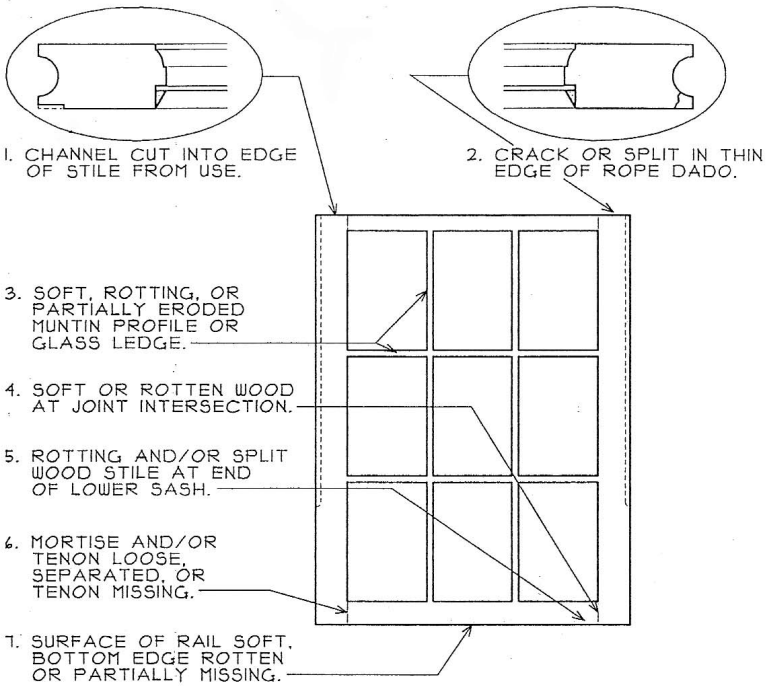
All glass had a plastic ultraviolet film adhered to the inside surface. This film had been cut to fit the glass tight against the muntin and had over-

lapped paint drips and adhesive along the edges. The film needed to be removed in order to fully clean the glass prior to reglazing. The film resisted attempts to remove it with readily available solvents, for example, toluene, isopropyl and methyl alcohol, and acetone. The glass was too fragile out of the frame to remove the film by scraping. The film was scored with a razor blade $\frac{5}{8}$-inch along each edge and then peeled off. The adhesive came off by scrubbing the area lightly with a fine 3M pad soaked in acetone.

The intact pieces of the earliest glass were returned to their place in the sash and puttied (see Drawing 3). Standard DAP 33 glazing compound was used. The remainder of the glass will be set in a new acrylic-silicone compound and a bedding compound developed by Morgan Philips. New glass was temporarily tacked in place until repairs to broken panes could take place and a supply of replicated glass was found. The ultraviolet film, although a nuisance, has held the broken pieces of glass together. Test repairs were carried out on several pieces of glass. Hextal (Eponex 1510 and T403) was worked into the cracks using the film on the other side to align them. The joint line partially disappeared upon curing. Part of the problem may be air that is trapped in the back of the joint by the film. Work will continue on improving the appearance of the repairs.

5/15/93	4	The reglazing was completed and the temporary window was removed and both sash were returned to the jamb.
Total Hours		66

WINDOW SASH REPAIR



ITEM #1

WORN AREA, PLANED WITH A RABBET PLANE, TO MAKE SMOOTH, STRAIGHT WITH SQUARE EDGES. STRIP OF WOOD CUT TO FIT, GLUED IN PLACE WITH EPOXY GLUE. WHEN DRY, PLANE, SCRAPE, AND SAND LEVEL.

ITEM #2

CRACK - REMOVE DEBRIS, BRUSH, POUR, OR INJECT EPOXY RESIN GLUE, CLAMP UNTIL DRY. FOR LARGER POORLY FITTING CRACKS, GLUE CAN BE THICKENED WITH CABOSIL TO LESSEN RUN OUT.

ITEM #3

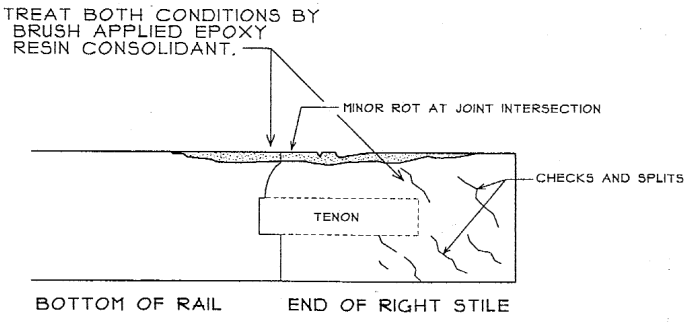
FOR WOODWORK TO BE PAINTED - FOR MINOR SURFACE DETERIORATION - LET THE KYANOIL HARDEN IT. IF VERY SOFT OR LOOSE, USE BRUSH ON APPLICATION OF EPOXY RESIN. DILUTE SLIGHTLY IF NECESSARY WITH MANUFACTURER'S RECOMMENDED SOLVENT. WHEN FULLY SATURATED, WIPE OFF EXCESS. AVOID A GLASSY OR SYRUPY COATING ON THE SURFACE.

PARTIALLY ERODED SURFACES CAN BE INFILLED AFTER CONSOLIDATION WITH EPOXY RESIN AND EPOXY PASTE FILLER AND SHAPED AFTER DRYING.

LARGER MISSING AREAS OF THE MUNTIN PROFILE OR THE GLASS LEDGE SHOULD BE REPAIRED BY CAREFULLY FITTED WOOD DUTCHMEN.

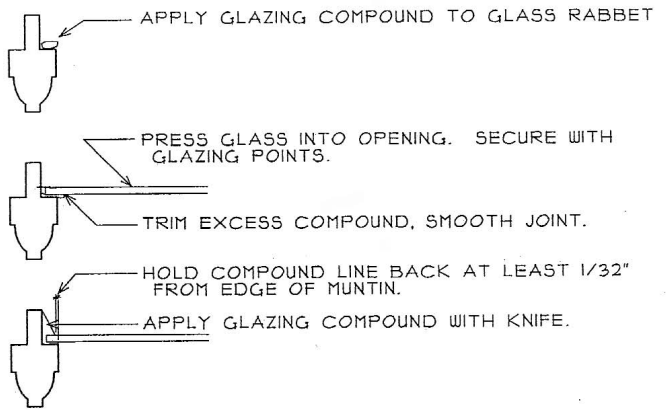
ITEM#4

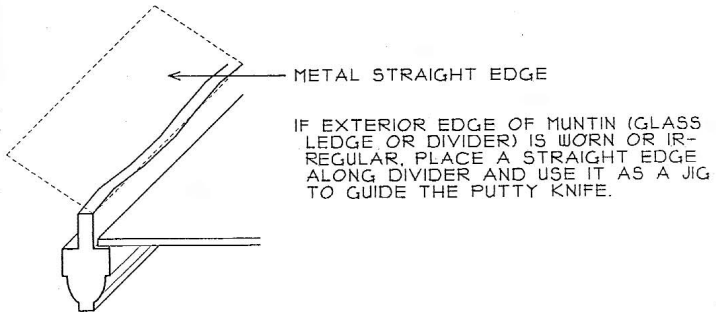
AFTER PAINT IS REMOVED FROM ANY WOODWORK, AREAS THAT APPEAR UNSOUND SHOULD BE TESTED TO DETERMINE THE EXTENT OF THE DETERIORATION. A SMALL-BLADED SHARP KNIFE OR ICE PICK IS THE APPROPRIATE TOOL. IT IS MOST IMPORTANT TO DETERMINE THE DEPTH OF THE ROT. PROBE BUT DO NOT PRY OR SPLINTER THE WOOD APART. DEPENDING ON THE EXTENT OF THE ROT ONE OR MORE TECHNIQUES MAY BE USED.



WHEN ALL GLASS, PUTTY, AND PAINT HAS BEEN REMOVED FROM A SASH, CARRY OUT REPAIRS.

WHEN REPAIRS HAVE BEEN COMPLETED, LIGHTLY SAND INTERIOR AND EXTERIOR. DUST OFF. APPLY COAT OF KYANOIL OR PRIMER TO ALL SURFACES (INTERIOR AND EXTERIOR). ALLOW TO DRY. LIGHTLY SAND ALL SURFACES (EXCEPT GLASS RABBETS) TO REMOVE BUMPS, RAISED GRAIN, ETC. THE SASH IS READY FOR REGLAZING.



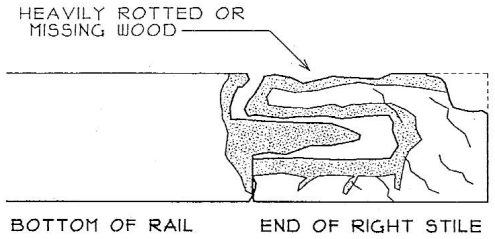


IF EXTERIOR EDGE OF MUNTIN (GLASS LEDGE OR DIVIDER) IS WORN OR IRREGULAR, PLACE A STRAIGHT EDGE ALONG DIVIDER AND USE IT AS A JIG TO GUIDE THE PUTTY KNIFE.

WHEN THE SASH IS GLAZED, WITH ALL PUTTY LINES CLEAN, STRAIGHT, AND TRUE, SET ASIDE TO CURE. WHEN READY, APPLY FIRST PRIME COAT TO EXTERIOR.

DO NOT TRY TO CUT IN THE PAINT CAREFULLY ALONG THE EDGE WHERE THE PUTTY MEETS THE GLASS. ALLOW THE PAINT TO FLOW ONTO THE SURFACE OF THE GLASS, AT LEAST ONE EIGHTH OF AN INCH.

ITEMS #5 AND #6



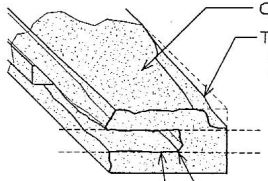
SURFACE APPLICATION OF EPOXY RESIN CONSOLIDANT NOT SUFFICIENT TO CORRECT PROBLEMS.

BEST APPROACH IS TO TAP THE FRAME APART. STAND THE ROTTEN ENDS OF RAILS, STILES, AND MUNTINS IN A CONTAINER OF EPOXY RESIN CONSOLIDANT.

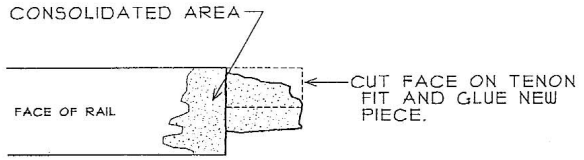
THERE SHOULD BE ENOUGH RESIN TO COVER AT LEAST 1/2 TO 2/3 OF THE ROTTED AREA. ALLOW THE RESIN TO SATURATE THE ROTTEN WOOD, AND CLIMB UPWARDS UNTIL THE ENTIRE DAMAGED AREA IS LOADED WITH RESIN. FOR SOME PIECES OF WOOD IT MAY BE NECESSARY TO DRILL A STAGGERED SERIES OF HOLES ACROSS THE GRAIN (MORE ABOUT THIS IN THE NEXT SECTION).

WHEN FULLY SATURATED, REMOVE, WIPE OFF EXCESS RESIN, AND ALLOW TO DRY.

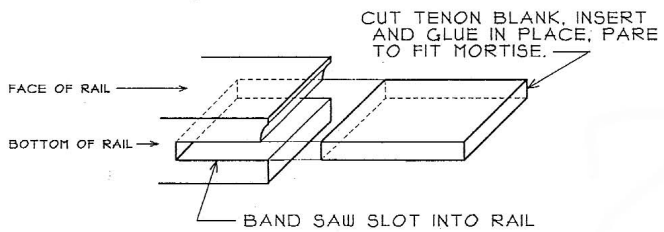
AFTER EPOXY RESIN CONSOLIDANT CURES



ITEMS #5 AND #6 (CONTINUED)



IF THE TENON IS TOO DAMAGED TO REPAIR



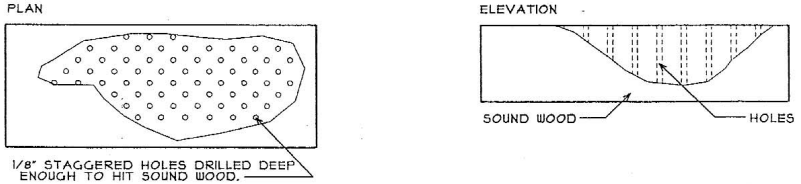
ITEM #7

THE FOLLOWING IS TRUE FOR ALL FLAT WOOD SURFACES.

A. VERY MINOR SURFACE CONSOLIDATION - KYANOIL (WEATHERED SURFACE)

B. SURFACE ROT - 1/8" TO 1/4" DEPTH. APPLY BY BRUSH OR IMMERSION IN EPOXY RESIN CONSOLIDANT.

C. DEEP ROT - 1/4" OR GREATER IN DEPTH. PROBE AREAS TO MAP EXTENT OF ROT. IF THE ROT IS SEVERE AND DEEP, CONSIDER THE FOLLOWING TECHNIQUE:



EACH ROW OF HOLES SHOULD BE STAGGERED FROM THE NEXT TO EXPOSE THE END GRAIN.

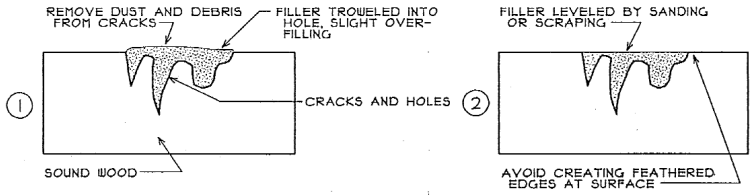
APPLY EPOXY RESIN CONSOLIDANT BY POURING OR BRUSHING, REPEATEDLY FILLING THE HOLES UNTIL ABSORPTION STOPS. WIPE EXCESS OFF OF THE SURFACE.

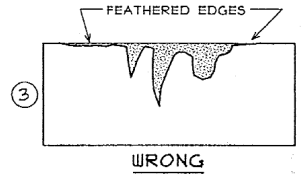
EPOXY PASTE FILLER

FOLLOW MANUFACTURER'S DIRECTIONS FOR MIXING.

THIS PRODUCT CAN BE USED FOR FILLING ALL HOLES, GOUGES, CRACKS, AND REBUILDING SURFACE DETAILS OF ORNAMENTAL CARVING, MUNTIN PROFILES, ETC. LOST OR DAMAGED. IT IS USED FOR FILLING NOT FOR RECREATING.

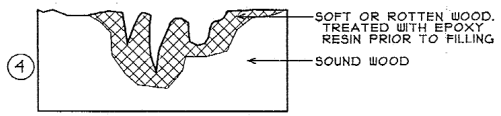
WHOLE PIECES, PARTICULARLY STRUCTURAL MEMBERS, SUCH AS THE END OF A STUD, OR THE MISSING CORNER OF A WINDOW OR DOOR. REMEMBER - IF A TREE WAS MADE OF EPOXY PASTE FILLER, ITS BRANCHES WOULD FALL OFF.





SAND OR SCRAPE TO REMOVE EXCESS FILLER, UNTIL OUTLINE OF CRACK OR SPLIT IS VISIBLE. AVOID LEAVING THIN LAYERS OF FILLER ON THE SURFACE AROUND OR ALONG THE AREA OF REPAIR.

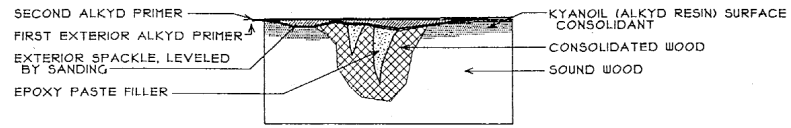
WRONG



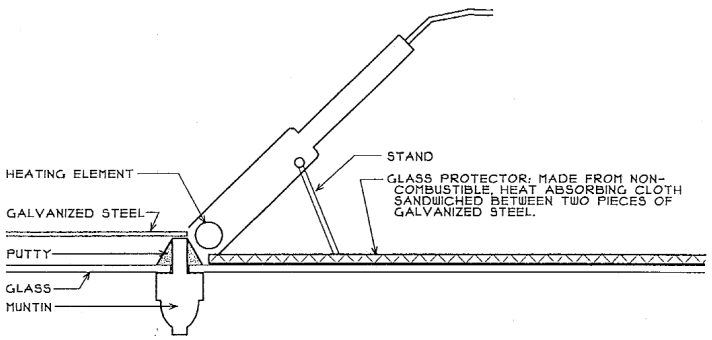
IF THE AREA TO BE FILLED IS SOFT OR ROTTEN, DO NOT SCRAPE OUT MATERIAL. APPLY BY BRUSH, THOROUGHLY MIXED EPOXY RESIN LIQUID TO WEAKENED AREA, THIN SLIGHTLY IF NECESSARY (10%). APPLY REPEATEDLY UNTIL THE FIBERS ARE SATURATED. WIPE OR BLOT OFF EXCESS. FILLER CAN BE APPLIED AT THIS TIME, OR IF NECESSARY AFTER THE EPOXY RESIN CONSOLIDANT CURES.

DO NOT APPLY EPOXY PASTE FILLER TO SOFT OR DETERIORATED WOOD AND EXPECT IT TO LAST!

SPACKLE FILLER FOR MINOR SURFACE UNEVENESS



PAINT AND PUTTY REMOVAL FROM WINDOW SASH



1.) HEAT A SECTION OF GLAZING PUTTY UNTIL SOFT.

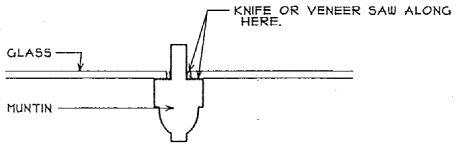
2.) MOVE THE HEATING ELEMENT ALONG TO ANOTHER SECTION.

3.) USING A 1/2" WOOD CHISEL OR THE BLADE OF A PUTTY KNIFE, SLIDE IT ALONG BETWEEN THE PUTTY AND THE WOOD EDGE, AND GENTLY ALONG THE SURFACE OF THE GLASS, SEPARATING THE PUTTY FROM THESE SURFACES.

4.) PULL THE GLAZING POINTS WITH NEEDLE NOSED PLIERS.

5.) RUN THE TIP OF A SHARP KNIFE OR A VENEER SAW ALONG THE EMBEDED GLAZING PUTTY AT THE EDGE OF THE GLASS UNTIL THE GLASS IS NO LONGER BOUND.

6.) GENTLY TAP THE INSIDE SURFACE OF THE GLASS UPWARDS UNTIL IT COMES FREE. IT MAY BE NECESSARY TO SLIDE THE KNIFE TIP ALONG THE INTERSECTION OF THE GLASS AND MUNTIN ON THE INSIDE.



7.) CONTINUE UNTIL ALL GLASS AND PUTTY ARE REMOVED.

8.) REMOVE PAINT FROM MUNTINS, RAILS, AND STILES.

PAINT, PUTTY, AND FILLER REMOVAL

FOR THIS PROJECT USE A FORCED AIR HEAT GUN (MAKITA, WAGONER, ETC.) AND A SELECTION OF PUTTY KNIVES, SCRAPERS, PICKS, DENTAL INSTRUMENTS, AND WOOD CHISELS.

THE TWO MOST USEFUL TOOLS ARE:

1.) 1 1/2" - 2" SEMI-FLEXIBLE PUTTY KNIFE (CORNERS SLIGHTLY ROUNDED WITH A FILE).

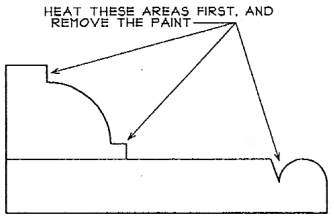
2.)RED DEVIL TYPE 3 SIDED SCRAPER (FLAT, CONVEX, CONCAVE).

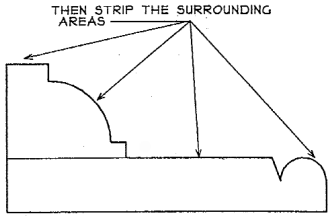
FOR LARGE PAINTED AREAS (MORE THAN ONE FOOT WIDE) A FLAT PLATE HEATING ELEMENT IS ALSO USEFUL.

WITH PRACTICE, PAINT REMOVAL USING A HEAT SOURCE (NO FLAME) WILL GO QUICKLY.

STRIPPING PAINT WITH HEAT DOES NOT MEAN CHARRING THE WOOD, ALTHOUGH OCCASIONALLY SURFACE DARKENING MAY OCCUR DUE TO THE HEATED OIL RESIDUE REMAINING IN THE WOOD. ON ANY VERTICAL SURFACE, START PAINT REMOVAL AT THE BOTTOM AND WORK UP. IF YOU START FROM THE TOP AND WORK DOWN THE RISING HEAT WILL CHAR THE BARE WOOD ABOVE. IF YOU START FROM THE BOTTOM, THE RISING HEAT WILL PRE-SOFTEN THE PAINT ABOVE, MAKING PAINT REMOVAL GO MORE QUICKLY.

WHEN USING THE 1 1/2" - 2" PUTTY KNIFE, HOLD THE GUN SO THAT THE HOT AIR IS DIRECTED PARTIALLY ON THE BLADE AND THE AREA OF PAINT SEVERAL INCHES IN FRONT. PUSH THE KNIFE AT A SLIGHT DIAGONAL AND UPWARDS ACROSS THE GRAIN DIRECTION OF THE WOOD.

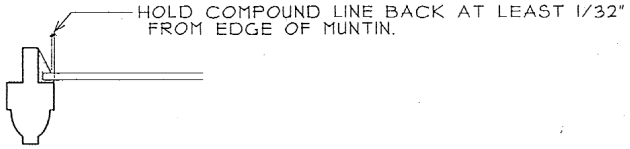


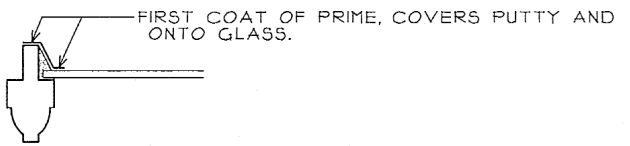


REMOVE PAINT IN THE RECESSES FIRST. THE REMAINING PAINT ON THE BROADER AREAS WILL PROTECT THEM FROM BURNING.

THE TRICK IN HEAT PAINT REMOVAL IS TO HEAT AN AREA EVENLY, ALL THE WAY THROUGH TO THE WOOD, AND REMOVE IT IN ONE PASS. INSUFFICIENT HEATING WILL ALLOW ONLY THE UPPER LAYERS TO COME OFF AND REHEATING WILL BE REQUIRED.

AFTER THREE OR MORE HEATINGS, THE PAINT WILL LOSE ITS ELASTICITY, AND MUST BE REMOVED BY SCRAPING OR SANDING.





CONTINUE WITH OTHER COATS OF PAINT IN THE SAME MANNER.
(INTERIOR AND EXTERIOR)

DO NOT REMOVE PAINT BY SCRAPING THE GLASS WITH A RAZOR BLADE AGAINST THE PUTTY. REMOVE THE PAINT BY THE FOLLOWING METHOD: