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courtesy of Paul Trudeau

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All current NAPC members who serve as city staff to preservation commissions are encouraged to distribute articles in *The Alliance Review* to commission members and other staff and elected officials within your member organization. Articles can be distributed via photocopies or scans distributed through file servers, intranets, and emails.

In this Issue

By Paul Trudeau, NAPC Program Director

This issue of *The Alliance Review* is dedicated to a topic most historic preservation commissions are familiar with – windows. The goal of this issue is to provide commission members and staff with a handy reference tool when facing window replacement proposals. The main article – "A Windows Short Guide for Historic Preservation Commissions" – discusses the various myths and facts of window replacement, and offers strategies to help commission members prepare for window replacement applications and public hearings. Jeremy Wells goes into further detail regarding window energy studies in his article, "Window Replacement, Energy Efficiency, and Economic Payback: Making Informed Decisions," while Rosemary Johnson from the city of Astoria, OR, concludes with an informative window rehabilitation case study.

Please contact NAPC with other stories from field – the ongoing battle to save historic wood windows takes many shapes and forms, and we're always looking for more information to distribute. Enjoy!

WELCOME TO NAPC

NEW NAPC MEMBERS:

Joan Barton	City of Batavia, NY Historic Preservation Commission
Gina DiBella	Greece, NY Historic Preservation Commission
City of DePere	City of DePere, WI Historic Preservation Commission
Chris Skelly	Massachusetts Historical Commission
Shelly Talbert	Main Street Hanford, Hanford, CA
Michael Zimny	Florida Bureau of Historic Preservation
Stacey Mattox	Haverford Township, PA, Historical Commission

NEW NAPC PROFESSIONAL NETWORK MEMBERS:

Ann Benson McGlone, LLC provides historic preservation consulting services to local governments, architecture and engineering firms, preservation organizations and individual property owners who are interested in preserving the unique character of their neighborhoods, buildings, public places and downtowns. Ms. McGlone's experience in both public administration and architecture helps balance citizen desires with municipal constraints by providing achievable strategies and long term value for community enhancement through design guidelines and historic district designation. As a registered architect specializing in Historic Preservation she offers insight and advice to architects, engineers and owners who are working with historic structures or within historic districts.

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John Williams | Architect provides consultant services to the preservation community. As a sole proprietor, my primary responsibilities include project management, coordination, and design for both public and private clients. The firm currently focuses on rehabilitating historically significant resources, producing planning studies, and conducting workshops addressing preservation topics.

I was honored to be appointed to the United States Advisory Council on Historic Preservation by President Bush. And was appointed by then Governor Locke to the Washington State Advisory Council on Historic Preservation and reappointed by Governor Gregoire as its Chairman. I have served as Vice President of Preservation Action and enjoyed serving as Chairman of the National Alliance of Preservation Commissions. I was the Chair of the Pike Place Market Historical Commission, Chair of the Oysterville Design Review Board, and a past member of the King County Landmarks Commissions.

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RENEWING NAPC MEMBERS:

CONTINUES ON PAGE 26

NAPC would also like to recognize our recently renewing members.

		City of Astoria, Community Development	Astoria	OR
Pete	Alday		Cartersville	GA
Gianfranco	Archimede	Paterson Historic Preservation Commission	Paterson	NJ
Karen	Bailey	Hawkinsville Historic Preservation Commission	Hawkinsville	GA
Gary	Boyle	City of Oberlin Historic Preservation Commission	Oberlin	OH
Brian W.	Bray	City of Nacogdoches	Nacogdoches	TX
Wade	Broadhead	City of Pueblo	Pueblo	CO
Karen	Bulman	Rapid City Historic Preservation Commission	Rapid City	SD
Carol	Coyle	City of McCall, Idaho	McCall	ID
Dr. Chris	Dietz		Pine Island	MN
Jay	DiLorenzo, President	Preservation League of New York State	Albany	NY
Stephanie	Dye	City of Roswell	Roswell	GA
Paul	Edmondson	National Trust for Historic Preservation	Washington	DC
Alexis	Eiland	City of Steamboat Springs	Steamboat Springs	CO
Robert	Fisher	Town of Bel Air, Historic Preservation Commission	Bel Air	MD
Sean	Gascoigne	Hinsdale Historic Preservation Commission	Hinsdale	IL
Stephen	Gugliotta	City of Galesburg, Galesburg Landmark Commission	Galesburg	IL
Iris	Hemmingson	LeMars Historic Preservation Commission	LeMars	IA
Donna	Jennings	City of Denham Springs	Denham Springs	LA
Janet	Joiner	Vienna Historic Preservation Commission	Vienna	GA

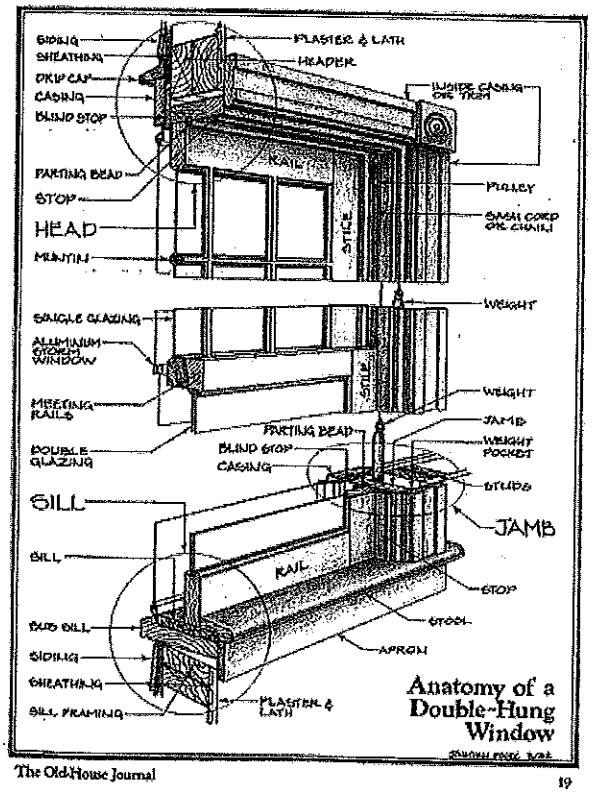
Written and compiled by
Paul Trudeau and the National Alliance of Preservation Commissions

A WINDOWS SHORT GUIDE for Historic Preservation Commissions

The Great Debate

One of the most prevalent topics in the historic preservation community is the debate over when to restore and when to replace historic wood windows. Local preservation commissions across the country must consider a myriad of issues when reviewing window replacement proposals, including, but not limited to, historic character, energy efficiency, sustainability, cost, existing condition, necessary maintenance, installation details, natural ventilation, and a wide variety of replacement models. Aggressive advertising from window replacement manufacturers, dealers, and installers, along with misinformed property owners, makes this task even more difficult.

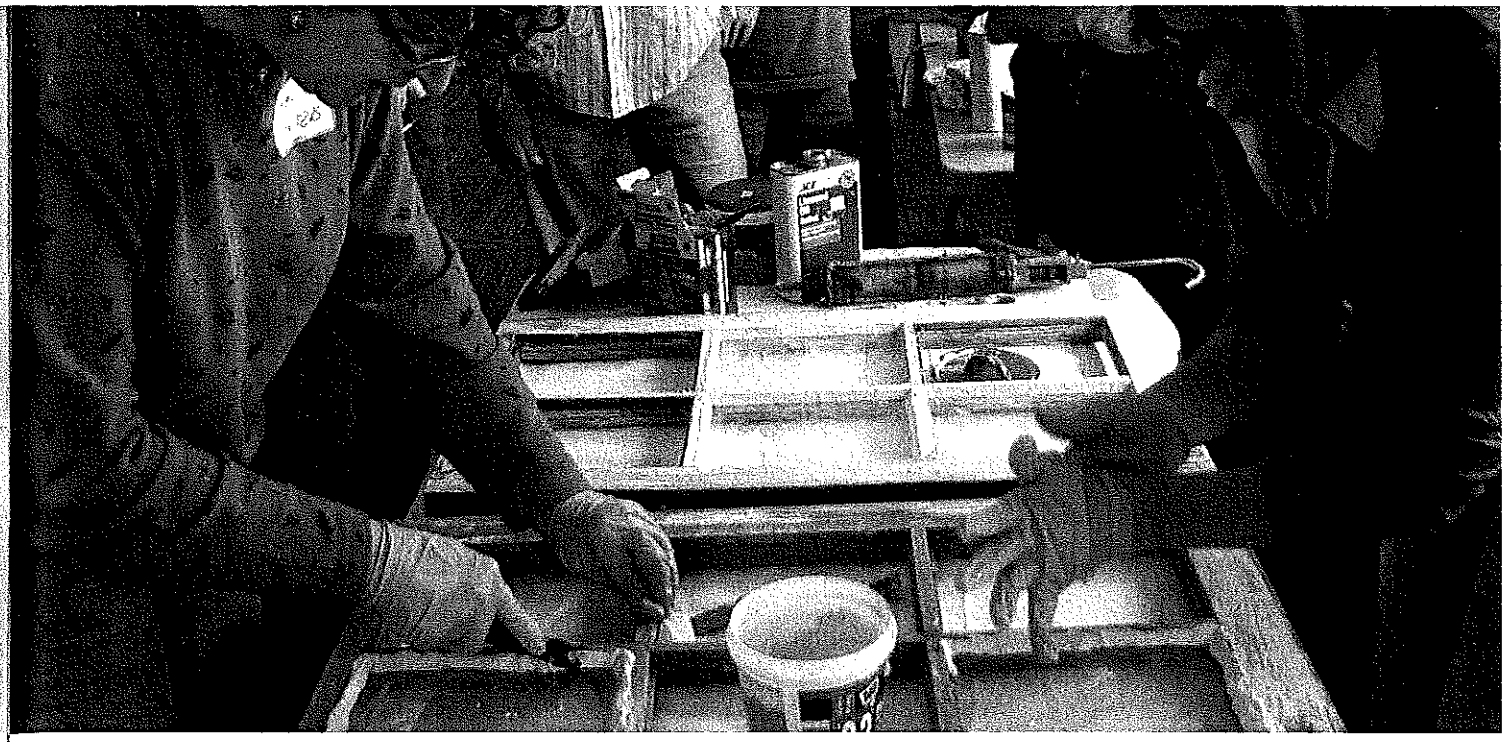
Because window replacement is one of the most common items a commission finds on its agenda, commission members and staff must be prepared to address these issues. An important part of this preparation is developing a clear and consistent review methodology that follows adopted guidelines. Accordingly, the National Alliance of Preservation Commissions (NAPC) has produced this issue of *The Alliance Review* to give local commissions information necessary to make defensible decisions. In addition to providing a historical overview of windows, the handbook addresses popular myths and facts of the restore vs. replace debate. It also provides detailed preparation strategies and a series of questions for commissions to consider when reviewing window replacement proposals.



Traditional double-hung sash construction was an intricate process, consisting of numerous parts and detailed components. Image source: http://urbanplacesandspaces.blogspot.com/2011/09/historic-house-expos.html

An Historical Overview

First and foremost, it is important to have a basic understanding of why windows are a valuable component of a building. Often referred to as the "eyes" of a building, windows are a character-defining feature that provide scale, profile, and composition to a façade. Federal preservation guidelines advise, "windows should be considered significant to a building if they: 1) are original, 2) reflect the original design intent for the building, 3) reflect period or regional styles or building practices, 4) reflect changes to the building resulting



Hosting a hands-on window repair workshop is a great way to great property owners energized about wood window restoration.
Photo courtesy of Athens-Clarke Heritage Foundation

from major periods or events, or 5) are examples of exceptional craftsmanship or design."[1]

The most common window type, the double-hung sash, dates back over three centuries in America. The purpose of a movable top and bottom sash was to allow for ventilation and air circulation throughout the house in warm months. Traditional sash construction was an intricate process, using mortise and tenon joinery to create sash that fit tight into the window openings of a house. The construction technique of individual panes of glass ("lites") held by molded wooden members ("muntins") evolved at an early stage. The time and attention to detail that went into window sash and frame construction paralleled other structural framing components in early American buildings. Similarly, the old-growth lumber used for these buildings, including window sash, is extremely resilient and will continue to last if maintained properly.

Window styles changed significantly over the years as glass became less expensive to manufacture. Early wood sash windows were marked by thick muntins and small lites, partly due to the high price of glass and technical difficulties in manufacturing large panes. As glass technology improved and prices decreased, lites became larger and muntins became thinner. By the late eighteenth century, dimensions of windows had become standardized according to the sizes of glass imported from Britain. This evolution can be seen with the change of architectural styles in America; the typical six-over-six muntin patterns found in early Greek and Classical Revival buildings gave way to two or one-over-one configurations in Italianate and Queen Anne styles by the late 1800s. With this change came different moulding and casing details, evidence that windows were regarded as a major element of architectural design.

Homeowner Education

The most important aspect of the restore vs. replace debate is educating district residents and property owners. With numerous misconceptions about old wood windows in the public eye, owners of historic buildings are easily swayed to quick-fix solutions that may be inappropriate. Proactive educational programs and user-friendly materials and literature can successfully influence public opinion and decision-making by historic property owners. Local historic preservation commissions have the ability to get involved in this cause, and many commissions may even have a mandate by their local preservation ordinance to promote and/or conduct educational outreach programs. There are many ways to do so:

1. Include a section on the benefits of window restoration in historic district design guidelines.
2. Host a window repair workshop through a preservation non-profit or local contractor.
3. Prepare window brochures and handouts for distribution at City Hall, public hearings, neighborhood meetings, or elsewhere.
4. Encourage property owners in historic districts to join historic preservation Listservs.
5. Work with local non-profits to hold annual events such as a window condition assessment weekend to offer homeowners firsthand experience of various window issues.

It is also important to know your audience. If there is a growing trend to replace windows in your local historic districts, try to get a sense of what is fueling this trend. If it is based on economics or energy-related issues, provide studies to property owners that focus on these topics in layman's terms. This information may convince those who do not value the historic character of old wood windows to reconsider replacement.

The Myths and Realities of the Window Debate

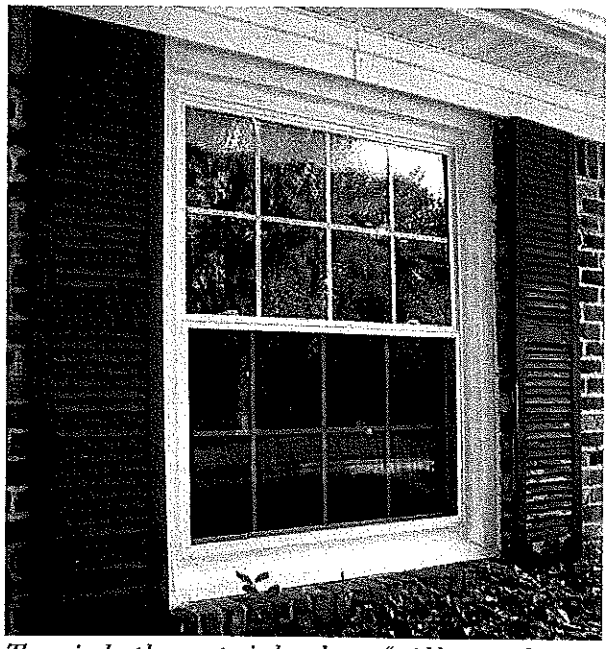
Frequently, well-intentioned property owners are persuaded to replace repairable windows by the various myths of the restore vs. replace debate. By being aware of the misconceptions and having a clear understanding of the issues involved, local preservation commissions can proactively educate property owners and make defensible decisions when reviewing window replacement proposals. As a first step, commission staff should provide property owners with the appropriate literature and educational information about why restoration is the preferred option, and then commission members need to know the facts in order to make consistent, valid decisions.[2] The myths and realities discussed below are extensive but not comprehensive or absolute; more discussion and research should be expected as the window-replacement industry finds new ways to promote its products.

Moreover, aside from change of exterior appearance, these myths include issues that are typically not under a commission's jurisdiction. Commissions and staff will likely hear concerns about energy efficiency, cost, and other related issues from property owners as a justification for window replacement. While it is important to educate property owners, commissions must avoid making design review decisions based on issues that are not within their purview (see following examples of cost, energy efficiency, etc.). However, as property owners will propose window replacement for a variety of reasons, it is important to gather as much information as possible on these topics in preparation for public meetings. This preparation will put commissions in the best possible position to educate and inform property owners when making decisions.

Aesthetic or Appearance Argument

THE MYTH: "Replacement Windows Look Just the Same as Historic Wood Windows."

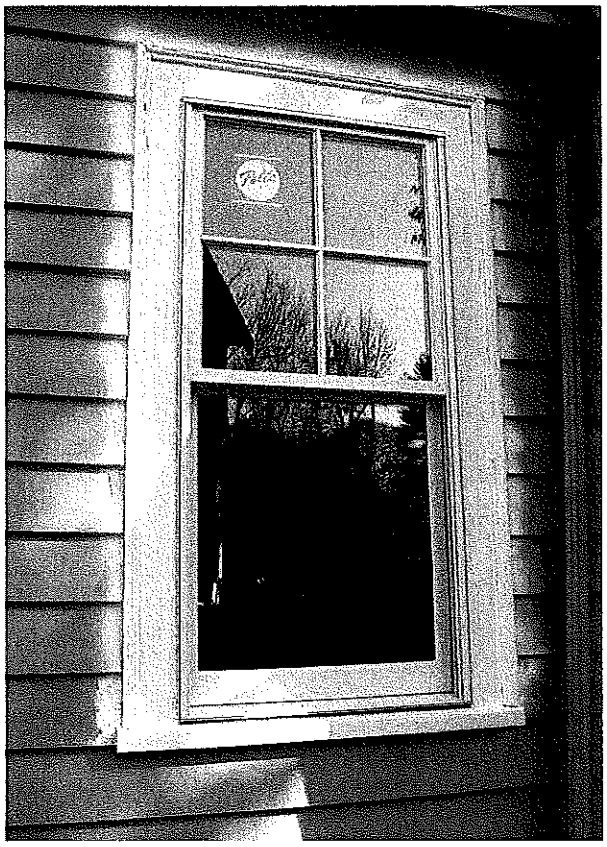
The issue most directly associated with a local preservation commission's jurisdiction is how a replacement window will alter a designated property's character. A popular claim is that a replacement window will easily and conveniently match the character-defining components of historic wood windows. This assertion typically focuses on a grid configuration in the replacement model that would resemble the existing muntin configuration of the original wood windows. Muntin profiles in wood windows are, in fact, difficult to replicate and replacement windows or sash rarely have the same details. A "true divided-lite" window with a traditional 1/2" or 5/8" exterior muntin with a putty bead is hard to reproduce in an insulated glass, "true divided-light" window, as heavier muntins are required to support the insulating glass.[3] This type of replacement window reproduction is also more costly. Many wood replacement windows have a muntin at least 7/8" wide with a surface-mounted molding affixed to the glass (or sometimes an "air-space grille" sandwiched between the glass) that is not actually holding individual panes of glass. Its appearance is intended to simulate a "true divided-lite" profile. Cheaper models, typically of vinyl or aluminum, feature snap-in grilles or grilles between the double glazing, providing no profile, depth, or shadow lines.



These vinyl replacement windows have a "grid between the glass" configuration that does not accurately represent the muntin profiles of traditional "true divided-light" wood windows.
NAPC file photo

In some replacement windows, the heavier framing required to support insulating glass decreases the overall glazed opening by as much as 3 inches in width, with a significant loss of light and alteration of the appearance. In some cases, it may be considered appropriate to replace deteriorated one-over-one windows (which have no muntins holding individual panes of glass) with certain wood, fiberglass, or vinyl replacement models.

Aside from the difference in muntin profiles, replacement windows will also often require a change in a window's rough opening because their size is based on current industry standards and does not match traditional window dimensions, which are frequently larger.



The framing component required for this replacement window model diminishes the window's rough opening by several inches.
Photo courtesy of Paul Trudeau

This change will sometimes involve the installation of additional vinyl balances or aluminum framing members to hold the replacement window properly. Custom sizing will add to the expense of replacement windows. Other appearance-altering features of new replacement windows include the inherent shiny and glossy look of vinyl or other synthetic cladding compared to wood, and the stark differences between "wavy," antique glass and replacement glass (fiberglass models, which can be painted, may be a better alternative). These changes to the fenestration's appearance can have a negative impact on a building's character. Commissions need to take into account all of these considerations when reviewing replacement models, as no two cases are the same. Oftentimes, questions of visibility from a public way will enter the equation when considering the overall effect of replacement windows on a building. In addition to the required information listed below, commissions and staff should always request a sample replacement window to be brought to a public hearing or on-site meeting in order to get a better sense of the various details involved.

How commissions and staff can prepare in advance for window replacement proposals based on the AESTHETIC/ APPEARANCE ARGUMENT:

1. Document the typical historic wood windows found on your community's historic buildings and take notes on their details, including muntin profiles, glass, trim, casings, etc. Compare the same elements to those found on a recently installed replacement window.

2. Become familiar with replacement window components as viewed from the exterior of a building (e.g., simulated muntin grids, claddings, and framing systems) by attending trade shows or visiting local replacement window distributors.

3. Compile a file or brochure of comparison photographs (replacement windows vs. restored windows) to share with property owners.

Information to require of the applicant before a public hearing or meeting for window replacement proposals based on the AESTHETIC/ APPEARANCE ARGUMENT:

1. Of what materials will the replacement window be constructed? How will these materials be similar in appearance to the original windows?

2. If the replacement window has a grid pattern, will the grids be snap-in (i.e., surface mounted), between the glass ("airspace grids"), or "true divided lites" (i.e., authentic through-the-glass muntins)?

3. How closely will the grid profile in the replacement window match the muntin profile (i.e., width, contour) of the original wood window?

4. Is the whole window (casing, stops, counterweighted ropes, etc.) being replaced or just the operable sash?

5. If only the sash is being replaced, will additional framing be required to hold the replacement sash?

6. Will the replacement sash have an aluminum or vinyl cladding?

It is essential to distinguish between "windows" and "sash," especially when discussing their potential replacement. "Replacing a window" means removing the entire window, including the sash, the jambs, the interior and exterior casings, and the sill, and installing an entire new unit. This replacement is often problematic because the casings will almost inevitably have different dimensions from the original, leaving gaps against both exterior and interior finishes. Unless specially ordered, modern windows will have a different configuration of casings, stops, and screens, dimensionally thinner sills and casings, and will sometimes occupy a different plane in the wall. "Replacing a sash" means replacing the moveable parts of a window, leaving the casings, jambs, and sill intact.

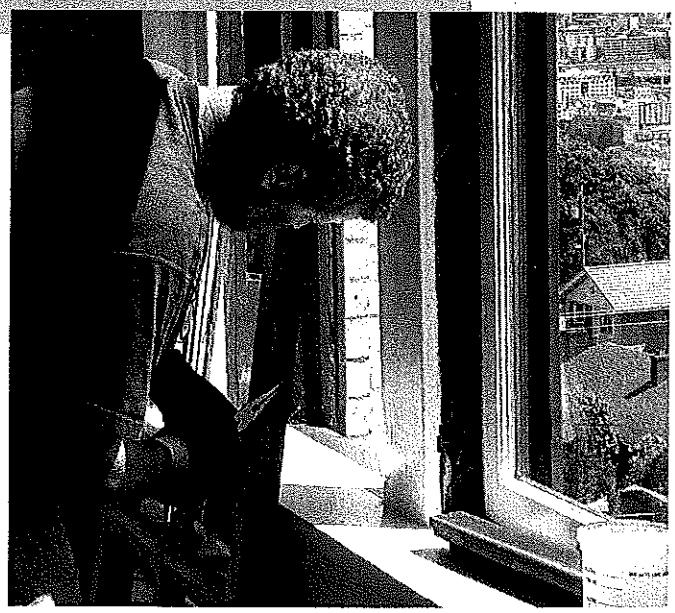
Cost Argument

THE MYTH: "It's More Expensive to Restore Historic Wood Windows than to Install Replacement Windows"

The claim that it is too expensive to repair existing windows is one of the most frequently used arguments in favor of window replacement. A clear understanding of the economic realities of window restoration and replacement is needed to refute this claim.

If a property owner believes that old wood windows need to be replaced because it would be too expensive to restore or repair them, a detailed assessment of the existing window's condition is necessary to support this contention. Commission members or staff may need a site visit to gain a clear understanding of the actual state of the windows. In many cases, simple repairs will greatly improve a window's condition and overall performance, but no two cases are the same. If a window is in workable condition, it may need only work such as spot glazing, caulking, scraping, filling holes, repainting, or replacing a pane of glass. These costs should be well below the cost of even the cheapest replacement model. A more detailed restoration – including fixing broken sash cords, removing the sash for weatherstripping, replacing rotted or missing wood sections, re-glazing the entire sash – and/or the installation of a storm window – may cost more than an inexpensive replacement model, because the windows often have to be moved off site to a workshop and the work is much more labor intensive.

A closer look at the long-term picture reveals that the installation of cheaper replacement windows will make less economic sense than restoring the existing windows. Property owners may not realize that the life cycle of a product must be considered when calculating actual expenses. In the short term, installing bargain replacement windows may be easier on a property owner's wallet; but with only a 10- to 15-year life expectancy, the new windows will likely need to be replaced in the not-so-distant future. In fact, a property owner may have to replace new windows several times before well-maintained historic wood windows will complete their life cycle. In this sense, short term gain does not always mean long term savings.

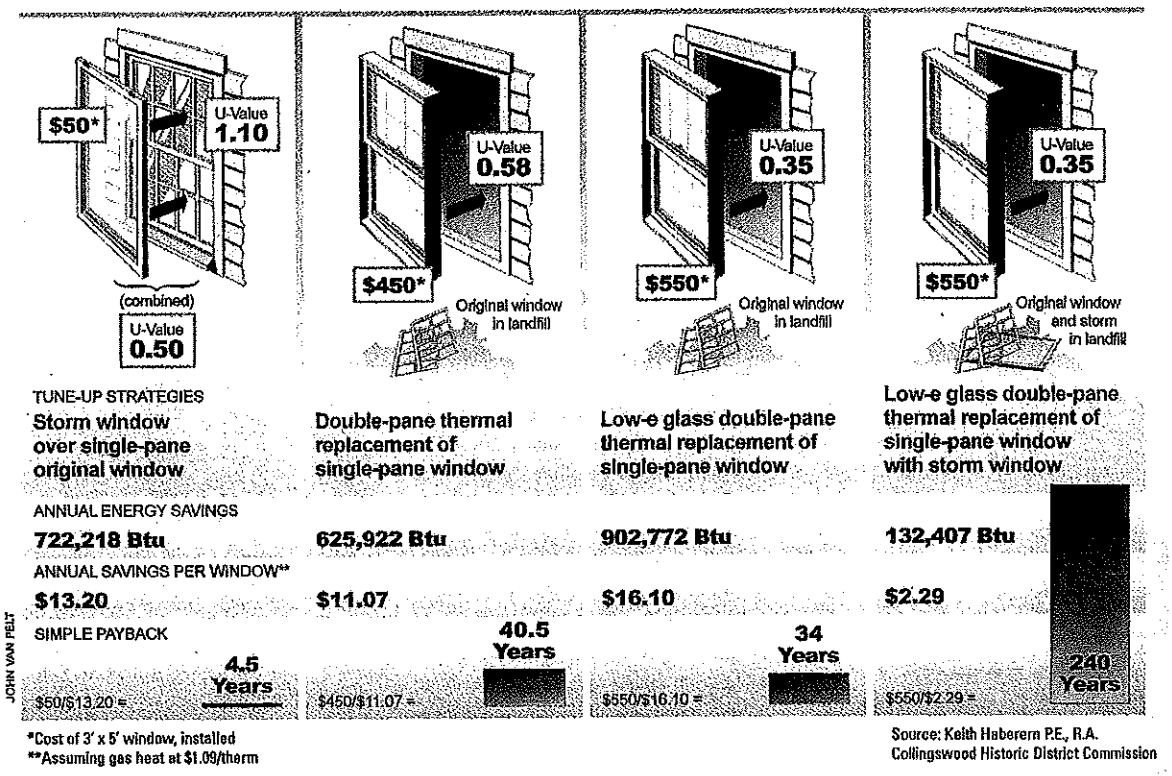


The costs of a complete window restoration will vary depending on the level of work required. Image source: http://www.doublehungwindowrestoration.com/about.html

One study in the Northeast United States revealed that the average cost for ten, mid-range priced vinyl replacement windows was $9,705, with the average annual energy savings a mere $405 a year and up to 24 years to recoup the investment[4] (not to mention that most houses have more than ten windows). So, in essence, a one-time investment for a thorough restoration of the existing wood windows can make the most economic sense because the cost of basic maintenance to keep them in good condition will be far less than the cost of repeated replacement as subsequent models fail. Another study showed a return on investment of up to 200 years for replacement windows![5]

Restoring and maintaining historic wood windows is a sustainable economic practice, and local commissions should emphasize this point when presented with the economic argument for window replacement.

Let the Numbers Convince You: Do the Math



A 2007 study found that window replacement was generally not cost-effective for homeowners. Image source: http://blog.timesunion.com/holland/this-message-brought-to-you-by-the-letter-%E2%80%9Cw%E2%80%9D/131/

How commissions and staff can prepare in advance for window replacement proposals based on the COST ARGUMENT:

1. Do research on window replacement payback period studies.

2. Talk with local carpenters and/or window restoration specialists to get a sense of the costs involved for both simple window repairs and a complete restoration.

3. Gather contact information from knowledgeable local carpenters and/or window restoration specialists to provide to property owners.

4. Gather information about the life cycle costs of cheaper replacement models versus that of more expensive models whose life cycles are comparable to that of a restored and maintained original window.

Information to require of the applicant before a public hearing or meeting for window replacement proposals based on the COST ARGUMENT:

1. What is the condition of the existing windows?

2. Did the property owner get a cost estimate (at least two) for repairing or restoring the existing windows?

3. What type of warranty is provided for the proposed replacement windows? What parts of the window are covered under the warranty?

4. Can the proposed replacement windows be easily repaired when their components start to break down?

5. Could weather-proofing improve the overall performance of the window and has that option been explored as a cheaper solution to replacement?

6. What proof has the manufacturer provided to show that their product will outlast the existing windows?

Some Notes on Storm Windows

Some may believe that modern storm windows are an inappropriate addition to a historic building, when, in fact, this is not always the case. There are several important points to consider when determining the appropriateness of storm windows.

PAGE EIGHT—EDITORIAL & AUTOMOBILE SECTION

Don't Blame the Furnace!

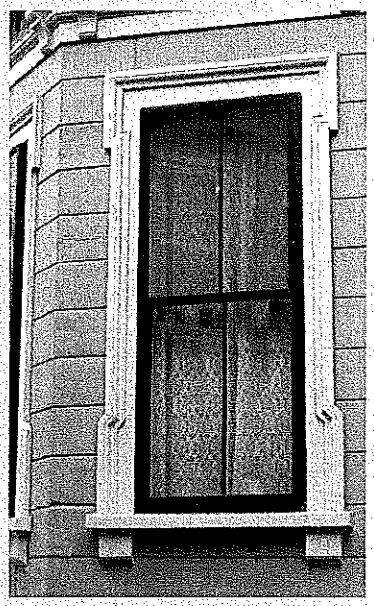
FURNACES are built to heat houses—not all outdoors. You can't expect to be comfortable in cold weather, if your house isn't properly protected.

Every window and every door may be a "heat escape." The heat goes out and the cold comes in. They're fighting the furnace every minute of the day and night. Protect those exposures with

Storm Windows and Storm Doors

Wholesale Sash & Door Association, Chicago

A storm window and door advertisement from 1918 – note the emphasis on energy savings.
NAPC file photo



A quality aluminum storm window can be an appropriate addition to a historic window.
Photo courtesy of Paul Trudeau

Storm windows that are installed flush within a window casing can have a minimal impact, as shown with this wood model. Image source: http://smithrestorationsash.com/woodstormwindows.html

Precedent. The concept of protecting your window sash from the elements has existed for several centuries in America, first in the form of shutters and then storm windows. Storm windows themselves have been around for over 100 years, initially constructed of wood and then steel in the 1940s and aluminum by the 1960s. So while some storm windows may look out of character, it's important to remember that there is historic precedent for their use.

Appearance. While it's true that old, dilapidated aluminum storm windows are considered an eyesore by most people, there are high-quality models on the market today. These newer versions look and perform better than older models. Wood storm windows are even a better insulator than aluminum models. Some current models are installed flush with the exterior window frame for minimal visual impact, while others provide a variety of colors to match various color palettes. Additionally, with proper preparation, aluminum storm windows can be painted to better blend in with the preferred color scheme.

Reversibility. One of the most important considerations regarding storm windows is that the installation process is reversible. Replacing the window sash is not. This reversibility is why the addition of storm windows is often exempt from review under many local preservation ordinances.

Energy Efficiency. Aside from protecting the window sash, a properly installed, sealed storm window will help cut down on air infiltration and lower your heating and cooling bills!

Tax Credits. Tax credits for storm windows were offered as part of the American Recovery and Reinvestment Tax Act of 2009, which provided homeowners with an energy-saving alternative to unnecessary window replacement. How long these tax credits will be available is unknown at the time of this publication; visit energystar.gov for more information.

Energy Efficiency Argument

THE MYTH: "Replacement windows are more energy efficient than old wood windows."

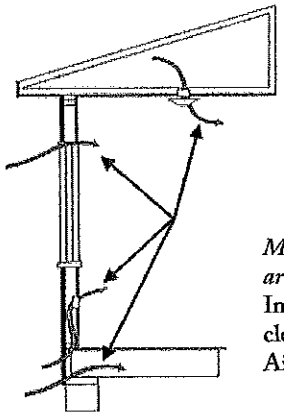
Another frequently heard claim from the window replacement industry is that an old, drafty wood window is no match for a newly installed wood or vinyl replacement window with insulating glass. A local preservation commission's jurisdiction does not usually extend to questions of energy efficiency when reviewing exterior alterations to a designated property, but when a property owner uses this argument as a basis for replacing historic wood windows, a commission should know the facts to successfully refute this claim and to suggest alternate ways of achieving energy efficiency without removing historic windows.

One important consideration is that replacement window manufacturers will often compare their product to a historic wood window that has ***not*** been maintained or restored. A window that fits this description will likely be drafty and inefficient, especially in colder climates. In most cases, however, a well-maintained or fully restored, tight-fitting, properly functioning, weatherstripped wood window coupled with a high-quality storm window will have virtually the same insulating properties as a double-glazed replacement window.[6] Consequently, one of the most important things a commission can do is encourage and advise property owners about the need and benefits of regular maintenance.

As replacement window manufacturers will attest, the best insulation on a small scale is dead air space. The extra dead air space created with a sealed storm window (typically about two inches, opposed to approximately 1/16 to 1/32 of an inch in insulating glass) means more insulation and increased energy efficiency. For warmer climates, the issue may be limiting heat transfer through the glass to keep the house cooler; this can be remedied by cellular shades, thick curtains, or low-e storm windows.[7]

Another popular term you hear in the energy efficiency debate is the U-value of a window. U-values gauge how well a material allows heat to pass through it. U-value ratings generally fall between 0.20 and 1.20; the lower the U-value, the greater a product's resistance to heat flow and the better its insulating value. Replacement window manufacturers often misquote U-values as the value through the center of the glass (the location of the best U-value) and not for the entire unit.[8] In truth, a U-value is a rating of energy efficiency for all the combined components of a window or door. It is also important to remember that air infiltration is the principal cause of energy loss in a window; it can account for as much as 50% of the total heat loss of a building.[9]

In addition to weatherstripping and storm windows, caulking around the window trim will help reduce drafts. The installation of a double-glazed replacement window alone will not solve problems of air leakage in old wood-framed buildings. Moreover, most of the heat loss in a house occurs in areas other than windows; insulation in attics and between floors and weather stripping around doors will make a big difference.[10]



Major points of air infiltration around a window.
Image source: http://www.clemdesign.com/InfoPages/AirInfiltration.htm

How commissions and staff can prepare in advance for window replacement proposals based on the ENERGY EFFICIENCY ARGUMENT

1. Do your homework! There are several studies that show how a restored wood window with a properly installed, high- quality storm window will have comparable energy savings to a double-glazed replacement window. [See bibliography or contact NAPC for more information]

2. Understand the basic terminology the window replacement manufacturers utilize in their promotional literature, including U-values, R-values, solar heat gain coefficient, and low-e glass.

3. If possible, observe replacement window performance on the interior of a building, preferably on a cold day to feel for air infiltration. Compare its performance to a restored window with a storm window.

4. Stay up-to-date on the latest window replacement models and the benefits touted by their manufacturers regarding energy savings. Attend trade shows or other exhibit events where replacement windows are featured and promoted.

5. Compile a list of resources for property owners regarding energy efficiency in historic buildings.

Information to require of the applicant before a public hearing or meeting for window replacement proposals based on the ENERGY EFFICIENCY ARGUMENT:

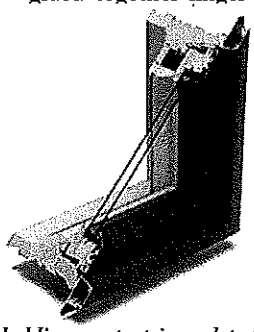
1. What is the general condition of the existing windows and storm windows (if applicable)?
2. Has there been any weatherization of the existing windows?
3. Has there been a quote for a full restoration of the existing windows?
4. Has the applicant considered installing storm windows as an alternative to window replacement?
5. Have other areas of the house/building been insulated or weatherized?

Sustainability Argument

THE MYTH: "Replacement windows are the 'greener' option."

Another topic not directly related to a local preservation commission's jurisdiction is the issue of environmental responsibility; however, it is important issue to address because towns, cities, and counties may have energy codes that require property owners to address old wood windows. Various window replacement manufacturers have regularly promoted their product as a "green" choice because of the purported energy savings one gets with a new window. The greenness of a product is not limited to energy savings alone. It also includes other sustainability criteria such as embodied energy, landfill waste, the carbon footprint of replacement window manufacturing and transportation, etc. With these considerations in mind, a closer analysis of window restoration will prove to be a greener option, and that window replacement is an inherently unsustainable practice.

Regarding sustainability,[11] it is important to consider the durability of old wood windows. These windows are remarkably resilient even when not maintained, because most were milled with old-growth lumber and carefully constructed with mortise and tenon joinery to fit tight into the window openings of a house. Old wood windows were built to last, and are the very definition of a sustainable product. Conversely, mass-produced wood replacement windows are typically constructed of new-growth lumber, often with glued-together finger joints, and are highly susceptible to rot. In many cases, wood replacement sash have protective exterior aluminum or vinyl cladding. If moisture finds its way in, through split seams or other infiltration sources, the new-growth lumber beneath the cladding will deteriorate. The notion of a vinyl window as a sustainable product is also questionable – vinyl is prone to denting, warping, and fading in high temperatures. Accordingly, most replacement windows come with a limited warranty. No warranties are available or required for historic wood windows; basic maintenance will suffice to keep them functional.



Exterior cladding can trap in undetected moisture on replacement windows, which can lead to rot. Image source: http://chicagowindowexpert.com/windowtags/wood-window-leaks/

Sustainability also relates to the need and frequency of repairs and maintenance for a building component and all of its parts and materials. A determining factor of a product's life cycle is its maintenance requirements over time. Old wood windows usually need only simple repair and routine maintenance, including replacing broken panes of glass, replacing glazing compound, and a new coat of paint, which can be done my most property owners with tools and materials found at a local hardware store. The same simply is not true for replacement windows; when repairs are needed, replacement is usually the only option, especially for window products no longer in production.

A major selling point touted for replacement windows is insulating glass: two panes of glass with an inert gas sealed in the space between them (also called "double-glazed" windows). Windows with insulating glass come with only a 15-to 20-year warranty; when the sealant fails, the window will gradually lose its insulating quality, the glass will fog, and the entire window may have to be replaced.[12]

When the seal on insulating glass fails, the window loses its insulating properties and the glass fogs up.
Photo courtesy of Paul Trudeau

Vinyl and wood replacement windows are also made with stock parts that quickly become outmoded, making them difficult, if not impossible, to repair if a spring or other suspension component breaks. For these and other reasons, it's no surprise that there's no such thing as a vinyl window repair workshop!

A product's larger environmental impacts are another important consideration when determining environmental sustainability and "greenness." Restoring old wood windows, much like the restoration of any component of a historic building, is the ultimate practice of reuse and recycling. The removal of wood windows for replacement models adds unnecessary waste to landfills. Moreover, the manufacture of vinyl and aluminum creates a number of toxic by-products.

The claim that a replacement window is more "green" in terms of energy efficiency, sustainability, and environmental impact is highly debatable. When these three elements are carefully analyzed, it becomes evident that the restoration of existing wood windows can be a more environmentally responsible choice. Understanding these facts can be helpful to commissions in framing counterarguments when property owners or window sales representatives pitch claims of "green" as a basis for window replacement.

How commissions and staff can prepare in advance for window replacement proposals based on the SUSTAINABILITY ARGUMENT

1. Research common "green" terminology and issues in building construction and historic preservation – including sustainability, environmental impacts, and energy efficiency – through blogs, trade shows, historic preservation Listserves, etc.

2. Stay up-to-date on replacement window technologies and materials.

3. Attend or host a window restoration workshop to learn about the durability of old wood windows and how they can be refurbished, with an emphasis on sustainability and energy efficiency.

Information to require of the applicant before a public hearing or meeting for window replacement proposals based on the SUSTAINABILITY ARGUMENT

1. Has the applicant considered the sustainability and environmental impacts of the proposed replacement windows?

2. What are the warranty details of the replacement windows?

3. Can the replacement windows be easily repaired?

4. What proof has the manufacturer provided to show that the replacement windows will last longer than the existing wood windows, especially if they are properly repaired or restored?

Many "green" experts agree that window replacement isn't always the best option when it comes to energy savings.

From the GreenBuildingAdvisor.com
(http://www.greenbuildingadvisor.com/green-basics/windows-glass-ratings-and-installation-0)
"When planning energy improvements to an existing house, replacing windows should show up toward the bottom of the list. It almost always makes sense to improve an existing home's air tightness and add insulation to the attic and basement. Replacing an old furnace or refrigerator can also be cost-effective. But if the windows work well, it's usually best to put replacing windows lower on the list. In a cold climate, the best way to improve single-glazed windows is to install exterior storm windows with low-e glass."

From the GreenBridge Blog
(http://greenbridge.wordpress.com/2009/01/17/help-for-historic-windows/)
"The repair of an historic window, with the addition of a storm window, proper sealant and weather-stripping, can result in a window with energy efficiency close to that of a new window."

From Planetgreen.discovery.com
(http://planetgreen.discovery.com/home-garden/green-windows.html)
"Windows are a critical part of the look of an historic home, but they are often sacrificed on the altar of supposed energy efficiency and convenience... in the end, the greenest window is the one that's already in the wall."

OTHER **MYTHS**
Commissions Should Expect to Hear:

The Lead Paint Argument
THE MYTH: "Old Wood Windows with Lead Paint are Hazardous and Should Be Discarded."

Lead paint in older buildings is a serious issue that should be dealt with accordingly. The detection of lead paint on older wood windows, however, should not lead to a knee-jerk reaction for wholesale replacement. With proper planning, precautions, and safety measures, historic wood windows with lead paint can be remedied. It is possible to remove lead paint from historic sash without posing serious health hazards. Local municipalities often have guidelines for safe and effective lead abatement, including windows, but it needs to be done by a certified professional.[13] An experienced contractor or window restoration specialist should be able to identify unstable lead paint (the most hazardous condition) and treat it appropriately according to local and Federal standards. Stable lead paint can be encapsulated with lead-free paint to comply with federal and state laws. For more information about addressing lead paint hazards in historic buildings, refer to *Preservation Brief 37: Appropriate Methods of Reducing Lead-Paint Hazards in Historic Housing* from the National Park Service: http://www.nps.gov/history/hps/TPS/briefs/brief37.htm

The Maintenance Argument
THE MYTH: "Replacement Windows are Maintenance-Free"

While this claim may sound appealing to property owners, the fact remains that no material or building component is maintenance free. Maintenance is an important part of property ownership and contributes to the overall value of a building. Buying into the notion that a replacement window will never need maintenance from the time it is installed does the property owner a disservice. Any product that is in constant operation and is susceptible to seasonal fluctuations and weathering will need regular inspection and periodic attention and care. As mentioned earlier, vinyl is prone to denting, warping and fading; vinyl and aluminum claddings can also dent and fade. These deficiencies cannot be repaired or maintained, nor can most failed insulating glass or plastic parts in replacement windows. So, although the pitch of a "maintenance-free" product is tempting, property owners need to be informed of the facts. Simple maintenance to a single-glazed, historic wood window is all that is needed to keep it in operation for years to come.

The Operability Argument
THE MYTH: "Old Wood Windows Don't Operate Properly and Need to be Replaced"

Deferred maintenance is not uncommon with old wood windows, and can lead to poor performance. Problems include broken sash weight ropes, sashes painted shut, worn jambs, and off-center parting beads and stops. Much like the energy performance of an unmaintained window, the best treatment is to systematically repair the deficiencies, focusing efforts on solving the specific problems related to its operation. There is no need to discard an entire window unit because one component is not working optimally. If the window is not functioning properly, a property owner should be encouraged to get quotes for a repair or restoration job. The results can be surprising!

WHEN IS **REPLACEMENT ACCEPTABLE?**

With the variety of window replacement models available on the market today, a commission's review of a replacement proposal all comes down to the details. Image source: http://schmidthomes.wordpress.com/2008/02/20/a-visit-with-marvin-windows/

In some cases, an old wood sash may be beyond repair and need to be replaced. It is also common to find original windows already replaced with inappropriate aluminum or vinyl models from earlier decades. The challenge for commissions is determining the appropriateness of a proposed replacement model, and this type review comes down to details.

If the original windows are still in place but are beyond repair, the commission has an advantage in determining the appropriateness of a replacement model, as the existing windows can serve as a guide. Depending on the significance of the building, a single-glazed reproduction wood sash with the same number of lites may be the preferred option. Coupled with a high-quality storm window, this solution satisfies much of the rationale for restoration as discussed earlier. As a service to property owners, the commission and staff can compile a list of window manufacturers that produce single-glazed, "true divided-light" windows with individual panes of glass set into authentic muntins.

If a double-glazed replacement window is the only option, Commissions will generally consider how the proposal will impact the historic character of a building; namely how the replacements match the originals in pattern, details, materials and finishes as closely as practicable. Dimensions and profiles of casings, sills, jambs, meeting rails and muntins should all be subject to review.

Some manufacturers have been able to produce double-glazed wood windows with muntin profiles that are similar to those found on single-glazed sash. Although there have been advances in recreating the details of historic windows, the sustainability and energy efficiency issues discussed in this short guide merit consideration when considering the appropriateness of proposed replacements. It should be noted that there are window replacement models of higher quality than others. The appearance, durability and energy efficiency of these high quality replacements often make them more expensive. Although costly, they may provide an acceptable replacement option. In some municipalities, replacing an existing non-original window with an in-kind replacement that does not alter the structural opening of the window may not be subject to review and permit requirements. In these instances, public education and outreach to property owners may be the only means for ensuring that careful considerations are given to repair or replacement decisions. In some locales, window replacements may be approved at the staff level.

CON**CLUSION**

Local preservation commissions are likely to be confronted with more and more window replacement proposals as public opinion continues to be influenced by window replacement manufacturers and the economies of building repair and maintenance. With issues of "green," energy efficiency, sustainability, and related tax credits gaining popularity, the case for window preservation becomes a greater challenge. Commissions must understand the issues in advance of addressing them and be prepared to make defensible decisions. Like any proposal at a public hearing or meeting, window replacement must be dealt with on a case-by-case basis, but there is an abundance of information available for commissions to arm themselves with when perfectly good historic wood windows are threatened. If proper steps are taken, through education and consistent review procedures, window restoration could become a more common and accepted trend in local historic districts.
Please contact NAPC with any questions regarding window replacement not covered in this issue of The Alliance Review; we want to hear from you!

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[1] John Myers, "Preservation Brief 9: The Repair of Historic Wooden Windows," Technical Preservation Services, U.S. Department of the Interior (1981) (http://www.nps.gov/history/hps/tps/briefs/brief09.htm)

[2] The focus of this short guide is traditional wood double-hung sash windows. Other window types, such as awning, casement, slider, fixed, etc., may require additional research.

[3] Insulating glass is generally defined as a combination of two or more panes of glass with a sealed air space between them, often filled with an inert gas such as argon. Windows with two panes of insulating glass are often referred to as "double-glazed" windows. An aluminum seal encases the two panes of glass.

[4] Remodeling Magazine's "Cost vs. Value Report" for 2009-2010, http://www.remodeling.hw.net/2009/costvsvalue/division/south-atlantic/city/washington-dc.aspx

[5] "Let the Numbers Convince You: Do the Math." Old House Journal 35/5 (September/October 2007)

[6] Several studies reveal comparable energy savings between a restored single-glazed wood window/storm combination and a double-glazed replacement window, including: Bill Mattinson, et. al., "What Should I Do About My Windows?" Home Energy 19/4 (2002); Noelle Lord, "Embracing Energy Efficiency," Old House Journal (September/October 2007); Andrew Shapiro and Brad James, "Creating Windows of Energy-Saving Opportunity," Home Energy Magazine Online (September/October 1997).

[7] A low-E (low-emissivity) coating is a microscopically thin, metal or metallic oxide layer deposited directly on the surface of the glass, which prevents heat and ultra-violet rays from passing through glass.

[8] Walter Sedovic and Jill H. Gotthelf, "What Replacement Windows Can't Replace: The Real Cost of Removing Historic Windows," APT Bulletin: Journal of Preservation Technology 36:4 (2005): 25-29.

[9] Sedovic and Gotthelf, 27.

[10] Energy audits are one good strategy for finding areas of the house where energy efficiency can be improved; free or low-cost audits are typically provided by utility companies or local non-profits. Contact NAPC for more information on weatherization strategies for older and historic buildings. Information can also be found from the National Park Service (http://www.nps.gov/history/hps/tps/weather/index.html) and the National Trust for Historic Preservation (http://www.preservationnation.org/issues/weatherization/)

[11] "Sustainability" has several definitions. The United Nations defines "sustainable development" as development that "[meets] the needs of the present without compromising the ability of future generations to meet their own needs." (http://www.un.org/documents/ga/res/42/ares42-187.htm) Similarly, the most common web definition that best relates to building materials is "capable of being continued with minimal long-term effect on the environment." (http://dictionary.reference.com/browse/sustainable)

[12] Sedovic and Gotthelf, 27.

[13] As of April 2010, new Federal laws require stricter training and certification for contractors involved with lead abatement projects. See: http://www.epa.gov/lead/pubs/renovation.htm#homeowners

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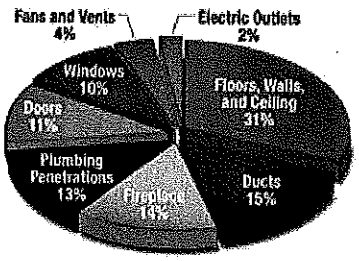
Window Replacement, Energy Efficiency, and Economic Payback: Making Informed Decisions

By Jeremy C. Wells

Ideally, decisions on whether or not to repair or replace existing windows should be based on sound energy efficiency evidence. This assessment needs to consider the relative role that windows play in retaining a building's thermal energy versus other components and systems. The loss of heat from a building is largely through air leaks, yet windows are responsible for only 10% of these leaks compared to other sources in a typical building.[1]



A familiar graphic to preservationists is the U.S. Department of Energy's air leak chart, which shows that windows only account for 10% of heat loss in a house. Image source: http://www.energysavers.gov/tips/air_leaks.cfm

In addition, single-glazed windows in an older building, independent of air leaks, only transmit 10% of a building's heat to the outside.[2] Moreover, the most efficient (and very expensive) triple-glazed windows struggle to achieve the energy efficiency comparable to a single inch of standard fiberglass insulation. (Compare this to the twelve, or more, inches of insulation in a typical attic. You would have to stack twelve triple-glazed windows on top of each other to achieve the equivalent of an R-30 insulation rating.) Or another way to look at the energy saving potential of the very best triple-glazed windows on the market is that they perform about as well as an uninsulated 3-½ inch wood cavity wall.[3]

So what does all this mean? The answer is that approaching windows as a first line of attack in achieving improved energy efficiency in an older building makes little sense from a financial perspective. Studies indicate that it would take from thirty to one hundred years to achieve a payback through improved energy efficiency by replacing single-glazed windows with good quality double-glazed windows.[4]

Realistically, as the sources below indicate, it makes a lot more sense to assure that an attic is well insulated and the number of air leaks in a building are reduced through caulking, insulation, and window and door repairs than to begin addressing energy efficiency through window replacement. Even so, simple treatments such as storm windows, heavy curtains, and interior shutters can bring a traditional single-glazed wood, double-hung window into the same performance specs as a good quality double-glazed, new window.

If a replacement window fails, however, the fix is typically replacement, not repair, due to the way these windows are designed and manufactured in a way that makes repair difficult or impossible. On the other hand, the only non-repairable components in a traditional wood window system are the sash cord, glazing putty, and paint. The replacement of original, repairable windows is therefore tantamount to swapping a sustainable window system with one that is now disposable – a situation that may be good for window

[1]Source: U.S. Department of Energy Office of Energy Efficiency and Renewable Energy
[2]Source: Energy Saving Trust (UK)
[3]Refer to table of R-values at http://www.coloradoenergy.org/procorner/stuff/r-values.htm
[4]See Andrew M. Shapiro and Brad James, "Creating Windows of Energy-Saving Opportunity," Home Energy 14, no. 5 (1997).

manufacturers, but bad for our landfills and limited natural resources. More importantly, the cost savings of window replacement is entirely dependent on the longevity of the new windows and their ability to provide an economic payback based on increased energy efficiency.

For instance, if the new windows fail in less than thirty years, any savings would be wiped out by the need to purchase new windows before there is a total recoup of costs. The lack of repairability, especially with inexpensive vinyl windows (think of how difficult it is to repair most things that are largely made of plastic), coupled with the improbability of spare parts still being available for a modern window thirty or more years into the future (think of how difficult parts for a thirty-year old car are to get) compromise the potential for an economic payback based on increased energy efficiency. While traditional window systems chiefly fail due to rot and glazing putty, paint, and sash cord failure, the more complicated systems of modern windows are subject to an increased number of problems including the seal between glazing failing, the friction track system malfunctioning, plastic parts breaking, and thermal expansion issues that render windows inoperable (especially with vinyl windows). Vinyl components are particularly vulnerable to ultraviolet radiation in high altitude cities such as Denver or Santa Fe. In these environments, vinyl windows can begin to powder and crack on the southern exposure of buildings in as little as four or five years.

So what is the actual longevity of replacement windows? Unfortunately, there does not appear to be any open, non-biased scientific studies on the subject, although window manufacturers have performed their own (proprietary) tests, but even in this latter case, the data may not be readily available to the public. Due to the large variety of window types and quality on the market, there would undoubtedly be a fairly wide variation in longevity. There are some guides, however, that can be used as an approximate rule of thumb. The National Trust for Historic Preservation indicates that the expected lifetime of a replacement window is twenty years,[5] and is a figure often cited in most preservation-oriented window replacement literature. Donovan Rypkema (an acknowledged international expert in preservation economics), in his closing speech at the 2007 Main Streets Conference, indicated that "thirty percent of the windows being replaced each year are less than 10 years old, and many only two years old."[6] Perhaps most telling is that window manufacturers typically have a maximum warranty of twenty years (or exceptionally, thirty years). Based on this information, the cost of repairing existing, traditional windows over the next couple of centuries is likely to be far less than replacing those same windows repeatedly over the same period of time.

Window replacements in historic buildings, therefore, tend to be based more on feelings than facts. But there is some truth to this assessment: single-glazed windows do "feel" colder than multiple-glazed windows. This is largely due to two factors: convection currents and air leakage. The interior surface of a single-glazed window can be many tens of degrees colder than the ambient inside air. This sets up a convection current whereby the air inside the room cools and sinks as it hits the glass, creating a slight breeze.[7] If there are significant air leaks around the window and its components, the draft can dramatically increase the perception of cold near the window. This gives credence to an often-stated claim made by owners of older homes in reference to single-glazed windows: it feels cold to be standing next to them. A simple remediation is to correct air infiltration issues, close a shutter or curtain, or install interior or exterior storm windows. (An even simpler solution to address this largely psychological phenomenon is to arrange interior furniture such that the users of the space are not constantly seated directly next to a window.)

For further information on older windows and energy efficiency, refer to the following list of resources:

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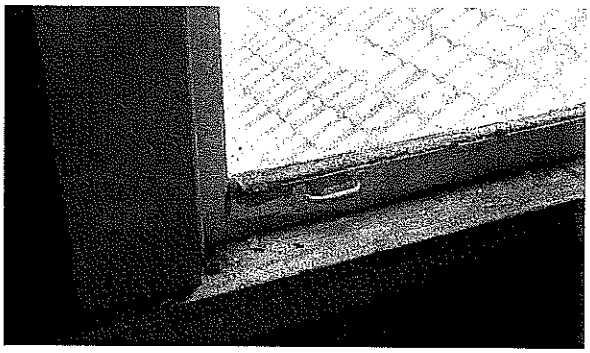
PRESERVATION TAKES PERSEVERANCE: A WINDOWS CASE STUDY

BY ROSEMARY JOHNSON, PLANNER
CITY OF ASTORIA, OR

The Owens Adair Senior Housing facility in Astoria, OR.

In 2010, Owens Adair Senior Housing facility in Astoria approached me about replacing their windows. The four-story building, including the parking lot, encompasses an entire city block and is a highly visible historic building in the Downtown National Register Historic District. It was constructed in 1931 as Saint Mary's Hospital and holds a special place in the hearts of many Astorians who were born there.

It is Art Deco in style with Mediterranean detailing and has over 250 wood, double-hung, one over one windows. The project manager said that the windows were in poor condition, leaked cold air, were hard to maintain because of the height of the building, and were a safety hazard. One senior had just experienced an injury when she tried to open a window and it fell back and broke her arm. Something had to be done. His solution: replace all the windows with vinyl windows! As Planner and Historic Preservation Officer for the City of Astoria, this proposal is always dreaded ... and, we hate to wreak someone's plans.



Window detail before rehabilitation.

There was no hesitation in my "NO!" answer, but clearly, we had to work together to find a solution to the problem. I noted that to repair the windows would not require permits or additional historic public review, but any replacement would require review by the Historic Landmarks Commission and there could be a problem getting approval. I asked him to research some options because vinyl was inappropriate. I also told him that we would need to determine if the windows really needed to be replaced or just repaired. Of course, his reply was that replacement was the only answer due to cost. The housing agency had a limited budget—and had put some money aside to deal with the windows—but could not afford to repair the windows to historic-preservation standards. I met him on site and, as I guessed, the windows needed repair (80 years of poor maintenance had left its mark on them), but they did not need to be replaced. Windows had been painted over time with

lead- based paint. They were loose and leaked air. Many of the sash cords were broken, and the counter-weights laid uselessly in the bottom of the weight pockets. In their current condition, many were a safety hazard to the elderly tenants.

I asked the project manager if he would be willing to meet with someone from the State Historic Preservation Office (SHPO) to see if they had any ideas on what to do with the windows. He agreed. SHPO Restoration Specialist Joy Sears came to Astoria and met us on site. After a wonderful tour of the building, which included the 1930's monster boiler and the interior of some of the apartments, Ms. Sears came to the same conclusion as I had: the windows needed work but were repairable. She offered suggestions about different types of pulley systems that could replace the counter-weights and contractors equipped to do restoration work. The project manager agreed to do some more research into his options with this new information.

After several months, he met with me and a local wood-window maker who said he could replace all of the windows with new wood windows with the same dimensions and appearance, but that repair and restoration of the windows would be more expensive. If the windows had to be replaced, an in-kind replacement with new wood windows would have been the best option, but we were holding to the idea that we wanted to preserve the original material. A couple more months passed, and the project manager said he was soliciting bids to repair and/or replace the windows. I talked with many of the potential contractors about the historic concerns of the City and what options might be available for the client. Some of the contractors talked about constructing temporary enclosures in the apartments around the windows to create a confined working space. This was not appealing to the elderly tenants, who were very protective of their spaces.

Then one day I got a call from the project manager. He had tallied the bids and selected a firm. I held my breath fearing the worse and the rocky path that could lie ahead until he told me, "We've selected Chosen Wood Window Maintenance from Canby OR who says they can repair the existing windows." I was so excited but also a little hesitant to hear what this would cost them because I knew they were on a limited budget. He said the bids ranged from $259,000 to $450,000 to $680,000 . . . drum roll . . . and their bid was the $259,000! He couldn't thank me enough for the savings they would have in this project because they were originally looking at the $680,000 replacement.

Well, it's now the end of 2011, and the job is complete. The contractors removed each window, a few at a time, took them back to their shop, and stripped them to remove the lead-based paint and asbestos glazing compound. They then routed the sash to accommodate double-paned insulated glass. They replaced the lead-weight system with a spring balance customized to each window's weight and size, but kept the weight pockets and lead weights intact. They painted, reinstalled, caulked, and sealed every window while the tenants remained in their apartments. They were able to keep the old storm windows in place to keep out some of the weather while the windows were being repaired and then removed the storm windows as they reinstalled the restored windows. New screens were installed on the lower half of each window allowing the seniors to open the windows and keep out the unwanted insects. The windows were installed so that one pane could be removed allowing both windows to be cleaned inside and out from inside the apartment, thus eliminating the need for a lift truck each year.

All photos courtesy of the author

Window detail after rehabilitation.

The seniors are thrilled with the results and can now easily, and safely, open and close their own windows. They were so pleased with the contractors that they took up a collection and gave the contractor a gift upon completion of the project. The project manager reported that Chosen Wood Windows caused very little disruption to the everyday operations and living conditions of the tenants, followed Department of Environmental Quality (DEQ), and Occupational Safety and Health Administration (OSHA) requirements, and completed the job better than anyone anticipated. While time will only tell how much the new windows will help with energy conservation, the initial reports on the first month's heating bill is a reduction of $1,000 alone in one month. This project has been a win for everyone involved and the City has another champion for our historic preservation efforts. The project manager has thanked the City for our efforts and our perseverance in wanting the job to be done right while understanding their concerns. And, the City thanks the Oregon SHPO for their continued support and assistance in projects such as this. The technical knowledge and moral support we receive from SHPO make our jobs easier and more credible in the eyes of property owners such as this one. It is a great example of how team effort and researching ALL options can lead to cost reductions and better end products. Historic preservation can be the right solution!