Window Repair
and
Weatherization Guidebook

Image Courtesy of Patty Spencer

A Handy Guide for Owners of Portland, Oregon Homes

Bosco-Milligan Foundation/Architectural Heritage Center
With support from the Irvington Community Association
Portland, Oregon

TABLE OF CONTENTS

Introduction

This booklet was created to identify issues common to original windows in vintage and historic homes in Portland, Oregon and to offer solutions for how these issues can be resolved without seriously impacting historic character. In many instances, the tips in this booklet may be applied to other parts of the Pacific Northwest where similar building materials are commonplace.

Why Should I Keep and Repair My Old Windows?

- Because the original windows were designed specifically to fit your home. Not just in shape and size but in materials too.
- Because the original windows have character defining features that you love, such as wavy glass, real divided light sashes, and ogee lugs.
- Because you appreciate the longevity of irreplaceable old growth wood and high quality craftsmanship.
- Because you recognize value in being able to repair something when it needs repair, rather than replacing it because it cannot be repaired.
- Because original windows really can be made as energy efficient as any replacement.
- Because you can save money and energy by repairing your original windows whereas you may never recoup the expense of replacement windows or be able to repair them should they need work.

Through the use of this booklet and the resources therein, owners of historic homes of all shapes and sizes will find that in most circumstances, original windows can be repaired and weatherized, and when such work is performed in combination with other weatherization measures can result in significant energy savings. Such repair and weatherization work also costs less than window replacement. In addition to cost and energy savings, by keeping original windows intact, usable and repairable materials are kept from the waste stream and the depletion of natural resources is prevented, all the while maintaining the historic character of homes, neighborhoods, and communities.

This booklet should serve as a guide for:

- Property owners in National Register Historic Districts whose properties are subject to Historic Design Review for any changes to the exterior of the structure(s).
- Property owners of properties that are individually listed in the National Register of Historic Places and which are subject to Historic Design Review for any changes to the exterior of the structure(s).
- Property owners in Conservation Districts whose properties may be subject to Historic Design review for any changes to the exterior of the structure(s).
- Owners of older homes who want to preserve or restore the historic character and architectural integrity of their homes, even if they are not designated historic.

50 years of age is generally regarded as the point in which a home or other structure may be considered "historic." According to the City of Portland, more than 62% of existing structures in the city meet this standard. In some parts of the city, however, that percentage is even higher. In Northeast Portland, for example, 83% of buildings meet the 50 year threshold. The issue of preserving the historic character of Portland neighborhoods is, therefore, a citywide issue. It is not limited to a few parts of the central city.

Although we have attempted to provide the most up to date information on window repair and weatherization for historic homes, following the recommendations in this guide does not guarantee approval by any current or future Historic Design Review commission.

PLEASE NOTE: In Portland, if you have a building in a historic district and plan on altering your windows beyond simple repairs, you will trigger a required Historic Design Review. Replacement windows are generally not permitted unless they are beyond reasonable repair.

Always consult your local jurisdiction for advice prior to starting any window related project on a designated historic home, whether individually listed, part of a historic district, or part of a conservation district.

Windows and Local Design Guidelines

Before embarking on any project related to windows in a historic home, you should have a thorough understanding of local historic design guidelines and how they may be applied to your home and/or historic district. In Portland, Oregon some historic districts have historic design guidelines that are specific to those individual districts, while others only refer to the *Secretary of the Interior's Standards* (explained below). In both cases it is important that you investigate what guidelines apply to your home, prior to performing any work on the exterior, including the windows.

Windows and the *Secretary of the Interior's Standards*

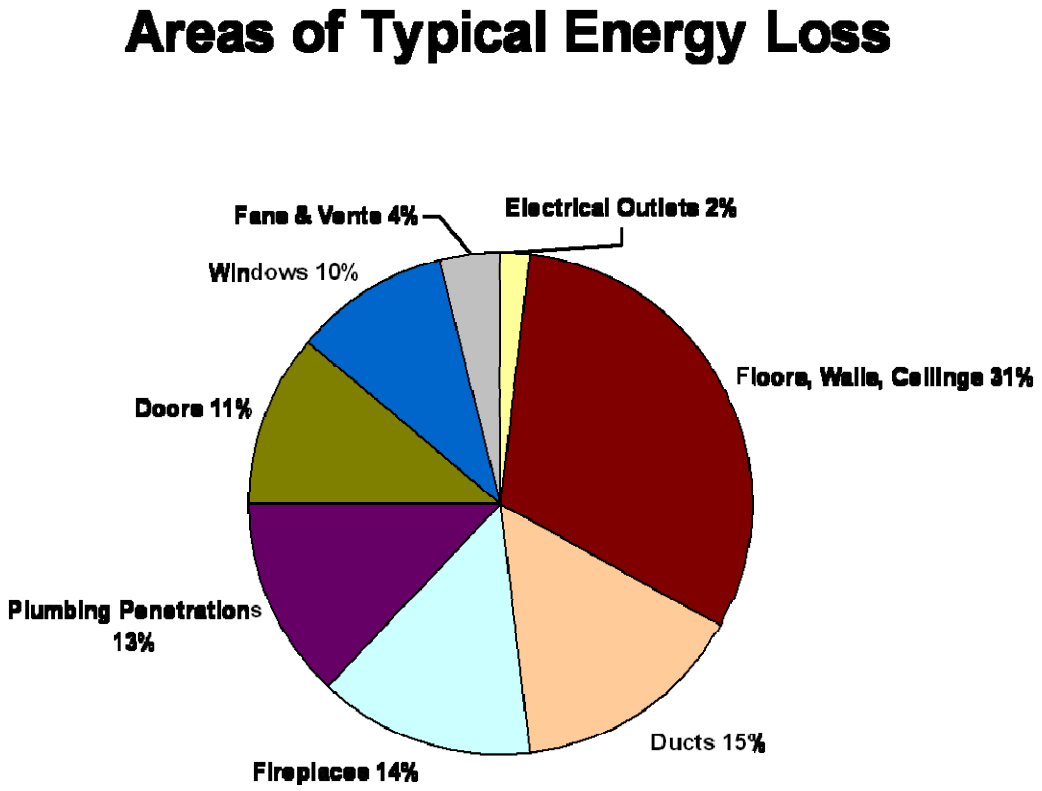
The Secretary of the Interior's Standards for Rehabilitation and the National Park Service's *Guidelines for Rehabilitating Historic Buildings* serve as the rule-of-thumb for any work on a historic building. In general, the Standards and Guidelines recommend that as much as possible, original historic materials be retained, maintained, and/or repaired.

In regards to windows, the Guidelines specifically recommend installing *compatible interior or exterior storm windows to improve energy efficiency*. In instances where the original windows cannot be repaired or are missing, the Guidelines recommend *installing compatible and energy-efficient replacement windows that match the appearance, size, design, proportion and profile of the existing historic windows and that are also durable, repairable and recyclable*. In addition *retrofitting historic windows with high-performance glazing or clear film* is not recommended unless it is determined that the historic character of the windows can be maintained.

Windows and Energy Loss

For more than two decades, original single paned wood windows have been cast as the enemy when it comes to heat loss and energy consumption in our homes. But the fact remains that windows are not the sole or even the primary culprit in this regard. In fact **there are several other factors that need addressing before window replacement should even be considered**. This is especially true in our historic districts, where windows are often considered as defining features of houses built prior to the 1960s. The fact that windows are significant to the architecture of a home frequently leads to contentious battles between well-meaning homeowners and local landmarks commissions that review exterior alterations to historic properties. Simply put, window replacement is most often not the most effective solution for saving energy or money. There are several other areas where energy can be conserved while still maintaining the historic character of a house.

Figure 1.



Source: U.S. Department of Energy

R-Values and U-Factors

R-Values are a measurement of the resistance to heat flow. A higher R-Value indicates higher insulating properties. The more insulation that is properly installed will increase the R-Value, and when combined with air sealing will normally make the home more energy efficient. R-Values are generally not applicable to windows, which are meant to add light to a building's interior, not to act as an insulator.

U-Factors are the inverse of R-Values and are the rating commonly applied to windows. The U-Factor of a window is the measure of the rate of heat transfer through that window. A lower U-Factor indicates a more energy efficient window.

Air Infiltration

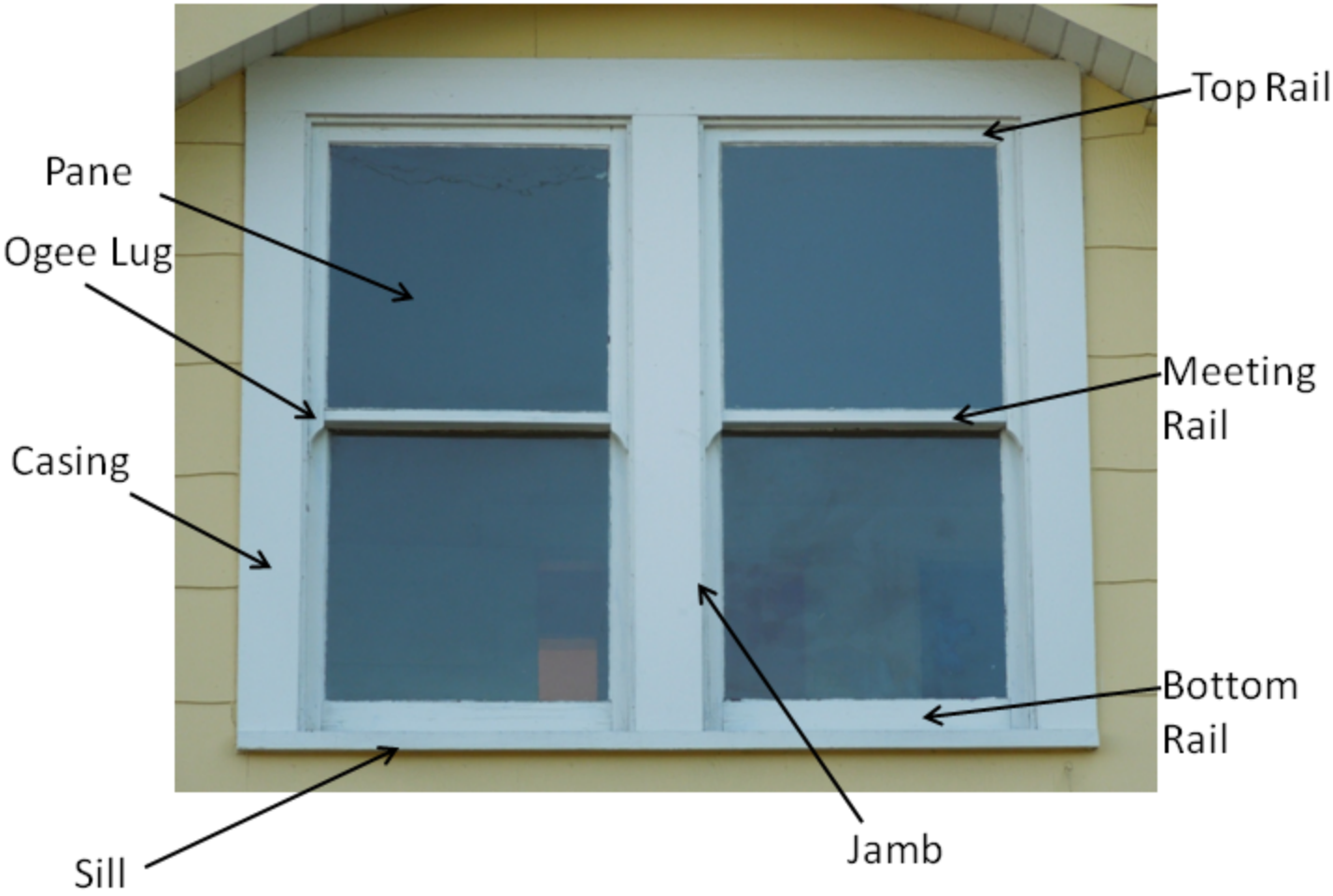
Air infiltration is the most common reason for energy loss in a historic home and for the purpose of this report will be used to refer to the ability of air to pass through the walls and/or around the windows of a home. Before any work is performed on the windows, air infiltration should be addressed. Tips for addressing air infiltration can be found in the *Typical Window Issues* portion of this booklet.

Typical Windows in Portland Area Homes

Most historic homes in Portland have windows that fit into one of the following categories. Each window is made up of one or more *sashes* – the framework that holds the glass panes in place. Figure 2 identifies some of the common elements of a window and the areas in which weatherization measures can be most effective.

- *Double hung wood windows* are the most common type of window found in older and historic Portland area homes. They are meant to open from both the bottom and the top in order to provide proper ventilation.
- *Casement windows* can be wood or metal framed but rather than opening up and down, the window sash opens outward. This is the second most common window type in Portland.
- *Fixed windows* are those that do not open, such as some very large picture windows or some attic windows. Fixed windows can be either wood or metal framed.
- *Hopper windows* tip outward from the top of the sash and are either wood or metal framed.
- *Sliding windows* open and close by sliding one of the sashes and are either wood or metal framed.
- *Jalousie windows* consist of glass louvers and are usually metal framed.
- *Multi-light windows* refers to the number of panes of glass in a sash. For example, a double hung wood window may have nine panes of glass in the top sash and one in the bottom sash. This would be referred to as a *nine over one* multi-light window.

Pair of Typical Double-Hung Wood Windows



Typical Window Issues and Their Repairs:

Before you begin work on any historic window, it is important that you understand and address potential lead paint issues. Any building or house built prior to 1978 may have lead paint. Lead paint can become a hazard during any sort of window repair or replacement. Consult with your local authorities about how to address lead paint concerns and remember to work "lead safe."

Decades of exposure to the extremes of Pacific Northwest weather and the lack of regular maintenance can lead to a need for window repairs. In the following section several window issues and their remedies are discussed. You should also refer to the National Park Service's *Preservation Brief 9*, which identifies many wood window repair issues and how they can be effectively addressed.

Deterioration
If well maintained, historic wood windows can last as long as the rest of the house. In the Northwest, windows are often made of old-growth clear grain wood (often fir), as opposed to modern wood windows that are finger-jointed or made of much younger wood that is more easily damaged by the weather. The good news is that these old windows can most often be repaired, even if they look deteriorated or even rotted. Before considering replacing any historic wood window, it is important to examine it closely to determine if the window can be repaired. A window repair professional can provide insight or in many instances you may be able to make such a determination yourself.

Window deterioration is mainly caused by water infiltration and poor maintenance. It is important that you maintain your windows just as you would any household appliance or HVAC system. Maintaining your windows will help minimize potential weather damage caused by the moist climate of the Pacific Northwest. In general, water penetrates in the same areas where air leaks occur (Figure 2). Making sure that these areas are properly caulked or puttied and that all finished surfaces are smooth, will help minimize window deterioration caused by moisture.

The areas most impacted by moisture, and therefore more susceptible to rot, are the sill, the joints at the lower corners of the upper and lower sashes, and the joints where the sill and jambs meet. **The good news is that these areas can usually be repaired**. Loose joints can be re-glued and rotted sections of a sash or sill can be repaired with epoxy (do not use automobile body filler), or new sections can be cut to replace the area that is rotted. *Preservation Brief 9* offers further details on how to perform such repairs yourself. In many instances such repairs on homes that are designated historic or part of a historic district, will not require Historic Design Review. As with other repairs or renovations, always check with your local jurisdiction. Relying on the opinion of a contractor as to whether or not a project requires Historic Design Review is not advised in this or any project that involves alterations to a designated historic home.

Condensation
Condensation forms when warm areas of a window – such as the interior side of a window sash, come in contact with cold air from outside. This can occur with any type of window, including storm windows or even newer replacement windows if a seal is broken. The resulting droplets of water can run down the window surface creating areas of standing water that can then seep into loose joints or unfinished surfaces and cause deterioration. The formation of condensation is directly related to the presence of air infiltration. Mitigation measures are discussed below.

Air Infiltration/Leakage
There is perhaps no greater issue with historic windows than the amount of air that is able to infiltrate a building from around their perimeter. Such infiltration leads to cool air entering the home making the window feel drafty. In order for any window (new or old) to truly be energy efficient, air leakage must be minimized. The biggest culprits in this area are around the entire window opening and around the window sashes. It is important that both of these areas are

properly sealed in order to diminish air infiltration issues. Other areas where air can infiltrate a home are the sash weight pockets (inside the window frame and casing) and where the glass and sash frames meet. **Replacing windows will not automatically fix air infiltration issues**.

There are several measures that can be taken to address air infiltration in historic windows. Caulking around the entire exterior of the window frame (where the casings and house siding meet) is an important first step. In areas where there are larger holes or gaps between the siding and the window frame, it is possible to add foam filler or backing material to fill the void, before sealing it with caulk. On the interior, installing sash pulley covers is an affordable way you can help reduce the amount of air coming through the weight pockets and into the home's interior. Replacing or adding new glazing compound is also an effective way to minimize air leaks and it can lessen window rattling.

Weather Stripping:
Weather stripping historic windows can be one of the most effective yet least expensive methods of minimizing air infiltration. It can also be an effective tool against noise infiltration – another reason why people often wish to replace their original windows. Weather stripping is typically installed around the perimeter of the window sashes. In most cases a homeowner can install weather stripping themselves, but window repair professionals also perform such work. To be fully effective, weather stripping must not have any breaks around the perimeter.

Weather stripping comes in a variety of forms and materials, including foam, vinyl and metal. Types of weather stripping include: compressible foam, vinyl v-flex, compressible felt, bronze strips, and zinc strips. The type you use depends upon the application (see below). If you have irregular openings, you can also use a product known as "rope caulk" that can be removed and re-used as necessary.

- **Weather Stripping for Sliding Applications**
  The term "sliding applications" refers to weather stripping that can be used along the sides of window jambs, where friction occurs. The spring metal type of weather stripping, for example, is tacked to the window jambs. This type of weather stripping is perhaps the most effective and durable, but is more expensive.

- **Weather Stripping for Compression Applications**
  "Compression application" means that the weather stripping is compressed when a window is closed. Foam and felt are the most common and inexpensive types of compression application weather stripping. These products are adhered to the surface on which they are used and are not for sliding applications. Foam and felt are therefore

Compression weather stripping on a wood casement window.
Image Courtesy of Jim Heuer.

most effective at the top and bottom of double hung windows or for use around casement windows. Keep in mind that foam and felt do not have a long lifespan as they can deteriorate when exposed to moisture. They are also usually visible when the window is open.

Weights and Sash Cords

One of the most common complaints against historic windows is that they won't open or close properly because the window ropes (sash cords) and weights are either broken or have detached. This is another affordable fix that can usually be completed by a homeowner or through a window repair professional.

In the Pacific Northwest, "double hung" windows are the most common type found in historic homes. This means that not only should the window open from the bottom, it should also open from the top as well. When operating properly, such windows can be used to provide natural ventilation throughout a home. When the window sash cords break or come untied, the sashes become out of balance, leading to opening/closing difficulties. In order to repair the sash cords and re-connect the weights, you must first gain access to the cavities where they are located. Many historic double hung wood windows have an access door cut into the window jambs. These doors are often screwed or nailed in place. Once removed, the weights and ropes should be able to be accessed without removing the interior window casings. Unfortunately, in some instances, there are no access doors and the interior casings must be removed in order to gain access to the weights and sash cords. In such cases you might consider screwing the casings back into place after you have made repairs, rather than nailing them, in order to make them easier to remove in the future.

Example of a properly knotted sash cord.
Image Courtesy of Patty Spencer

Once you have access to the weights cavity you can install new sash cord (or chain) – available at most hardware stores. New sash cord will last for decades but you must make sure you tie the cord to the weights securely, so they do not fall off after you have put things back together. Never paint sash cords as it will only lead to additional problems opening and closing the windows.

Painted windows can create major complications for this process. Paint can hide the location of the access doors. Many window repair professionals encourage paint removal, especially along the window jambs, in order for proper ongoing repair. This can increase the time and expense of such a project, but it makes future maintenance and/or repair of the windows much easier. Remember to <u>always work lead-safe</u> and to use proper care when using chemical paint strippers or heat guns to remove paint.

Locks and Latches

Poorly working or broken locks and latches can also be a common problem with historic windows. Locks and latches are not just for security purposes. On typical double hung windows, the lock mechanism pulls the two sashes tightly together – minimizing air leakage at the meeting rail. Lock or latch screw holes that are deteriorated can be repaired using an epoxy filler that, when hardened, can be re-drilled so locks and latches can be re-installed. Re-using the original locks and latches is recommended as they are usually made of higher grade materials than newer locks. Paint can be removed from old hardware using a variety of techniques that are affordable and can be completed by a homeowner.

Paint

Depending on where it is located, paint can be one of your historic windows' biggest enemies. Most window repair professionals do not recommend painting the sash jambs as that frequently leads to sticky windows. We've all heard of windows being "painted shut". That is because jambs were painted, along with the sash frames. In such instances, the first step in repairing sticky windows is to cut through the paint using a painter's tool. Paint can also be removed using chemical strippers or a heat gun, along with a paint scraping tool. Once paint is stripped from a window it can then be sealed with a high quality wood sealant or coated with a varnish that does not create the stickiness of paint and maintains the unpainted wood finish that was typically original to the house. You can also rub paraffin wax on the sides of the sash frames so that they will slide up and down more easily.

Unpainted jambs decrease friction and allow window sashes to open and close more easily.
Image Courtesy of Patty Spencer

IMPORTANT! Before you begin work on any historic window that has been painted, you must understand and address potential lead paint issues.
<u>Any home built prior to 1978 may have lead paint</u>. In Oregon, consult the Oregon Health Authority if you have concerns about how to address lead paint in your home.

Example of a window that will not close completely because it is racked
Image Courtesy of geoffcoats.com.

"Racked" Windows

Windows that won't open or close properly because they are no longer square are considered "racked." Racking is typically not a problem caused by the window itself – it is most often caused by the settling of a house over the course of many decades. Not only will a racked window need to be repaired in order to function properly, racked windows can also lead to a number of additional problems ranging from increased air and moisture infiltration to broken sash joints. The good

news is that historic windows can usually still be repaired, but you must also determine and address the root cause of the racking, or your repairs will be unsuccessful. Unless the original cause of the racking is addressed, replacing a racked window with a new replacement window will likely lead to the premature failure of the replacement.

Storm Windows and Alternatives to Window Replacement

Storm windows create an extra layer of insulating air between the interior of a home and the weather outside. They also reduce air and noise infiltration. Properly repaired and maintained historic wood windows combined with properly installed storm windows can yield energy savings as good as replacement windows, and typically for a lower cost too. By keeping your original windows intact, you also preserve the historic character of your home. In any case, if your home is designated historic or is located in a National Register Historic District or local Conservation District, you should consult your local jurisdiction before installing storm windows of any kind.

Interior Storm Windows and Thermal Window Inserts – Interior storm windows and interior thermal window inserts can provide much of the insulation benefits of window replacement at a lower cost and with dramatically lower impact on the historic character of a home. These products also provide a sizable reduction in the amount of noise that can enter a home through the window area.

Interior thermal window inserts are held in place by compression tubing whereas interior storm windows sometimes require the installation of an interior bracket or frame that remains in place even when the storm window is removed. Interior storm windows and thermal window inserts are frequently made out of acrylic glazing, which is relatively lightweight and strong, making them easy to remove and put back into place. While this is true, they do impact your ability to open or close a window.

In most instances, interior storm windows or interior thermal window inserts will reduce or eliminate condensation that may form on single pane windows in winter. If moisture does build up between the interior storm window and the single pane window one proposed mitigation technique is to drill very small weep holes into the exterior window frame so that moisture can escape. Seek the advice of a storm window professional before undertaking such measures. In this circumstance, having too much weather stripping can actually be detrimental as that can also prevent moisture from escaping the space between the interior storm and exterior windows.

Exterior Storm Windows – Exterior storm windows have long been a common method for making historic homes more comfortable. Exterior storm windows come in a variety of materials and can be custom built to meet your specific needs. In order to maintain a historic appearance, windows should be designed to reflect the design of the original windows. For example, with double hung windows, your storm window sashes should mimic the location of the meeting rail – where the upper and lower sashes come together. This will make the appearance as seamless and unobtrusive as possible. Exterior storm windows can vary in price depending upon the material, but can offer considerable cost savings over entire window replacement.

Insulated Glass Systems (IGS)– Another method of improving the energy efficiency of historic windows is the installation of insulated glass into the existing window sashes. The single pane glass is removed from the original sash, along with the original glazing compound. The sash opening is then modified so that insulated glass and new glazing compound can be installed in the opening. Often the installer will perform additional weatherization measures like caulking and weather stripping before installing the insulated glass. The process does alter the original appearance of the windows, albeit slightly, and as with other weatherization measures, you should consult with your local jurisdiction as to whether the installation of insulted glass systems requires historic design review. Some IGS vendors use a holistic approach that includes fully weatherizing your historic windows in addition to adding insulated glass. Even with that amount of work, insulated glass systems can still be far less expensive than entire window replacement.

Other Types of Historic Windows and Their Weatherization Solutions

- **Casement Windows** – As mentioned above, most storm windows can be custom built to match your original historic windows. This includes casement style windows that swing out and away from the house when opened. On casement style windows, the type of storm window that is used most often is called a "piggy back" style because it actually mounts directly to the original sash frame. This allows the window to still be opened although the additional weight may make opening more difficult. In addition to storm windows, you can also install weather stripping in casement windows much the same as you would with double-hung windows. **Make sure that you use compression type weather stripping for casement window applications**.

"Piggy-Back" casement style storm window
Courtesy of Jim Heuer.

Aluminum casement style window.
Courtesy of Val Ballestrem.

- **Metal Frame Windows** – Metal framed windows, typically steel or aluminum, present unique challenges for repair and weatherization that may be best addressed by a window repair professional. If the metal is corroded or bent, the window may have to be removed first in order to be properly cleaned and repaired. You can still install custom storm windows, but adding weatherstripping, especially along sliding surfaces can be difficult. You can (and should) still caulk around metal windows to prevent air infiltration just as you would with other types of windows. The National Park Service provides additional detail for repairing and weatherizing metal windows in their *Preservation Brief Number 13*, available online. The URL for this brief is located in the resource section of this booklet. In the event that your metal windows are beyond repair, there are companies throughout the United States that produce custom metal windows.

Weatherizing Using Window Treatments

Shutters, Curtains, Shades, Blinds, Films, and Awnings – There are numerous types of window treatments that have been used historically to lessen drafts or heat/cold transfer around windows. Some of these measures can be very cost effective while producing positive results. Of the following measures, those that are employed in the home's interior will likely not require historic design review. As always, however, check with your local jurisdiction prior to installing anything on the exterior of your home if it is designated historic or located within a historic or conservation district of any kind.

- **Shutters** – Interior shutters provide privacy and in the summer shading, but are otherwise mostly for decorative purposes. In the Pacific Northwest exterior shutters are typically only decorative as well and therefore neither historically appropriate nor an effective weatherization measure. In Portland's historic districts, installation of exterior shutters will require Historic Design Review too. However, if your historic home does have original working shutters or you have definitive evidence that the home once had working shutters, they can also be used effectively to keep the sun out of your home in the summer, but remember, they offer little protection against winter drafts.
- **Curtains** – Curtains can provide an affordable and historically appropriate solution for improving comfort in a home with historic windows. Depending on their coverage and weight, they can minimize draftiness, and lessen the impact of solar gain (how a home heats up) on a home's interior. Curtains can also be custom fit and styled to maintain an appropriate historic look and feel.
- **Shades** – Like curtains, shades can increase interior comfort, while also reducing solar gain. Insulated shades are now readily available and, if properly installed, they can greatly increase the R-value of your window area, increasing your home's energy efficiency. If historic appearance is desired, shades can also be custom made of fabrics that are period appropriate.
- **Blinds** – Blinds are one of the most common window treatments available today. They can be custom fit for historic window openings and can be insulated as well, increasing your home's energy efficiency much the same as insulated shades. Blinds have little or no visual impact on the exterior of a historic home. Some blinds can be raised from both the top and bottom providing light, shade, and privacy as needed.
- **Films** – In recent years, films have been developed that can easily be applied by a homeowner to the window panes as a method of reducing the amount of sunlight that enters a home. While these films may deflect some of the light entering a home, there is no conclusive evidence that such films provide any additional weatherization benefits. Therefore they should not be viewed as viable window weatherization measure.

- **Awnings** – Awnings were commonplace on homes built from the late 19th through the mid-20th century and therefore if they are made of suitable materials can be considered historically appropriate. Installation of new awnings on historic homes in Portland, however, will require Historic Design Review. Given that they are used to shade the interior of a home from the sun, they are mostly effective in the summertime. They are often retractable too, so in the winter the sun can be allowed to heat the home's interior.

Early 20th century postcard depicting an awning on a Portland, OR home.
Courtesy of the Architectural Heritage Center.

Historically Sensitive Replacement Windows

This guidebook is meant to provide some basic guidelines for the repair, maintenance, and replacement of historic windows. In Portland, if you live in a designated historic home or in a home located within a historic district, a window replacement project will require a Historic Design Review that can be costly and time consuming. Most repairs however, including those involving the replacement of individual window parts (such as a rotted bottom rail), will not require such a review so long as the replacement parts are identical to the original.

The replacement of historic windows should <u>only</u> be considered as a last resort after all other measures of increasing energy efficiency have been addressed in a home. No matter the quality of the replacement window, there may still be air infiltration that if not properly mitigated, will decrease the effectiveness of the replacement window. As mentioned earlier, <u>windows only account for around 10% of the overall energy loss in any home</u>. Many other measures can and should be undertaken prior to replacing original historic windows.

If all other measures prove unsatisfactory or if there are windows that are beyond repair – such as those with significant rot – then replacement windows may be considered. Even if you think that your windows are physically beyond hope, it is always recommended that you check with a local window repair professional (not a new window salesperson) to see whether or not the windows can be repaired. Repairing your original windows almost always costs less than buying replacements and when combined with proper additional measures, such as storm windows, will produce significant energy savings.

Windows are a character defining feature of any building. If they are replaced by windows of inferior quality, windows made of substitute materials, or windows of a design that differs from the originals, the changes will be obvious and often incompatible. Most off the shelf replacement windows will not be approved for use in a historic district, especially if they change the original style of window – such as the conversion of a pair of double hung windows into a single large picture window. Such alterations will diminish the historic qualities of a home. If, after all other home weatherization measures and repairs have taken place, it is determined

that a window (or windows) must be replaced, then owners of historic homes should examine their windows carefully to determine what they will need in order to replace them in the most historically sensitive manner.

Example of muntins on a pair of historic wood windows.
Photo courtesy of Patty Spencer

Most historic windows in the Pacific Northwest are constructed of wood and it is recommended that if windows must be replaced, that they are replaced in-kind (of same/similar material, style, and dimensions). Substitute materials, especially vinyl, are not appropriate for a historic home. Replacement windows often have different profiles than the original windows and lack key features of original windows such as the "ogee" lugs that extend from the bottom of the upper sash on the typical double hung windows found in our region. Many historic homes have windows with so-called "divided light sashes", where the sash glass is divided into multiple sections by wooden dividers called *muntins*. If divided light windows are replaced, the replacements should also have real divided light sashes with muntins that match the originals. The use of windows with "faux historic" divided light inserts is not acceptable for use in historic homes.

There are numerous materials used in the manufacture of replacement windows. Before proceeding with any window replacement in a historic home, it is recommended that you consult with your local jurisdiction to determine what types of replacement windows may be acceptable. They may also be able to provide you with examples of replacement window types that have been approved for use in other historic homes in your area.

As a general rule the following types of windows should not be considered acceptable replacements for original wood windows in historic homes:

- Vinyl
- Aluminum
- Fiberglass or aluminum "clad"

Fully fiberglass replacement windows have been approved in Portland for use in historic homes, but are reviewed on a case by case basis.

Adding New Windows Where There Are None

Owners of historic homes should think very carefully about their needs before they consider adding a new window to a home where previously there wasn't one. Such alterations to the home can have a dramatic effect on its historic character and may not be viewed as acceptable by the local jurisdiction and/or historic landmarks review body. In Portland, any addition to a

home located in a historic district or individually listed on the National Register of Historic Places, requires Historic Design Review. It is understandable that some homeowners wish to increase the size of their homes through building additions or dormers. In these instances, new windows should be consistent and complimentary to those on the rest of the home in regards to material, style, profile, and proportions. Newly added windows should reflect both the placement of the home's original windows and the ratio of wall to window surface. Removing original windows altogether, especially on the front or prominent sides of a historic home should always be avoided.

Basement Windows

Often homeowners wish to update their basements into finished living spaces for their families or to create an accessory dwelling unit (ADU) for a relative or other tenant. In such instances, larger windows are sometimes required as a health and safety matter. In Portland, if larger basement windows are required for an ADU in a designated historic home or a home located in a historic district, the replacement windows are typically allowed provided that 1) The frames are of the same material as other original basement windows and have the same physical profile, 2) The width of the windows matches that of adjacent windows (as long as they also meet safety codes), 3) The surface area of the replacement or new window that is visible from the street or from adjacent properties is no more than is visible of the historic windows being replaced, unless they are on the rear of a house. This usually means that the windows are mostly concealed by window wells. Larger, replacement windows for ADUs that meet safety code for egress, are typically not allowed on the front of contributing resources in Portland's historic districts.

What if the Original Windows Were Already Replaced?

Often the original windows in a historic home were already replaced some years ago. If a homeowner needs to replace such windows, they should first consider what the originals may have looked like and try to find new replacements that are made of historically accurate materials, as well as matching the style, profile, and proportions. One way to determine what the original windows may have looked like is to explore your neighborhood or similar neighborhoods in your area to find houses of a similar period and style with their original windows intact. You can also review old house magazines, books, and websites to find examples of period windows. Once you have determined a window style that is appropriate you can then consult with window manufacturers to determine who makes the type of windows you need.

Acknowledgments

This guidebook was produced with the support of the Irvington Community Association. Without their leadership this project could have not been completed.

In preparation of this guidebook, several window repair and weatherization experts from the Portland, Oregon area were consulted. Their expertise is reflected in the types of solutions offered in the several "issue" categories. All experts consulted in the development of this guidebook are listed in the resource portion of the guidebook.

The most recent publications related to window repair and weatherization have also been consulted and are cited in the resource portion of this booklet. This includes publications from the National Park Service, the National Trust for Historic Preservation and other nationally recognized leaders in historic preservation as it relates to windows.

Resources

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Portland, Oregon Area Window Repair and Weatherization Professionals

Chosen Wood Window Maintenance – http://www.chosenwwm.com	503.266.3830
East Portland Sash and Carpentry Co. - www.eastportlandsash.com	503.453.6301
Fresh Air Sash Cord Repair – www.freshairsash.com	503.284.7693
Indow Windows – www.indowwindows.com	503.284.2260
Jack of the Woods – www.jackofthewoods.com	503.249.8201
Jeffrey Franz – www.windows-woodwork-detailing.com	503.234.9641
Oculus Fine Carpentry – http://oculuswindow.blogspot.com	503.740.6222
Truax Builders Supply – www.truaxnw.com	503.256.4066
Versatile Wood Products – www.versatilewoodproducts.com	503.238.6403
Viridian Window Restoration, LLC – www.viridianwindow.com	503.922.2202
Well Hung Windows, LLC – www.wellhungwindows.com	503.235.2493
Window Menders – www.portlandwindowcompany.net	360.562.0772

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