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City of Phoenix Historic
Preservation Commission
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CITY OF PHOENIX
PLANNING & DEVELOPMENT DEPARTMENT
HISTORIC PRESERVATION OFFICE

GUIDE TO WINDOW REPAIR & REPLACEMENT FOR HISTORIC PROPERTIES

INTRODUCTION

The purpose of this guide is to provide information to historic property owners who are considering repair and/or replacement options for their windows. This guide pertains to properties either individually listed on the Phoenix Historic Property Register or located within a locally designated historic district. The guide is intended to help owners retain the historic character of their properties and to consider a wide range of solutions—including energy retrofits—before making final window decisions.

This guide will also be used by the Historic Preservation Office to determine whether a project can be approved via a Certificate of No Effect (over-the-counter approval) or through the Certificate of Appropriateness hearing process. For more information on the historic design review process, please refer to pages 16-17 of this document.

Additional information is available on the city website at phoenix.gov/historic. You may also call (602) 261-8699, send an e-mail message to historic@phoenix.gov, or visit the Historic Preservation Office at 200 West Washington Street, 3rd floor, Phoenix, Arizona 85003.

Historic windows at Steele Indian School Park are painted after being restored by a window repair specialist.

PLANNING YOUR PROJECT

Here are a few things to consider as you plan your window project:

1 **Conduct a survey of the existing windows on your building before deciding what action to take.** The purpose of the survey is to determine the condition of each window, whether the window is from the historic era, and whether it is a "Tier 1" or "Tier 2" window. Tier 1 windows should be a high priority for preservation and are defined as follows:

- *For single-story buildings on interior lots*, Tier 1 windows are those on the front of the building and at first-room depth on each side (see illustration on page 10).
- *For buildings on corner lots*, Tier 1 windows are the same as above but also include all windows that face a side street.
- *For multi-story buildings*, Tier 1 windows are the same as on single-story buildings but also include additional windows on the upper stories, if they are readily visible from a front or side street.

All windows on the building that do not meet the criteria for Tier 1 windows are considered Tier 2 windows. While not as critical to the historic character of the house, Tier 2 windows should also be preserved, where possible.

2 **Determine how best to address energy efficiency priorities for your property.** Most historic buildings can benefit from energy efficiency improvements without compromising the building's historic character. To find out what measures make sense for your building, it is recommended that you have a professional energy audit performed on your building first, then implement the most cost-effective approaches to improving energy efficiency. Improvements with the shortest

The front bay window of this historic house is a Tier 1 window and should be a high priority for preservation.

Energy auditors often use calibrated fans to measure the relative tightness of a building and to identify sources of air leaks.

Should I replace my historic windows?

Your historic windows are an important character-defining feature of your historic home. "While window replacements could save $200 to $300 per year in heating and cooling costs, doing so is not typically effective since it takes over 10 years to pay back, in energy savings, the cost of installing new windows."

Source: Arizona Public Service

payback period typically include items such as installing compact fluorescent light bulbs; adjusting thermostats on water heaters, furnaces, and appliances; wrapping insulation around heating and cooling ducts and hot water pipes; adding insulation to attics, basements, and crawl spaces; and installing high efficiency A/C units and furnaces.

Maintain and repair historic windows wherever possible. Maintaining windows in good condition reduces the need to replace these important features of your historic property. Removing or altering historic windows could compromise the appearance of your historic building, reduce its value, and result in the loss of historic status (including the historic property tax reduction).

Most historic windows can be repaired—peeling paint scraped off and sanded down, rust removed, broken window panes replaced, putty removed and replaced, rotted wood or depressions in metal windows removed and patched with appropriate compounds, and then repainted. In many cases, a property owner or handyman can perform the work. For more complex projects, window rehabilitation specialists should be brought in to undertake the project.

Achieve a balance between sustainability, energy efficiency, and historic preservation. Most historic windows were built with quality in mind and can be readily repaired and maintained in perpetuity. The continued use of existing windows avoids the need to ship new products to the site and lessens the need to add to our landfills, contributing to overall environmental sustainability. Furthermore, some of the newer window products, such as vinyl, do not always hold up well over time in our severe climate. Most replacement models only come with a 10 to 20 year warranty; by the time the warranty

Removing repairable windows and dumping them in a landfill is contrary to "green" principles.

A common problem with dual-pane replacement windows is that the insulating seal will eventually leak and moisture will penetrate between the glass, leaving the window looking foggy. When this happens, the glass—or perhaps the entire window—will need to be replaced again.

Vinyl window frames are constructed of polyvinyl chloride (PVC), a plastic material that breaks down in direct sunlight. To increase their longevity, vinyl frames include UV light stabilizers to keep them in good condition. However, over time, these windows may begin to lose their color, turn yellowish, or degrade. They are particularly susceptible to warping at high temperatures, as seen in the example above.

expires, the replacement window may need to be replaced again. So one replacement can soon lead to another, proving costly over time.

Use value engineering to spend funds on "energy efficiency" improvements with the quickest payback and with the least potential to impact your property's historic appearance. If window replacements are a must, replace the least street-visible units. Retain the Tier 1 historic windows and consider thermal upgrades instead of replacement.

One cost-effective solution is to reduce heat gain/loss in remaining historic windows through passive improvements such as adding insulated interior blinds, exterior fabric awnings, and/or strategically placed shade trees (see examples at right). This approach can greatly improve the building's overall performance while still retaining the unique historic aesthetics of the property.

Heat gain/loss in historic windows can often be reduced through passive solutions such as adding insulated interior blinds (top left), exterior fabric awnings (top right), and strategically placed shade trees (bottom).

THERMAL UPGRADES

Upgrading the thermal performance of your historic windows is an easily achievable goal. A wide range of improvements exists—from easy and relatively inexpensive solutions to more complex but still readily achievable improvements.

Some of the easiest solutions to improve the thermal performance of windows are:

- ***Passive improvements***—such as adding interior blinds, exterior awnings, and tree plantings.
- ***Window repair solutions***—removing excessive layers of paint, replacing broken window panes, replacing loose window putty, and ensuring a window fits tightly in the jamb are all easy methods to improve windows energy efficiency.
- ***Window insulation solutions***—adding caulking between exterior window jambs

Caulking between exterior window jambs and wall surfaces is recommended to reduce air infiltration.

and wall surfaces, and installing weather-stripping between rails, sash, and jambs are recommended.

Other more complex solutions to improve the thermal performance of historic windows include:

- ***Adding window films to historic glass***—applying high-quality films can be an effective means of reducing solar heat gain while still retaining the historic clear appearance of the glass (see example at right).
- ***Replacing historic glass with thicker panes***—removing historic glass (usually 1/8" thick) and reinstalling thicker single-pane glass (3/16" to 3/8" thick) in existing jambs and sashes is another effective approach.
- ***Replacing historic glass with single-pane hard coat Low-E glass***—installing new hard coat Low-E glass will significantly reduce solar heat gain compared to regular single-pane glass (see example at right).
- ***Replacing historic glass with dual-pane glass***—replacing historic glass with dual-pane glass may be possible with wood windows, although in most cases the sash will need to be routed to accept the new thicker glass. Dual-pane glass may also be used in steel windows, although its use is typically limited to commercial buildings where the sashes are generally thicker than in residential models.
- ***Adding interior storm windows***—adding interior storm windows (when they can be added into the wall depth without furring out interior walls) is another viable option. Original single-pane windows coupled with Low-E storm windows typically have a better U-value than new dual-pane windows.

Please note that all window films and replacement glass should have a visible light transmittance rating of 0.65 or higher to retain the building's historic character (the window

A high-quality window film has been applied to the windows on the right, while the windows on the left are unchanged. The film reduces glare, provides substantial heat rejection, and blocks harmful UV rays, protecting furniture and floors from fading.

The original glass in this steel casement window (top) was replaced with single-pane hard coat Low-E glass (below).

overall should have a rating of at least 0.5). Also, the glass replacement treatments outlined in this section are not recommended for windows with stained, leaded, or figured glass (see example at right).

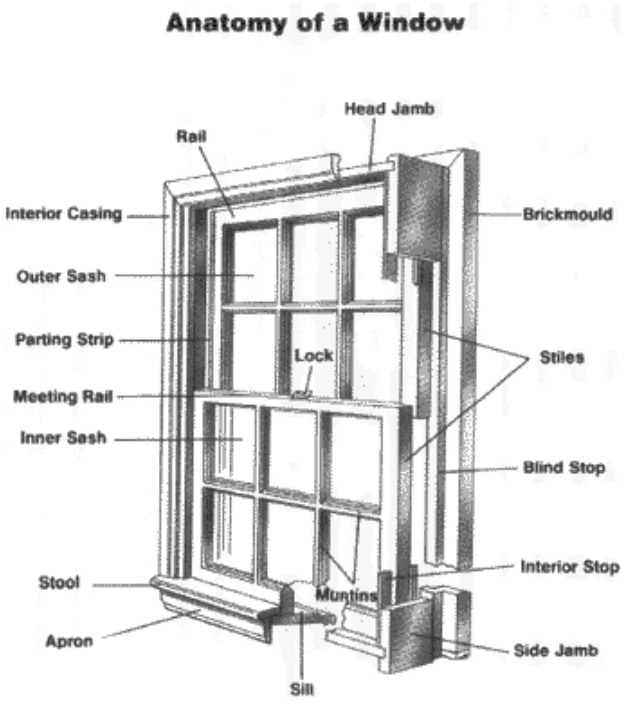
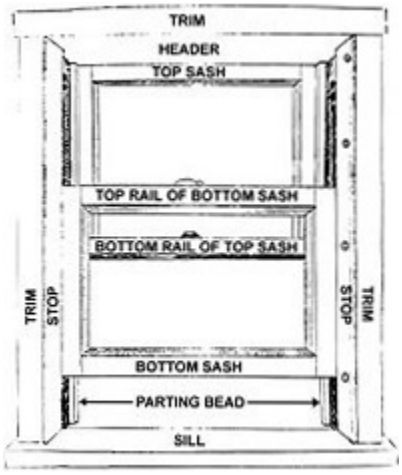
HISTORIC WINDOW REPAIRS

This section provides more detailed information regarding how to repair your historic wood, metal, and leaded light windows. Additional information is available in the City of Phoenix window repair technical bulletins and National Park Service Preservation Briefs (available at the Historic Preservation Office or online at phoenix.gov/historic).

A. Wood Windows

Most historic homes feature wood windows constructed of high-quality, old-growth lumber. If the windows are properly maintained and repaired, they can remain in perpetuity.

Overall Repair Approach

1. A good window repair project should holistically address the windows—sills, jambs, and sashes—with all components to be repaired or replaced in kind with matching materials and dimensions.
2. Exterior jambs for windows should be repaired in place if at all possible. If jambs are weak, they should be disassembled and reassembled with glue and pins.
3. Wood components should be gently hand-sanded, patched, and primed with appropriate wood compounds and fillers to be smooth. Any cracks or voids shall be glued, filled, and/or consolidated using semi-rigid epoxies appropriate for wood, with new parts of sashes or jambs spliced in when consolidation methods are ineffective. Mechanical/abrasive, chemical stripping, or thermal paint removal methods should be used with caution.

Thermal upgrades involving replacement of original glass are not recommended for windows with leaded glass, such as the one shown above.