

## 5.2 Window Technical Guidelines



### 5.2.1 INTRODUCTION

The windows on historic buildings are an important aspect of the architectural character of those buildings. Their design, craftsmanship, or other qualities make them worthy of preservation. The significance of original materials and features should be respected; existing windows should be repaired and retained wherever possible, and when necessary, replaced in kind. As part of the original fabric of historic buildings, windows should be maintained and preserved in their original setting.

Refer to 'Window Design Guidelines,' section 4.2, for design information regarding windows in historic properties.

The repair and weatherization of existing wooden windows is more practical than most people realize, and many windows are unfortunately replaced because of a lack of awareness of techniques for evaluation, repair, and weatherization. Wooden windows which

are repaired and properly maintained will have greatly extended service lives while contributing to the historic character of the building. Thus, an important element of a building's significance will have been preserved for the future.

Evaluating the architectural or historical significance of windows is the first step in planning for window treatments, and a general understanding of the function and history of windows is vital to making a proper evaluation. As a part of this evaluation, one must consider four basic window functions: admitting light to the interior spaces, providing fresh air and ventilation to the interior, providing a visual link to the outside world, and enhancing the appearance of a building.

No single factor can be disregarded when planning window treatments; for example, attempting to conserve energy by closing up or reducing the size of window openings may result in the use of more energy by increasing

electric lighting loads and decreasing passive solar heat gains.

### **5.2.2 PHYSICAL EVALUATION**

The key to successful planning for window treatments is a careful evaluation of existing physical conditions on a unit-by-unit basis.

An effective tool is a window schedule which lists all of the parts of each window unit. Spaces by each part allow notes on existing conditions and repair instructions. When such a schedule is completed, it indicates the precise tasks to be performed in the repair of each unit and becomes a part of the specifications. In any evaluation, one should note at a minimum, the following:

- 1) window locations (and number)
- 2) condition of the paint
- 3) condition of the frame and sill
- 4) condition of the sash (rails, stiles and muntins)
- 5) glazing problems
- 6) hardware, and
- 7) the overall condition of the window (excellent, fair, poor, and so forth).

Many factors such as poor design, moisture, vandalism, insect attack, and lack of maintenance can contribute to window deterioration, but moisture is the primary contributing factor in wooden window decay. All windows should be inspected to see if water is entering around the edges of the frame and, if so, the joints or seams should be caulked to eliminate this danger. The glazing putty should be checked for cracked, loose, or missing sections which allow water to saturate the wood, especially at the joints. The back putty on the interior side of the pane should also be inspected, because it creates a seal which prevents condensation from running down into the joinery.

The sill should be examined to insure that it slopes downward away from the building and allows water to drain off. In addition, it may be advisable to cut a dripline along the underside of the sill; this almost invisible treatment will insure proper water runoff, particularly if the

bottom of the sill is flat. Any conditions, including poor original design, which permit water to come in contact with the wood or to puddle on the sill must be corrected as they contribute to deterioration of the window.



**WINDOW REQUIRING REPAIR**

Since excessive moisture is detrimental to the paint bond, areas of paint blistering, cracking, flaking, and peeling usually identify points of water penetration, moisture saturation, and potential deterioration. Failure of the paint should not, however, be mistakenly interpreted as a sign that the wood is in poor condition and hence, irreparable. Wood is frequently in sound physical condition beneath unsightly paint.

Each window should be examined for operational soundness beginning with the lower portions of the frame and sash. Exterior rainwater and interior condensation can flow downward along the window, entering and collecting at points where the flow is blocked. The sill, joints between the sill and jamb, corners of the bottom rails and muntin joints are typical points where water collects and deterioration begins. The operation of the window (continuous opening and closing over the years and seasonal temperature changes) weakens the joints, causing movement and slight separation. If severe deterioration exists in these areas, it will usually be apparent on visual inspection, but other less severely deteriorated areas of the wood may be tested

by two traditional methods using a small ice pick.

1. An ice pick or an awl may be used to test wood for soundness. The technique is simply to jab the pick into a wetted wood surface at an angle and pry up a small section of the wood. Sound wood will separate in long fibrous splinters, but decayed wood will lift up in short irregular pieces due to the breakdown of fiber strength.
2. Another method of testing for soundness consists of pushing a sharp object into the wood, perpendicular to the surface. If deterioration has begun from the hidden side of a member and the core is badly decayed, the visible surface may appear to be sound wood. Pressure on the probe can force it through an apparently sound skin to penetrate deeply into decayed wood.

### 5.2.3 REHABILITATION OF WINDOWS

Following an inspection of window/s, the scope of the necessary repairs will be evident and a plan for the rehabilitation can be formulated. Generally the actions necessary to return a window to "like new" condition will fall into three broad categories:

- 1) routine maintenance procedures (repair class I)
- 2) structural stabilization, and (repair class II)
- 3) parts replacement. (repair class III)

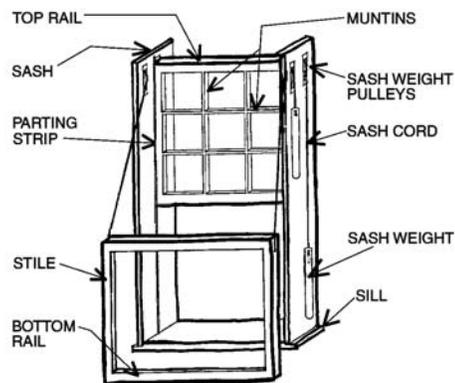
Before undertaking any of the repairs all sources of moisture penetration should be identified and eliminated, and all existing decay fungi destroyed in order to arrest the deterioration process. Many commercially available fungicides and wood preservatives are toxic, so it is extremely important to follow the manufacturer's recommendations for application, and store all chemical materials away from children and animals.

### 5.2.4 ROUTINE MAINTENANCE (REPAIR CLASS I)

Routine maintenance repairs to wooden windows are usually labor intensive and relatively uncomplicated. Routine maintenance required to upgrade a window to "like new" condition typically includes the following steps:

- 1) some degree of interior and exterior paint removal,
- 2) removal and repair of sash (including reglazing where necessary),
- 3) repairs to the frame,
- 4) weather-stripping and reinstallation of the sash, and repainting.

Historic windows have usually acquired many layers of paint over time. Removal of excess layers or peeling and flaking paint will facilitate operation of the window and restore the clarity of the original detailing. Some degree of paint removal is also necessary as a first step in the proper surface preparation for subsequent refinishing. There are several safe and effective techniques for removing paint from wood, depending on the amount of paint to be removed: scraping, chemical stripping, and the use of a hot air gun; refer to *Paint and Color Design Guidelines* section within these Guidelines for detailed information about this.



WINDOW COMPONENTS

Paint removal should begin on the interior frames, being careful to remove the paint from the interior stop and the parting bead, particularly along the seam where these stops meet the jamb. This can be accomplished by running a utility knife along the length of the seam, breaking the paint bond. The interior

stop may be initially loosened from the sash side to avoid visible scarring of the wood and then gradually pried loose using a pair of putty knives, working up and down the stop in small increments. With the stop removed, the lower or interior sash may be withdrawn. The sash cords should be detached from the sides of the sash and their ends may be pinned with a nail or tied in a knot to prevent them from falling into the weight pocket.

Removal of the upper sash on double-hung units is similar but the parting bead which holds it in place is set into a groove in the center of the jamb and is thinner and more delicate than the interior stop. After removing any paint along the seam, the parting bead should be carefully pried out and worked free in the same manner as the interior stop. In order to remove the sash the interior stop and parting bead need only be removed from one side of the window. The upper sash can be removed and both sashes taken to a convenient work area. Window openings should be covered with polyethylene sheets or plywood sheathing while the sash are out for repair.

The sash can be stripped of paint using appropriate techniques, but if any heat treatment is used, the glass should be removed or protected from the sudden temperature change which can cause breakage. It is important to protect the glass because it may be historic and often adds character to the window.

Deteriorated putty should be removed manually, taking care not to damage the wood along the rabbet. If the glass is to be removed, the glazing points which hold the glass in place can be extracted and the panes numbered and removed for cleaning and reuse in the same openings. With the glass panes out, the remaining putty can be removed and the sash can be sanded, patched, and primed with a preservative primer. Hardened putty in the rabbets may be softened by heating with a soldering iron at the point of removal. Putty remaining on the glass may be softened by soaking the panes in linseed oil, and then removed with less risk of breaking the glass.

Before reinstalling the glass, a bead of glazing compound or linseed oil putty should be laid around the rabbet to cushion and seal the glass.

Glazing compound should only be used on wood which has been brushed with boiled linseed oil and primed with an oil based primer or paint. The pane is then pressed into place and the glazing points are pushed into the wood around the perimeter of the pane. The final glazing compound or putty is applied and beveled to complete the seal. The sash can be refinished as desired on the inside and painted on the outside as soon as a "skin" has formed on the putty, usually in 2 or 3 days. Exterior paint should cover the beveled glazing compound or putty and lap over onto the glass slightly to complete a weather-tight seal. After the proper curing times have elapsed for paint and putty, the sash will be ready for reinstallation.

While the sashes are out of the frame, the condition of the wood in the jamb and sill can be evaluated. Repair and refinishing of the frame may proceed concurrently with repairs to the sash, taking advantage of the curing times for the paints and putty used on the sash. One of the most common work items is the replacement of the sash cords with new rope cords or with chains; the interior window may be removed for access. Sash weights may be increased for easier window operation by elderly or handicapped persons. Additional repairs to the frame and sash may include consolidation or replacement of deteriorated wood.

The operations just discussed summarize the efforts necessary to restore a window with minor deterioration to "like new" condition. The techniques can be applied by an unskilled person with minimal training and experience.

### **5.2.5 STABILIZATION (REPAIR CLASS II):**

Many windows show some additional degree of physical deterioration, but even badly damaged windows can be repaired using simple processes. Partially decayed wood can

be waterproofed, patched, built-up, or consolidated and then painted to achieve a sound condition, good appearance, and greatly extended life.

An established technique for repairing wood which is split, checked or has signs of rot, is to:

- 1) dry the wood,
- 2) treat decayed areas with a fungicide (note that care should be taken with the use of fungicide which is toxic).
- 3) waterproof with two or three applications of boiled linseed oil (applications every 24 hours),
- 4) fill cracks and holes with putty, and
- 5) after a "skin" forms on the putty, paint the surface.

When window sills or other members exhibit surface weathering they may also be built-up using wood putties or homemade mixtures such as sawdust and resorcinol glue, or whiting and varnish. These mixtures can be built up in successive layers, then sanded, primed, and painted. The finish surface should be sloped slightly to carry water away from the window and building, and not allow it to puddle



**WINDOW FRAME AND SILL  
REQUIRING REPAIR**

Wood may also be strengthened and stabilized by consolidation (the third technique), using semi-rigid epoxies which saturate the porous decayed wood and then harden. The surface of the consolidated wood can then be filled with a semi-rigid epoxy patching compound, sanded and painted.

Any of the three techniques discussed can stabilize and restore the appearance of the

window. There are times, however, when the degree of deterioration is so advanced that stabilization is impractical, and the only way to retain some of the original fabric is to replace damaged parts.

### **5.2.6 PARTS REPLACEMENT AND SPLICES (REPAIR CLASS III)**

When parts of the frame or sash are so badly deteriorated that they cannot be stabilized, replacement of the deteriorated parts with new matching pieces or splicing new wood into existing members may be necessary. This approach requires more skill and is more expensive than any of the previously discussed alternatives.

It is necessary to remove the sash and/or the affected parts of the frame and have a carpenter or woodworking mill reproduce the damaged or missing parts. Many millwork firms can duplicate parts, such as muntins, bottom rails, or sills, which can then be incorporated into the existing window, but it may be necessary to shop around as some woodworking mills do not like to repair old sash because nails or other foreign objects in the sash can damage expensive knives; others do not have cutting knives to duplicate muntin profiles.

It may be useful, therefore, to take the following approach to frame repair:

- 1) conduct regular maintenance of sound frames to achieve the longest life possible,
- 2) make necessary repairs in place wherever possible, using stabilization and splicing techniques, and
- 3) if removal is necessary, thoroughly investigate the structural detailing and seek appropriate professional consultation.

Another alternative may be considered if parts replacement is required, and that is sash replacement. If extensive replacement of parts is necessary and the job becomes prohibitively expensive it may be more practical to purchase

a new sash which can be installed into the existing frames. Such sash are available as exact custom reproductions, reasonable facsimiles (custom windows with similar profiles), and contemporary wooden sash which are similar in appearance. There are companies which still manufacture high quality wooden sash which would duplicate most historic sash.

### **5.2.7 WINDOW REPLACEMENT**

Although the retention of original or existing windows is always desirable and these Guidelines are intended to encourage that goal, there is a point when the condition of a window may clearly indicate replacement. The decision process for selecting replacement windows should not begin with a survey of contemporary window products which are available as replacements, but should begin with a look at the windows which are being replaced. Attempt to understand the contribution of the window(s) to the appearance of the facade including:

- 1) the pattern of the openings and their size;
- 2) proportions of the frame and sash;
- 3) configuration of window panes;
- 4) muntin profiles;
- 5) type of wood;
- 6) paint color;
- 7) characteristics of the glass; and
- 8) associated details such as arched tops, hoods, or other decorative elements.

Replacement windows should be made to fit within the existing historic opening. Use the same sash size to avoid filling in or enlarging the original opening.

Armed with an awareness of the significance of the existing window, begin to search for a replacement which retains as much of the character of the historic window as possible. There are many sources of suitable new windows: check building supply firms, local woodworking mills, carpenters, preservation oriented magazines, or catalogs or suppliers of old building materials, for product information.

### **5.2.8 WEATHERIZATION**

A window, which is repaired, should be made as energy efficient as possible by the use of appropriate weather-stripping to reduce air infiltration. A wide variety of products are available to assist in this task. Felt may be fastened to the top, bottom, and meeting rails, but may have the disadvantage of absorbing and holding moisture, particularly at the bottom rail. Rolled vinyl strips may also be tacked into place in appropriate locations to reduce infiltration. Bronze strips or new plastic spring strips may be used on the rails and, if space permits, in the channels between the sash and jamb. Weather-stripping is a historic treatment, but old weather-stripping (felt) is not likely to perform very satisfactorily. Appropriate contemporary weather-stripping should be considered an integral part of the repair process for windows.

The use of sash locks installed on the meeting rail will insure that the sash are kept tightly closed so that the weather-stripping will function more effectively to reduce infiltration.