APPENDIX A:

Glossary of Architectural Terms

ARCHITRAVE – The lowest member of an entablature.

AWNING –A roof-like covering placed over a door or window to provide shelter from the elements. An awning usually consists of a metal frame covered with fabric.

BELT COURSE - Horizontal band of masonry or trim, extending across the facade of a structure; may be flush or projecting, and flat-surfaced, molded, or richly carved.

BLOCKING IN – The process by which one of a variety of materials is added to a window or door opening to decrease the size of the opening, or close the opening completely.

BRACKET – A general term for an architectural feature, typically treated with scroll or ornament, projecting from a wall, and intended to support a weight, such as a cornice, etc.

CHARACTER DEFINING FEATURE – Any distinguishable architectural element that has prominence in a composition, or that contributes to the ability to identify the style, period, or distinction of a building.

CLAPBOARD – An exterior horizontal wood siding applied so that the thicker edge of each board overlaps the board below.

COLUMN – A vertical architectural element intended to support a load. Classically inspired columns incorporate a base shaft and capital.

CORNER BOARD – A vertical board at the corner of a wood frame structure, against which the siding abuts.

CORNICE – The uppermost division of an entablature; a projecting horizontal at the top of a wall, at the intersection of wall and roof, or at the top of a prominent architectural element such as a window or door.

CORNICE RETURN – A pediment where the bottom molding is not continuous.

CUTOFF – A light fixture that directs the light downward to minimize glare and light trespass. A luminaire light distribution wherein the candlepower per 100 lamp lumens does not numerically exceed 2.5 percent at an angle of 90° above horizontal, and 10 percent at a vertical angle of 80° above horizontal. This applies to any lateral angle around the luminaire.

DOUBLE-HUNG WINDOW - A window having two (usually counterbalanced) sash which slide vertically past one another.

DOWNSPOUT - Vertical portion of a rainwater drainage pipe. Also called leader or conductor.

EAVE – The lower edge of a sloping roof that projects beyond the wall.

ENTABLATURE – The horizontal member carried by columns or pilasters and composed of an architrave frieze and a cornice.

EXTERIOR LIGHT – Any light using an artificial light source, whether mounted on a pole, bollard, sign, post, tree, building, or any other type of structure, intended to illuminate an exterior area of a property, parking area, walkway, water, landscaping, sign, or building face.

FACADE – The front face of a building with architectural distinction.

FASCIA – Any flat, relatively narrow horizontal member applied to the vertical face of the cave.

FEATURE – A single distinguishable part of a greater whole.

FENESTRATION - Arrangement pattern of windows in a facade.

FINISH – The texture, color, smoothness, reflectivity, and other visual properties of a surface.

FLASHING - Protective material, usually sheet metal, used to cover the joint between two parts of a building to prevent water from entering. Also, a general term for similar material used for other purposes, such as ledge covers and water diversions within walls.

FOOTCANDLE – The amount of light from one candle at one foot from the source of light.

FOUNDATION – The masonry substructure of a building that supports the structure, a portion of which is usually visible at grade level.

GABLE – The triangular-shaped end of a building that has a double sloping roof.

GLARE – Any artificial light that shines with a strong, steady, or dazzling light.

GLAZING – The glass surface of a window or door.

GRADE – The top surface of the ground around a building: to bring to a desired height or contour the elevation of the ground about a building or the surface of a road or path.

GRIDS - Prefabricated simulated muntins, usually made out of plastic, that are applied to the interior side, or within the insulation cavity of, modem insulated window sash.

HISTORIC BUILDING - Any building deemed eligible for listing in the State or National Register of Historic Places or any building located within the Village of Pittsford’s Architectural Preservation Design District.

JAMB – The vertical side of any window or door opening.

LUMINAIRE – A complete lighting unit.

MDO PLYWOOD - Medium Density Overlay plywood has faces impregnated with resin. It is intended for exposed exterior uses.

MULLION – The vertical member that divides multiple windows or doors in a single opening, or the panes of a window, or the panels of a door.

MUNTIN – a small, slender framing member that divides panes of glass in a window or door.

PARAPET – An extension of the wall above the roofline typically found on buildings with low-pitched roofs.

PEDIMENT – The gable end of a roof or portico, triangular in shape, and located above the cornice in classically inspired buildings.

PILASTER – A flat, architectural member resembling a column that projects slightly from the surface of a wall.

PORCH – A covered entryway with open sides that is attached to the exterior wall of a building.

PORTE COCHERE – A roof structure over a driveway at the door to a building, protecting from the weather those entering or leaving a vehicle: carriage porch.

PORTICO – An entrance shelter supported by columns and often incorporating classically inspired elements.

PRESERVATION – The stabilization of a building or material to protect it from deterioration. It includes initial stabilization work, as well as ongoing maintenance of the historic building materials.

REHABILITATION - The act or process of making possible a compatible modem use for a property through repair, alterations, and additions, while preserving those portions or features which convey its historical, cultural, or architectural values.

RESTORATION - The act or process of accurately recovering the form and details of a property and its setting as it appeared at a particular period of time by removal of later work and/or reconstruction of missing earlier work.

SASH – The unit that holds the window glass; especially the sliding frames used in double-hung windows.

SASH GRIDS - Prefabricated simulated muntins usually made out of plastic that are applied to the interior side or insulation cavity of modern insulated glazing. Because grids do not interrupt the exterior reflective surface of the glazing, they do not simulate the visual appearance of muntins.

SEASONAL LIGHTING – Any temporary exterior incandescent lighting erected for the purpose of holiday, festival, or other special event celebrations.

SCALE – An important proportioning system used in architectural design to regulate the size and shape of related architectural elements and to ensure their visual compatibility in an overall design.

SHUTTER – One of a pair of hinged doors that cover a window opening.

SILL – The horizontal bottom member of a window frame or other frame; the portion of a structural frame that rests on a foundation.

SIGNIFICANT FEATURE/ELEMENT/DETAIL – A detail, element, or feature essential to the understanding of the value and character of an historic building or property.

SIMULATED DIVIDED LIGHTS - Window sash with moldings applied to the exterior and interior faces and in between modern double-pane insulated glazing to simulate the appearance of traditional muntins.

SOFFIT – The exposed undersurface of any overhead component of a building, such as a balcony, beam, cornice, or eave.

SPANDREL – The wall area between the top of an opening and the bottom of one above it.

STOREFRONT – The street level of a store or business, including windows, entrance, cornice, and signs.

STREETSCAPE – The overall view of a street and its component elements, including the street, sidewalk, buildings, signs, street furniture, lampposts, etc., and also including less tangible factors, such as rhythm, solid-to-void ratio, changes, or consistency in building height, and changes or consistency in building setback.

TRANSOM - Opening over a door or window, often for ventilation, and containing a glazed or solid sash, usually hinged or pivoted.

TRUE DIVIDED LIGHTS - Window sash employing traditional muntins installed between multiple pieces of glass.

TYMPANUM - Triangular, recessed wall of a Classical pediment, between the raking roof cornice above and the horizontal cornice below; by extension, the wall enclosed by pediments of other shapes.

WATERTABLE - Band or belt course at the junction between the foundation and the wall above. This band usually protrudes and is sloped to shed water.

APPENDIX B:

The Secretary of the Interior Standards for Rehabilitation

Introduction

The Secretary of the Interior is responsible for establishing standards for all national preservation programs under Departmental authority and for advising Federal agencies on the preservation of historic properties listed or eligible for listing in the National Register of Historic Places.
The Standards for Rehabilitation, a section of the Secretary's Standards for Historic Preservation Projects, address the most prevalent preservation treatment today: rehabilitation. Rehabilitation is defined as the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values.

The Standards that follow were originally published in 1977 and revised in 1990 as part of Department of the Interior regulations (36 CFR Part 67, Historic Preservation Certifications). They pertain to historic buildings of all materials, construction types, sizes, and occupancy and encompass the exterior and the interior of historic buildings. The Standards also encompass related landscape features and the building's site and environment as well as attached adjacent or related new construction.

The Standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility.

The Secretary of the Interior's Standards for Rehabilitation

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

APPENDIX C:

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APPENDIX D:
Window Repair versus Replacement

Introduction

The recent emphasis on cutting fuel costs and increasing energy efficiency in buildings has increased the threats to wood windows in historic buildings across the Northeast. Replacement window manufacturers advertise new units that claim to be "Energy Star" rated and the answer to the heat loss in "drafty" old buildings. When combined with concern over lead paint issues, the perceived energy costs savings are prompting more applications from property owners who claim that replacing historic windows is the only way to comply with modern energy conservation codes. As a result, preservation commissions are often placed in a difficult position.

Without having practical arguments for retention or restoration of these important character-defining elements and fearful of appearing capricious, commissions can feel pressured to rule to allow the removal of historic fabric. Fortunately, there is a strong case for preserving wood windows aside from the aesthetic argument -- window restoration has proven favorable over window replacement, in terms of architectural integrity and aesthetics, energy efficiency, sustainability, durability, and long-term, material life span economics, despite the information conveyed by replacement window manufacturers.

Given the right tools, commissions across the state can do their part to preserve the character and craftsmanship of architecturally significant districts and educate the public about genuinely green approaches to energy efficiency.

Architectural Integrity

Preservationists have long used the "aesthetic and integrity" argument when addressing the question of the appropriateness of replacing original windows. It can be very jarring to see an otherwise perfectly restored Greek Revival building with new, white vinyl windows with "snap-in" muntins or no muntins at all, where once existed elegant and finely proportioned six-over-six wood sash with mortise and tenon joinery. In this case, the glass-to-frame ratio has been altered, the faceted nature of the individual panes has been replaced with a single, reflective surface, and the proportions of the framing and joinery indicative of period building technology have been erased.
The valuable role that windows play in the architectural character of a building should not be underestimated. Windows are one of the few parts of a building that are integral to both the interior and exterior, and serve both a functional and decorative role. What other architectural feature has this much "responsibility"?

Structures built prior to 1930 incorporated architectural elements, including windows that celebrated a particular style and craft in a variety of wood species, shapes, cuts, and finishes. The insertion of a plastic or aluminum window into a building 80 years or older, therefore, can look out of place and can negatively impact the architectural integrity of the building. Windows offer some of the most reliable clues to understanding the history and evolution of a building and, by extension, a street block or whole community.

Energy Efficiency

The most common reason people replace old windows is the "promise" of improved energy efficiency. How could a preservation commission deny an owner this opportunity? Unfortunately for the property owner, the "facts" about energy savings from replacement window companies are sometimes skewed, misinformed, or outright false. Window manufacturers universally boast about their windows' low U-values (the measure of the rate of heat loss through a material). The quoted U-values are misleading because they are usually given not for the entire window unit, but only for the value through the center of the glass (the location of the greatest heat loss). Not mentioned is the dramatic heat loss of their own windows, because where an imperfectly squared historic window opening does not allow a new replacement unit to be installed tight within the wall, U-values will be significantly higher (less efficient), owing to infiltration around and between the unit frame and the original window opening. What is most critical when evaluating the energy loss at a window or door opening in any building is the infiltration of outside air, rather than the insulating factor or heat lost through the glass. Air infiltration can account for as much as 50% of the total heat loss of a building.

The replacement window industry insists that windows are the principal source of heat loss in a building, and frequently mislead the general public in claiming that installing energy-efficient or "Energy Star" windows is more important, and will generate the greatest energy cost savings, than insulating the attic, foundation, or walls. Rarely is the energy loss tested before and after windows are replaced, so that property owners can see the extent of change or benefit in efficiency. In fact, actual energy conservation research and test data indicate that on average, only 20%- 25% of heat loss occurs through doors and windows, while the remaining 75-80% is lost through the roof, floors, walls and chimneys. Studies have shown that a double-glazed window may save $3.00 a year per window in energy cost (this is $30 per year for ten windows at 10 cent per KWH). When weighed against the cost of replacement windows and installation costs in this scenario, recovering the investment through energy savings can take 50-70 years. Since it is extremely rare to find a replacement window that is made to last 50-70 years, recouping that savings is nearly impossible in an owner's lifetime.

Unfortunately, there is a major lack of tangible energy conservation information for existing products, such as existing historic wood window assemblies or those that have been restored or upgraded. Today, consumers can find national ratings for U-factors of building materials and products containing Energy Star labels, but it is important to note that these types of ratings have not been performed for older windows or upgrade products. Therefore, consumers have very little,

if any, real data to help make comparisons for energy loss or savings between retaining existing windows and replacing them.
Historically, the best solution for better energy efficiency has been in stopping air infiltration by the installation of effective weather stripping. Weather stripping has been used on windows and doors for more than 80 years and is still the easiest and most economical way to keep old wood windows energy efficient and draft-proof. Storm windows are another traditional method for decreasing energy loss. Whether interior or exterior, storm windows create an insulating air space between the primary window and the storm. Storm windows can dramatically improve the U-values of old windows by reducing the heat lost through the surface of the glass.

Another idea to consider is retrofitting historic wood windows by substituting low-e glazing into existing single-pane storm windows. When used in combination with a storm sash, single-pane low-e glass can provide a level of combined energy savings equal to a standard new double-glazed unit. Using low-e coatings and reducing air infiltration is a very simple and cost-effective way to achieve the desired U-value of an entire window unit and avoids modifying visible glass/light, mullions, or sash weights. Therefore, the energy efficiency of restored windows incorporating upgraded components, such as weather stripping and tight-fitting storm windows with low-e coatings, can meet and even exceed the efficiency of replacement units.

Sustainability

Today, the architecture profession is more focused on “green” sustainable design. For many, the road to “green” is by using technology and materials that place the least amount of burden or waste on the environment and reduce one’s “carbon footprint.” However, since at least 1966 (the year the National Historic Preservation Act was passed), preservationists have been practicing “green design.” Long before the trendy term was coined, historic preservation promoted the philosophy of reduce, reuse, and recycle. By repairing rather than replacing elements, historic preservation conserves existing materials and the associated “embodied energy” used to create the original structure and architectural features. A preservation-minded project can use more materials produced locally or regionally. Common replacement practice requires the installation of mass-produced materials, usually transported over long distances. The “retain and repair first” approach can also reduce the need for landfills. Thousands of old wood windows are removed and sent to landfills each year, owing to misconceptions of the value of replacement windows. The wood sash that are most often removed are 75-100 years old with normal signs of deterioration. Constructed of old-growth hardwoods, many can be repaired and upgraded to meet modern requirements and give many more years of service.

Compare these windows to modern windows, which their manufacturers typically warranty for an average of 12-15 years. Now that may not mean that they will only last that long, but it is interesting that they do not warranty their products for anywhere near the lifespan of the older windows found in historic buildings. Key in this is that many replacement windows are constructed of lower-quality materials in a way that makes it impossible to simply repair individual elements, leading to the need to purchase entire new window units if the replacement unit fails or breaks. Given their limited lifespan and the lack of potential for repair, even with limited energy savings, the evidence seems to contradict the claim that replacement windows satisfy the “green” or “sustainable” criteria over the long term. Instead, choosing to repair existing original materials recycles them in place, avoids needlessly filling our landfills with repairable building elements, and results in an effective approach to sustainability that also supports the local economy. Preservation holds the principles of sustainable design at the very center of its philosophy and practice.

Durability

As mentioned above, wood windows that are 75-100 years old are most often removed and discarded when they begin to exhibit normal signs of age such as broken sash cords, paint failure or build up, broken panes of glass, deteriorated glazing putty, loose joinery or minor deterioration of wood members. While each of these ailments can negatively impact a window’s operation, appearance, safety, and energy efficiency, the fact that the window is nearly a century old is actually a strong testament to the quality of its materials and craftsmanship. The windows of the nineteenth and early twentieth century were designed and constructed to endure many decades and even centuries with a certain level of care and maintenance. In contrast, since the late 1940s, the business of fabricating windows has evolved from being craft-oriented to focusing on providing in-stock, pre-fabricated, low-priced products. At the same time, the labor force that once offered maintenance and repair services are now geared toward installing whole-window products. The imbalance often tips the scale toward the replacement option.

Windows pre-dating the 1940s are typically constructed of dense, old-growth woods, which grew naturally over the decades, whereas, the majority of new wood replacement windows are constructed of light, porous, fast-grown (i.e., farmed), soft woods that are most often the pine species. Because they are porous, they are more susceptible to moisture migration and often do not hold paint well. The manufacturer’s solution to this problem is to offer an exterior cladding material characterized as “maintenance-free.” Unfortunately, the cladding materials can trap any migrating moisture inside the wood, and in moist environments can lead to substantial rot beneath the cladding--this is the primary reason for limited and short warranty terms.

Many people consider the introduction of the insulated glazing unit (IGU) or thermal pane to be a major advancement in the window industry. Most replacement windows offer a thermal or insulated glass unit, wherein a vacuumed space is created by double-paned glass filled with argon gas and sealed with gaskets to maintain the vacuum and keep moisture out. Most insulated glass units also have a small amount of desiccant inside the glass space intended to absorb moisture for a limited time. However, as with most synthetic materials, the gaskets that seal these assemblies have a limited life and will deteriorate, allowing the argon gas to escape and air vapor to enter. Studies have found that most sealed gasket systems deteriorate within 25 years, which is why few replacement windows have warranty terms of more than 20 years, and why it is not uncommon to find 15-20 year old double-paned windows with a fogged air space.

Old wood windows, on the other hand, are glazed with a system of glass, glazing clips, and glazing putty. Glass is actually a fluid and, like the wood which holds it in place, will expand and contract according to climate conditions. Historically, glazing putty was linseed oil-based, and cured slowly over the years. The slow-curing glazing putty was intended to have some level of flexibility and was an excellent counterpart to the glass. Quality glazing putty has a lifespan of more than 50 years; however, after 50 years, it may begin to crack, become brittle and separate from the glass or it may become extremely hard with very little flexibility. As with most components of a wood window, glazing putty is intended to be renewable; replacement with new putty required little expense, effort, and impact to the original window. If a pane of glass in an old window breaks, it, too, is designed to be easily and inexpensively replaced. If a pane of glass in a replacement window breaks, a whole new window sash is necessary, requiring the costly services of a contractor.

Typical replacement windows involve a spring balance mechanism, which relies on friction and the strength of the user to operate them. In contrast, most windows constructed before 1930 use a weight and pulley system with either cotton sash cords or chains. The pulley system is based on equilibrium, with cords or chains balanced on either side with a counterweight in the pocket matching the weight of the sash. If weighted correctly, even a large window requires very minimal strength to lift or lower. Replacement windows typically experience failure when a spring balance wears out. A counterweighted window fails when the sash cord or chain breaks or the pulley jams. Spring balances cannot be fixed, and must be entirely replaced, whereas, broken sash cords can be fixed for the cost of the cotton sash cord and, usually, less than a half hour of labor time for most do-it-yourselfers or a handyman. Once a historic wood window is repaired or fully restored, it will not need major work for many years, aside from typical maintenance, such as an occasional cleaning of the glass, a quick spray of lubricant in the pulleys to keep them turning smoothly, and a touch up to keep the painted surfaces intact.

Economics

The discussion of durability naturally leads to the topic of how economics or cost plays a large role in planning any window project. Typically, projects are evaluated for their upfront and immediate costs. However, when an historic building is involved, it is important to consider long term impacts and a look at comparative life-cycle costs.

The cost of a typical replacement window can range from $200-$1500 per window, depending on the size and material (vinyl, aluminum or wood frame), and always involves the removal of the existing wood sash and the installation of a new sash unit into the existing wood frame. The old weight and pulley system is discarded or abandoned in place (behind the new unit frame), and replaced with an operation system that relies on friction and the user’s strength. It is not uncommon for any rotted wood to be simply covered over with new vinyl or aluminum cladding, rather than repaired, since this would be an additional cost. In general, the installation crew prefers to be in and out in the shortest amount of time. Most of the cost of replacement windows is the price of the new product itself, and not the minimal labor for installation. It can naturally be assumed that the lower the product cost, the lower the quality of the replacement unit, because the labor is typically the same. In comparing replacement costs to repair and/or restoration of an existing old wood window, it is important to understand that there is no straightforward formula for the repair approach, because the conditions and the extent of deterioration will vary from window to window.

If there is only minor deterioration or a malfunction that requires select repairs, such as strengthening loose joinery, minor re-glazing, replacing broken glass or sash cords, the cost can range from $50-$500 per window (based on 1-10 hours of labor). If the window requires complete restoration, the cost can range from $500-$1000 per window for residential double-hung windows, or $1000-$5000 per window for large institutional windows or complex and highly decorative windows. The difference here is that the repair and restoration costs include direct labor at standard craftsman rates, in addition to materials, overhead, and profits. Rehabilitation or restoration and repair costs are for skilled craftsman labor, rather than for the actual product since all of the materials involved are relatively inexpensive. Every dollar that is spent on a repair or restoration job is invested in the local economy, compared to dollars paid to a manufacturer of the replacement window products, which is not necessarily a local business.

The above example relates to the initial outlay of funds, however, this is not the only aspect of cost that is important to consider in the planning of a project. Life-cycle costs are equally, if not more, important, especially if one is concerned about sustainability and being environmentally responsible. Life-cycle cost comparisons usually come out in favor of preservation, even when values such as the architectural character of the original window and the inherent quality of material and craftsmanship are not accounted for. Moreover, maintenance versus replacement costs further support preservation when fit into the equation. When figuring life-cycle costs, the lifespan of older wood windows is an important consideration. Typically, these windows have proven to have endured between five decades and more than a century. The lifespan of vinyl, aluminum, or modern clad/wood replacement windows, on the other hand, is, in some cases, still unknown, but given manufacturer's warranties does not seem to be in the same time frame. With replacement windows, it is generally the lifting and lowering mechanisms that wear out in about 15-20 years, followed shortly thereafter with the deterioration of the insulated glass unit and the cladding material. All or one of these failures can require replacement of the "replacement" unit.

Another aspect in which the economic argument often favors the restoration approach is with respect to the whole building view. Often, when a property owner embarks on a window replacement project, it is because a handful of original windows require some level of repair. It is rare that all windows will need full restoration or extensive repairs. It is typically the elevation most exposed to weather that has the most window deterioration; other, more sheltered elevations can be surprising in how well they have preserved original building materials such as windows.

The first step for any property owner should be an assessment evaluating the condition of each window and prioritizing the order in which repairs are undertaken. Certainly, such an approach will result in a more lengthy process of overall window repair, compared to wholesale replacement; however, it is a more economical approach. For example, let's say there are 20 windows in a particular house, five per elevation. If the south elevation is exhibiting the most deterioration likely due to the exposure, it is rare that a replacement window contractor would replace only those windows in disrepair, but rather, would make a case for replacing all the building's windows, so they all look alike. If each window costs $500, that is a $10,000 project, whereas if only the deteriorated windows were restored, at $500 each, or even at $1,000 each, the restoration approach would cost a quarter to a half that of the full replacement, and would last 3-5 times longer.

Lastly, if the reason driving the need for replacement windows is to eliminate lead paint hazards, it should be acknowledged that whether the windows are replaced or restored, the most hazardous work involves the removal of the old wood sash. Therefore, removal for replacement is no safer than removal for restoration. The difference in approach occurs after the sash is removed. In the replacement approach, the old sash is disposed of in a landfill, and the original painted frames and jambs are covered over with vinyl or aluminum. The lead paint remains in place underneath. In the restoration approach, the old sash are fully stripped of the paint and glazing and then re-primed, re-glazed and repainted to meet modern standards. On the window frame itself, the areas most affected by friction are the jambs. These are usually tested for the presence of lead and either stripped and repainted or repainted encasing any traces of lead-based paint. In the latter approach, the lead paint on the windows has been abated in the approved method, making the area safe from that point on.

Guiding the Desired Outcome

Perhaps the most difficult part of a commission's work will be education about this issue. Overall, there needs to be a shift on the general public's appreciation for durable, sustainable materials and quality craftsmanship. Such an outlook does not need to be a thing of the past, but rather it can be the direction in which we move in the future. Preservation of old wood windows can be a difficult case to make when most owners of historic property are continuously barraged by relentless marketing campaigns and higher energy bills. Armed with basic window facts and with a little counter marketing, local preservation commissions can help property owners weigh their options more thoroughly and make the right decision for the integrity of their historic home, for the environment, and for their wallet.

Project Review Guide

These questions can help commission and board members lead property owners to the right window project.

ARCHITECTURAL INTEGRITY & AESTHETICS

What role do your windows play in the architectural significance of your historic building?

How do the replacement windows match the original construction method and appearance? (i.e. mortised & tenon joinery), wood species, quality and cut, wood member proportions (stiles, rails, muntins), overall dimensions and profiles and, most importantly, the frame to glass ratio?

ENERGY EFFICIENCY

What are the U-values for the entire window unit, not just the value through the center of the glass? In addition to the window manufacturer's stated U-values for the window units, what is the air infiltration rating, if any?

Has the extent of air infiltration been tested for the existing windows (use of a blower door test)?

Has energy loss been investigated and corrected at the roof, chimneys, foundations, and walls first?

Do existing windows have appropriately installed or repaired caulking, weather stripping and/or storm windows?

What is the projected annual energy cost savings for the new windows?

How many years of this savings will it take to recover the cost of the replacement windows and installation?

SUSTAINABILITY

What are the property owner's plans for the removed original sash? (Rather than being sent to a landfill, should they remain in the attic or basement so they can be reinstalled in the future if desired?)

Have the property owners explored the option of repair by a local craftsman?

How long does the property owner expect these new windows to last? What is the warranty term? (many do not read the fine print.)

DURABILITY:

What is the overall extent of deterioration or need for the replacement? Do all windows need repair or only some windows?

ECONOMICS:

Encourage property owners to solicit repair/restoration quotes with estimated years of service (based on age of original windows)

Encourage property owners to calculate the life-cycle cost comparisons of restoration of those windows that need attention only versus the cost of replacing all windows.

When Is Window Replacement Okay?

There may actually be a time when the case for the replacement of existing windows can be made. Buildings that have been abandoned for many years can suffer severe deterioration of materials, including window units. Windows can be heavily damaged by impact from trees, or partly damaged in a time-honored way, by baseballs or rocks. Also, not all older windows are created equal, so some materials can honestly have a shorter life span than others from the same time period. Additionally, in some buildings, particularly in tightly-spaced, urban lots, windows on side or rear elevations may not significantly add to the architectural character of a building, or may originally have been inexpensive units (also, many local laws do not allow the commission to review work not in the public right of way, making these units outside the purview of a commission). Also, on rear and side elevations in urban lots, a major rehabilitation may trigger modern codes that prevent the use of combustible (wooden) window materials at lot lines. In these cases, it is important to ask the following questions:

Are a majority of the window units truly at the end of their life?

Does the building still have integrity of window design? (Do a majority of character-defining windows remain in place and repairable?

Were the windows being proposed for replacement originally good quality units that can actually be repaired?

What significance do the window units have to the building's overall architectural style or history? (They need not be "fancy" or stained glass units to do this – more simple divided light sash can be important as well)

What modern constraints are being placed on the project?

Asking these questions, you then move forward carefully, as you may be impacting a building's appearance and performance for decades to come. If replacement is determined to be the appropriate approach, then the materials and appearance of the new units will be crucial to the success of the project. Overall, it is important to understand that the choice of material can dictate the appearance as well.

Vinyl windows, for the most part, should never be considered for replacement units at designated structures. Their construction in no way meets the appearance of historic windows. Typically, vinyl units have rails and stiles the same width, whereas most historic windows have wider bottom rails (the horizontal member at the bottom of the sash), and narrower stiles (the members at the sides of the window). These proportions are important to the character of a window, and should be kept. Also, vinyl is a material that can flex during movement, potentially breaking seals that are supposed to make them energy efficient, and have been known to sag or rack, also lessening their effectiveness.

When codes dictate that wooden windows cannot be used, one approach has been to use metal windows matching the original in as many details as possible in regard to proportion and configuration. However, this is an approach to be used only in these inflexible situations, and in non-character defining locations.

When windows are truly deteriorated beyond repair, new windows should be approved that match the historic units in proportion, configuration (number of panes in each sash), operation (double hung or casement), and other character-defining details. The highest and best replacement would be a new, true divided light, painted wooden unit. However, as can be inferred from the previous article, newer wooden units may not be a good option given the potentially short life of modern plantation grown wood. While there are some units on the market that use sustainably grown mahogany or Spanish cedar as their materials, their costs can sometimes be out of reach for homeowners if they choose to replace all windows. It may be appropriate to encourage phasing of the high quality wood replacements or as an alternative; approve aluminum-clad wooden replacement windows that fill the window opening without the use of fillers or spacers; that the new window be placed in the same plane as the original window (neither deeper or shallower in relation to the wall); and that it match the original in operation and division of panes.

It is in the detail of window panes that a replacement window project can utterly fail. Historic multi-pane windows typically have true divided lights, meaning that each pane is a separate piece of glass separated by a muntin (the muntin is the bar of wood or other material that creates the space for the panes and which the putty, or "glazing" compound, is placed against). Many modern windows use a single sheet of glass, and for muntins, use a variety of tricks. The cheapest and least appropriate muntin is a "snap-in" one, literally "snapped" into place from the interior of the window. This type of muntin does nothing to break up the reflection of the single sheet of glass from the exterior, provides no relief on the exterior of the building, and has been known to fall out, be taken out, or be broken, thus resulting in an inappropriate 1/1 appearance. Another approach is the use of a fake muntin sandwiched between the double panes of an insulating glass unit. As with the "snap-in" muntin, this type does nothing to break up the reflection of the single sheet of glass from the exterior, provides no relief on the exterior of the building, and when seen from certain angles, completely disappears. Other muntins are applied only on the exterior. This type of window attempts to have the appropriate exterior relief desired in a replacement project, but does not go far enough in providing the full character that a historic true divided light window had in the same opening.

In the case of an appropriate replacement window, the highest and best window is one that has true divided lights, with each pane being a separate piece of glass. However, given that new units will likely have insulating glass, an acceptable treatment can be achieved by using a replacement window that has exterior and interior muntins, and interior "spacers" between the glasses, in line with the muntins. Manufacturers are beginning to make these units with spacers matching the color of the sash and muntins, providing for a look that is not an exact match, but is closer to the appearance of the original window.

APPENDIX D – Window Repair versus Replacement

There are countless replacement window manufacturers claiming to have products appropriate for use in historic buildings. In addition to the highest and best options listed above, a replacement window inserted into an historic building should offer a warranty or performance and durability guarantee of at least 25 years. This will insure that the commission will not be faced with a repeat request in a matter of years, and will help the property owner weed out the lower-quality products.

It is best not to wait until a window replacement project is before you to do your homework. It is advisable to take the following steps BEFORE you have to learn on the job.

Maintain a list of experienced contractors who can do window repair.

Maintain a list of historic house part "salvager businesses" that can accept donations of historic windows, or open your own!

Work with municipal officials, staff, and or local banks to develop grant programs for window repair and restoration and/or replacement in kind.

Knowing when it is time to allow an appropriate replacement window is an important part of being on a commission. It can also show a homeowner that you do understand the realities of existing and new materials, and can help you serve as a resource to help a property owner do the right thing to maintain the integrity, architectural worth, and economic value of their building.

For further information

National Park Service The Repair of Historic Wooden Windows, National Park Service Preservation Brief #9 at www.cr.nps.gov/buildings.htm.

Secretary of Interior's Standards for Rehabilitation. www.cr.nps.gov/local-law/arch_stnds_0.htm

National Trust for Historic Preservation www.preservationnation.org/issues/sustainability/ "Window Know-How: A Guide to Going Green" at www.preservationnation.org/magazine/2009/march-april/ma09window.html "Historic Wood Windows Tip Sheet" www.preservationnation.org/issues/sustainability/additional-resources/July2008WindowsTipSheet.pdf

Repairing Old and Historic Windows, New York Landmarks Conservancy, 1992; www.nylandmarks.org

"Restoring Window Sashes," Fine Homebuilding, David Gibney, Feb/March 2004, pp. 84-89.

"Top Myths About Replacement Windows," James Crouch, Preservation in Print, December/January 2009, Pg 10. www.prcno.org

"What Replacement Windows Can't Replace: The Real Cost of Removing Historic Windows," Walter Sedovic & Jill Gotthelf, Association for Preservation Technology (APT) Bulletin, 36:4, 2005, or see www.apti.org/publications/Past-Bulletin-Articles/Sedovic-36-4.pdf

APPENDIX D – Window Repair versus Replacement

See these websites:

www.historichomeworks.com

Old House Journal website: www.oldhousejournal.com/index.shtml

www.oldhousejournal.com/strips_and_storms_windows/magazine/1099
www.oldhousejournal.com/Sash_Window_Clinic/magazine/1078
www.oldhousejournal.com/embracing_energy/magazine/1453

Rehab Rochester section of the Landmark Society of Western New York's website:
www.landmarksociety.org
www.windowrepair.com