AN ANALYSIS OF WOOD WINDOW RESTORATION AT THE

PRESIDENT LINCOLN AND SOLDIERS' HOME NATIONAL MONUMENT

WASHINGTON D.C.

by

PAIGE MICHELLE WOJCIK

(Under the Direction of Mark Reinberger)

ABSTRACT

The President Lincoln and Soldiers' Home National Monument, located in Washington D.C., is currently being restored to serve as a future house museum operated by the National Trust for Historic Preservation. Detailed restoration of all windows and doors on the exterior of the home has been progressing over the course of the past year. This thesis is an analysis of window restoration technique and planning methodology employed at the site, how these compare to a variety of conventional methods, and their potential value at other historic sites. The process chosen for window restoration will be critiqued on the basis of personal experience, feedback from the Project Director and restoration team, and analysis of the final restored product. In addition to the academic pursuits of this thesis, I also hope to advocate and educate about this almost unknown presidential site and national monument in the nation's capital.

INDEX WORDS: Historic Window Restoration, The President Lincoln and Soldiers' Home National Monument, National Trust for Historic Preservation, Armed Forces Retirement Home, Historic Structures, Historic Preservation

AN ANALYSIS OF WOOD WINDOW RESTORATION AT THE PRESIDENT LINCOLN AND SOLDIERS' HOME NATIONAL MONUMENT WASHINGTON D.C.

by

PAIGE MICHELLE WOJCIK

Bachelor of Family and Consumer Sciences, University of Georgia, 2001

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF HISTORIC PRESERVATION

ATHENS, GEORGIA

2005

AN ANALYSIS OF WOOD WINDOW RESTORATION AT THE PRESIDENT LINCOLN AND SOLDIERS' HOME NATIONAL MONUMENT WASHINGTON D.C.

by

PAIGE MICHELLE WOJCIK

Major Professor: Mark Reinberger

Committee: Wayde Brown
Evelyn Reece
Henry Parker

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
May 2005

DEDICATION

I would like to dedicate this thesis to my parents, who have always gently nudged me along with their support and encouragement, while allowing me to grow into a freethinking, independent woman. You have done everything in your power and means to make my life spectacular. I love you.

ACKNOWLEDGEMENTS

I would like to thank David Overholt at the National Trust for Historic Preservation for encouraging me to wrap this up, for providing numerous resources and supplies, and for being a positive mentor. Thanks also go out to Stephen Ortado and the crew of Historic Structures, for teaching me the nuts and bolts of restoration and keeping me entertained while stripping paint for months at a time. Thank you to Mark Reinberger for helping me along with this thesis and for sparking my interest in restoration. Thank you Wayde Brown and Henry Parker for serving on my reading committee. Evelyn, I hope for you to always be my mentor whether I'm here, there, or anywhere. You have taught me a great deal. And of course, I have our Director John Waters to thank for opening my eyes to the world of preservation.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

FORWARD

The President Lincoln and Soldiers' Home National Monument is an Early Gothic Revival structure built in 1842 by prominent Washington D.C. banker George W. Riggs as a private residence. The building, which sits three miles north of the United States Capitol, later became the summer home of Abraham Lincoln and his family during his tenure as President. In 2000, President William Clinton officially designated the site as a National Monument to afford the home protection under federal law. A partnership has been formed between the National Trust for Historic Preservation and the Armed Forces Retirement Home (present owners) to restore this important yet almost unknown presidential site. The President Lincoln and Soldiers' Home National Monument will be restored as a house museum and interpreted as the premier center for learning about Lincoln as President, family man, and author of the Emancipation Proclamation.

For the past year I have worked at the President Lincoln and Soldiers' Home National Monument as the project archivist and as an employee of Historic Structures, a private restoration contracting firm whose chief goal is to restore all original windows and doors in the building. I am no longer an employee of Historic Structures, but have maintained close contact with the company and project supervisors.

Figure 1.0 "Soldiers' Home Washington, D.C." Color lithograph published by Charles Magnus, ca. 1868. Library of Congress, LC-USZ62-16818.
The Lincoln Cottage is in the center of the print. The Military Asylum is on the right.

CHAPTER 1

Introduction

Purpose of the Study

The purpose of this thesis is to study wood window restoration in historic buildings, with an analysis of the planning and technical process used at the President Lincoln and Soldiers' Home National Monument to return 59 windows to a historically accurate, operable, and energy efficient condition. Windows are a key architectural element in all buildings because they serve a dual role as utilitarian and aesthetic components of the structures we inhabit. The windows in historic buildings often pose problems such as deteriorating conditions and poor energy efficiency, which must be planned for and dealt with in a sensitive manner.

This thesis aims to investigate conventional planning and restoration techniques in regard to historic wood windows and how this compares to methods employed at the President Lincoln and Soldiers' Home National Monument. Several unique aspects of this restoration process and the window design will be highlighted, as well as the extensive planning that was imperative for museum quality restoration of this National Monument and home of a great American leader.

Methodology

The history and development of wood windows will provide a background for current issues regarding window restoration, how to sensitively plan for a restoration project, and what methods and technology are available to accomplish this. An introduction to the history of The Lincoln Cottage (as it is often referred) and an overview of its present situation will be followed

by a detailed analysis of window conditions before restoration, the planning process undertaken to ensure a museum quality final product, and the methods of window restoration employed to accomplish this. The window stock as a whole will be analyzed, rather than each individual unit, unless unique circumstances warrant further investigation into a particular window or window type.

Restoration techniques used at this site will be compared to other conventional methods found in archival research such as trade journals, National Park Service Preservation Briefs, and site-specific restoration documentation. The process followed for window restoration at The Lincoln Cottage will be critiqued on the basis of personal experience, feedback from the Project Director, and analysis of the final restored product. The information gathered will then be used to recommend if this process should or should not be approached on other window restoration projects, depending on the scale and relative importance of the site.

Merit

Issues regarding historic windows increasingly confront historic preservation commissions, contractors, and owners. There is a great need to dispel the myth that total replacement of these windows is more cost effective and energy efficient than preserving existing windows, as they are often key to maintaining the historical integrity of a building. This thesis aims to alleviate confusion by explaining historically sensitive restoration techniques that will return existing windows to a sound, operable, energy-efficient condition without the loss of historic fabric.

The second purpose of this thesis is to fulfill the need for official documentation of window restoration at the President Lincoln and Soldiers' Home National Monument. No

studies of this kind have been undertaken, as exterior restoration is still in progress with a completion date scheduled for the near future. The next phase of restoration, focusing on interiors and site interpretation, will be completed by 2007. Discussion of an experimental technology employed to strip sash paint and remove glazing, and aesthetic reasons for using a unique glazing compound formula, will add to the body of technical knowledge.

In addition to the academic pursuits of this thesis, I believe it has merit in advocating and educating about this almost unknown presidential site and national monument in the nation's capitol. This is presently a leading project undertaken by the National Trust for Historic Preservation, is part of the Save America's Treasures initiative, and has been featured on Home and Garden Television and the History Channel. The President Lincoln and Soldiers' Home National Monument is increasingly receiving more publicity, but unfortunately still lacks national recognition by the general public, preservationists, military veterans, and numerous tourists that visit Washington D.C. each year.

Figure 1.1 Paige Wojcik and Reggie Robinson, Photo by Laura Mancuso

CHAPTER 2

Wood Window Restoration: The Importance of Preserving this Key Architectural Element

Wood Window Development

Windows are widely regarded as one of the most important architectural elements of a building. Stemming from the basic needs of light, ventilation, and a connection with the outside world, windows are one of the defining elements of a building and therefore, a key item to preserve. Their size, shape, and construction can provide valuable insight into the dating and style of a structure. The development of modern window systems has strayed far from the traditional wood window found in many historic houses and will undoubtedly continue as innovative materials arrive on the market. Their availability causes a deep rift in philosophies among preservationists, property owners, and professionals in the window industry. Differing methods of treatment and conflicting philosophies must be dealt with sensitively to ensure that a minimum amount of historic fabric is lost from our buildings when window restoration projects commence. Numerous types of windows exist in today's market, ranging from traditional wooden casement and double-hung sash to modern variations of these, constructed of steel, aluminum, and polyvinyl chloride (plastic). This thesis will focus on the restoration techniques employed to return historic wood casement and double-hung sash windows to useful operation.

Windows began as simple framed openings in the wall of a building with no glass to bar the elements and intruders from entering. The opening could be covered with an oiled cloth or interior timber shutters, but this prevented the desirable attributes of light and ventilation. Glass windowpanes became generally available in England in the sixteenth century. Glass allowed

light to enter a building, although at first the windows remained inoperable.[1] The diamond-shaped panes called quarries were very small and were set in slotted lead strips known as cames.[2] In the seventeenth century glass came into general use and casement windows with hinges were developed, which kept the design of leaded lights but allowed opening and closing for ventilation (see *Figure 2.1*).

In the United States window design and materials followed trends in England. Glass was first imported in 1620 and continued to be so throughout the nineteenth century; early attempts to produce glass in Jamestown, VA in 1608 and 1621 were unsuccessful.[3] Square and rectangular panes were probably first used in Jamestown at the end of the seventeenth century; they were especially important with the advent of the Georgian style in the early 1700's, when windows converted from casement to sash.[4]

Sash windows were first developed in Britain circa 1670 and were a welcome improvement over the casement window. Lead cames of casement windows were weak and only allowed for small panes of glass, which limited the amount of light entering a room. The earliest sash windows only had one operating section, which slid vertically past the fixed section and was held in position by a series of pegs and notches or a stick.[5] The subsequent design introduced weights and pulleys so that both sash were operable (see *Figure 2.2*).

Early sash had wider glazing bars of 2" or more with smaller panes of glass. As glass improved in quality and cost decreased, larger panes were possible. Glazing bars became thinner

[1]Andrew Townsend and Martyn Clarke, "The Repair of Wood Windows," *Society for the Protection of Ancient Buildings Technical Pamphlet: 13*, 5.
[2] Kenneth M. Wilson, *Window Glass in America, 153.*
[3] Wilson*,* 153.
[4] Wilson, 156.
[5] Townsend and Clarke, 5.

and the number of lights per window decreased until it was fashionable to have only 2 or 4 lights by the late nineteenth century.[6]

Casement windows were frequently removed and replaced with double-hung sash, although they were often kept in secondary buildings and rear elevations. Double-hung sash complimented the classical architecture of the time, preserving the symmetry and proportions of these styles.[7] Casement windows returned with modern improvements, as anachronistic architectural styles such as the Queen Anne Revival were introduced in the late-nineteenth and early-twentieth centuries. Numerous alternate designs of wood windows exist, from fixed pane to transom to awning windows, but this thesis will focus on casement and double-hung sash because these are the predominant types found at the President Lincoln and Soldiers' Home National Monument.

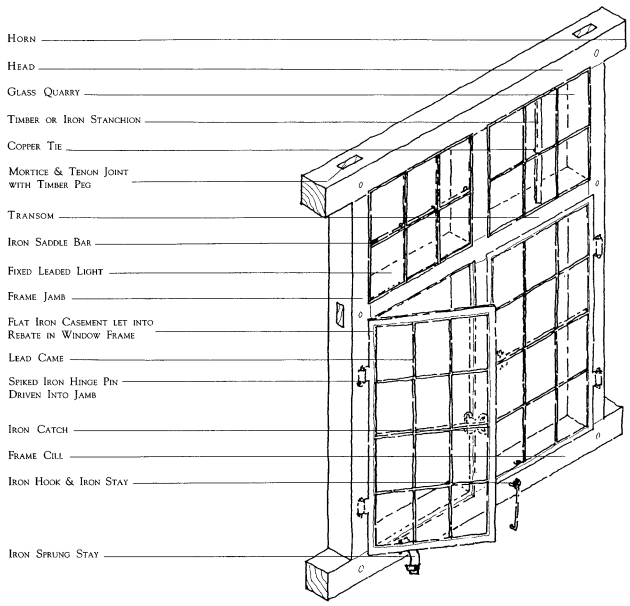

Figure 2.1 Typical wood casement window, from "The Repair of Wood Windows," Townsend and Clarke, 2.

[6] Townsend and Clarke, 5.
[7] John Fidler, *Sash Windows,* 1.

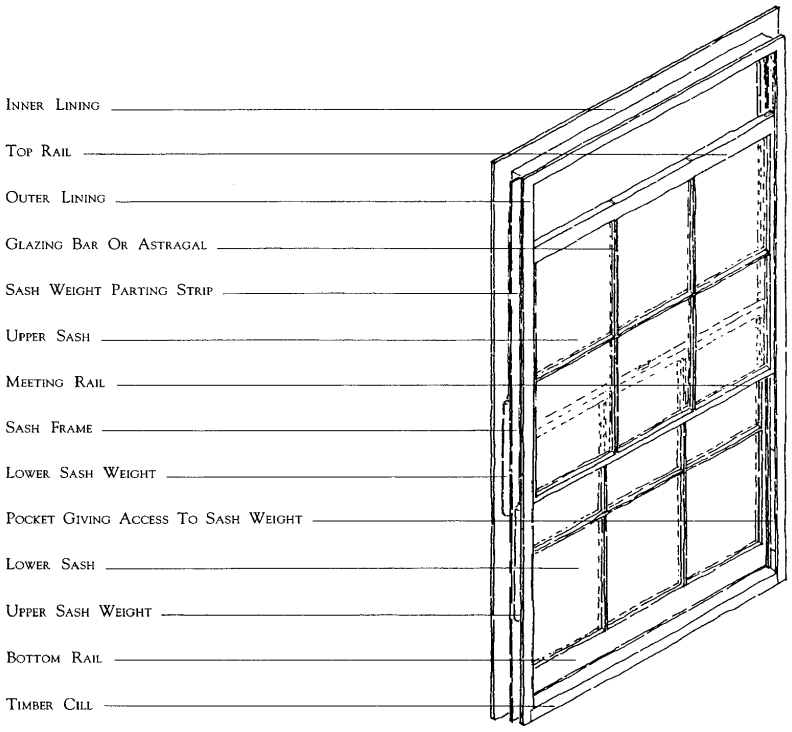

Figure 2.2 Typical wood double-hung sash window, from "The Repair of Wood Windows," Townsend and Clarke, 4.

The Secretary of Interior's Standards for the Treatment of Historic Properties

The evolution of the window continues, as it did throughout the twentieth century with the introduction of steel, aluminum, and plastic as alternative building materials. Many owners are faced with the decision of whether to restore their existing historic wood windows to an operable and energy-efficient state, or to replace them with reproductions in modern materials such as aluminum or plastic. A great deal of planning goes into this decision-making process and the result ultimately lies in the regional climate, existing window conditions, and cost.

The Secretary of Interior's Standards for the Treatment of Historic Properties outline recommendations for four possible window treatments: preservation, rehabilitation, restoration, and reconstruction. The Standards state that, "as one of the few parts of a building serving both

as an interior and exterior feature, windows are nearly always an important part of a historic building".[8] According to the Standards,

> *Preservation* [requires] retention of the greatest amount of historic fabric, along with the building's historic form, features, and detailing as they have evolved over time.
> *Rehabilitation* acknowledges the need to alter or add to a historic building to meet continuing or new uses while retaining the building's historic character.
> *Restoration* allows for the depiction of a building at a particular time in its history by preserving materials from the period of significance and removing materials from other periods.
> *Reconstruction* establishes a limited framework for re-creating a vanished or non-surviving building with new materials, primarily for interpretive purposes.[9]

The Secretary of Interior's Standards offer recommendations for the treatment of windows according to each of these principles. *Preservation* of windows requires the ability to identify, retain, and preserve windows through an in-depth conditions survey; stabilize deteriorated or damaged historic fabric; protect and maintain window elements with surface treatments and make windows weather tight; and repair window frames and sash by patching or consolidating.[10]

Rehabilitation procedures for window restoration follow the same guidelines as *preservation* but allow for more extensive repairs such as replacement in kind of those parts that are either extensively deteriorated or missing when there are surviving prototypes. The replacement windows "may be an accurate restoration using historical, pictorial, and physical documentation; or be a new design that is compatible with the window openings and the historic character of the building".[11]

---

[8] Kay D. Weeks and Anne E. Grimmer, *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings* (Washington D.C.: U.S. Department of Interior, National Park Service, Cultural Resources Programs, Preservation Assistance Division, 1995), 4.
[9] Weeks and Grimmer, 3.
[10] Weeks and Grimmer, 8.
[11] Weeks and Grimmer, 14.

The procedure for *restoration* follows the same basic protocol, but allows for the removal of architectural elements that are not concurrent with the chosen period of restoration. The removed items should be documented, and selected examples stored for future research.[12] *Reconstruction* is the most drastic measure and should only be approached when original examples of historic materials no longer exist.[13]

Planning for Window Treatment

When planning for the restoration of historic windows, these guidelines should be taken into consideration and appropriate measures decided on. Many factors contribute to the level of treatment needed, including relative significance of the building and windows, condition of existing windows, and budgetary considerations. As historic preservation review boards and owners call for more sensitive window solutions, the market for contractors specializing in window restoration and window companies providing products for historic buildings has expanded.

A historic window should be assessed for four major factors: material integrity; degree of visibility; interior appearance; and historic window design. Windows are an integral part of historic fabric and often comprise 20 to 30 percent of the surface area of a building[14]. The following questions must be asked to determine their significance: Are the windows original? Do they reflect the original design intent for the building? Do they reflect period or regional styles or building practice? Do they reflect changes to the building resulting from major periods or event? Are the windows examples of exceptional craftsmanship or design?[15]

---

[12] Weeks and Grimmer, 20.
[13] Weeks and Grimmer, 22.
[14] Charles E. Fisher, *Rehabilitating Windows in Historic Buildings: An Overview, 1.*
[15] John H. Myers. "The Repair of Historic Wooden Windows," Preservation Brief: 9, 1981, 1.

Buildings often have a principle façade that is more significant than other elevations, reflected in the design of windows; or all elevations could be equally visible and therefore every window is pertinent to the aesthetic whole. Each window must be examined individually, as many window types can be used on one building, or even one story of a building. Different levels of treatment may be needed for each.

Windows also have a dramatic effect on the interiors of a building – this must be taken into consideration to ensure that appropriate amounts of light and ventilation, as well as aesthetic appearances, are not diminished.[16] In *Preservation Brief 9*, John Myers writes, "one must consider four basic window functions: admitting light to the interior spaces, providing fresh air and ventilation to the interior, providing a visual link to the outside world, and enhancing the appearance of a building."[17] This may be the most important consideration, as the primary purpose of buildings is shelter - we spend most of our lives inside, looking out from the windows, not from the ground below.

The last point to consider in the initial assessment of historic windows is to determine if their components reflect the technology of the time or lend to the overall design of the building. Almost all elements of a window, from muntin widths and profiles to decorative elements such as architraves, sash color, and glass, play an important part in the aesthetics of the building.[18]

[16] Fisher, 1.
[17] Myers, 1.

Assessing Existing Conditions of Historic Wood Windows

First and foremost, the procurement of appropriate technical advisors should take place. Key players include a window/façade expert with technical engineering skills; an architect who can document, specify, and approve the windows; a historic consultant with in-depth knowledge of preservation guidelines and laws; and a contractor who can assist with research and production.[19] All of these players should be intimately familiar with planning for window treatments.

Existing conditions of windows and scope of repairs must be evaluated on a unit-by-unit basis and should be documented with drawings and photographs. On larger projects a window schedule may be employed to assign a window type, location, and identification number to each unit, list all window parts, and detail the repairs to be performed on each window.[20] Preliminary factors to be considered when investigating a window are: building location to determine regional weather characteristics such as temperature, humidity, rainfall, and wind, as well as the window location within the building; building type such as industrial, residential, institutional or commercial; building and window age which may lend insight into technology used and therefore how repairs will be made; window type to determine whether they are fixed or operable and if they open parallel to the wall surface or out-of-plane; and window materials which will determine the durability and performance of a unit.[21]

Next, a more detailed investigation into each window unit's existing condition must be made. Window parts that should be evaluated are: paint, frame and sill, sash (rails, stiles and

---

[18] Fisher, 2.
[19] Richard Graf, "Designing a Replacement Window to Fit Your Needs," Window Rehabilitation Guide for Historic Buildings, (1997): III-44.
[20] Myers, 2.
[21] Stephen J. Kelley, "The Assessment of Existing Window Systems," Window Rehabilitation Guide for Historic Buildings, (1997): III-3.

muntins), glazing, hardware, and the overall condition of the window. Water infiltration is often the chief cause of deterioration for all of these window elements, although poor design, lack of maintenance, and insects can wreak havoc as well.[22] In the case of moisture damage, the water source should be determined and eliminated through structural repairs or caulking before any other measures are taken. Any subsequent repairs will prove futile if this is not undertaken.

Paint condition can signal moisture damage, as it will not bond to saturated wood, but this does not mean that the entire piece of wood is in poor physical condition. The window should be tested for operational soundness, beginning with the lower portion of the sash and frame, as these are the places most likely to be deteriorated by water. An awl or other sharp object should be inserted into various points where the exterior appears sound; upon further inspection the probe may penetrate decayed wood.[23] Wood deterioration is especially prevalent at the joints of sash and frames where water can enter the end grain, as well as sills where water may pool on their horizontal surface (although sills should slope slightly to prevent this).

Broken glass or missing lights should be noted, as well as the condition of glazing putty. Glazing putty secures each pane of glass to the sash and forms a watertight seal. If it is broken, cracked, or missing in parts it should be replaced to avoid water penetration. Hardware may be rusted and inoperable, but can be returned to use with cleaning and lubrication. After all conditions are noted and the overall state of each window is determined, a method of treatment must be determined in regards to budgetary considerations.

[22] Myers, 3.
[23] Myers, 3.

Budgetary Considerations, Including Energy Efficiency and Environmental Impact

Historic wood windows that have not been maintained over time tend to have excessive air infiltration. Many building owners maintain the belief that their historic windows are costing them too much in energy bills, and that it would be more cost-effective to replace them with modern windows rather than restore existing ones. In most cases this is not true, and the retention of historic wood windows with energy-saving improvements is often less expensive, with the added benefit of retaining important historic fabric.

The market for replacement windows has grown exponentially in the recent past, with many studies being performed as to the advantages and disadvantages of each. This thesis will not delve very far into the various technologies that exist for replacement windows, due to the fact that we are discussing *wood* window ***restoration***, although many resources exist to support both retention and replacement.

Initially, an energy analysis should be undertaken to determine the thermal performance of existing windows as well as the building as a whole. Standards set by the National Fenestration Rating Council (NFRC) monitor optical properties, insulating ability, solar gain property, condensation resistance, and long-term energy performance of window systems.[24] These standards should be compared with the collective energy costs of a property when deciding on an appropriate window system. This figure and the projected cost of retrofitting existing windows for improved thermal performance, will determine what measures to take in treating windows.

Many life cycle cost analysis studies have been undertaken, such as one published by the National Capital Commission in Ottawa, Canada. This study considers the cost of glazing replacement, regular maintenance, calculated energy saving, and annual storm and screen

installation. The study illustrates, "that when the cost of restoration, energy, and maintenance are considered over 20 years, the preservation and upgrading of original windows compares very favorably to the cost of replacement units. The comparisons are considered to be valid for residential scale buildings containing 30 to 40 windows". It should be said that replacement windows might only have a serviceable life of 20 to 30 years, while properly maintained historic windows could last indefinitely.[25]

Numerous studies have shown similar benefits of repairing windows rather than replacing. Energy efficiency can be accomplished through varying levels of intervention, the simplest being installation of weather stripping to reduce air infiltration after the window itself has been restored to an air-tight state. Additionally, a second layer of glazing can be added to single-glazed windows, storm windows can be installed, and UV rays can be reduced with films, special glazing, or drapes to protect interior finishes. English Heritage, an organization that strongly advocates for historic window retention, does not recommend double-glazing because the reduction of energy bills rarely covers the cost of installation, and the glazing bars of older windows are often not wide enough to accommodate two pieces of glass.[26]

The conclusion of a study that analyzed the role of the mechanical engineer in window restoration states, "in summary, there are no compelling arguments from the field of mechanical engineering for replacing historic windows, provided the windows are moderately airtight, treated to prevent excessive UV and visible light transmission, and not prone to excessive

---

[24] Ross McCluney, "Let There Be Daylight," Window Rehabilitation Guide for Historic Buildings, IV-45.
[25] Jean-Yves Tremblay and Craig Sims, "Life Cycle Cost Analysis for Restored and Replacement Windows," Window Rehabilitation Guide for Historic Buildings, III-13.
A similar study called "Retain or Retire? A Field Study of the Energy Impacts of Window Rehab Choices" was undertaken by the Vermont Division of Historic Preservation, funded by a grant from the National Park Service through the National Center for Preservation Technology and Training. Conclusions concur with the Canadian study.
[26] English Heritage, "Draughtproofing and secondary glazing," Framing Opinions (London: English Heritage, 1994), 1.

condensation."[27] Preservationists, contractors, architects, and other professionals faced with window issues should tout the findings of these studies to prevent the further unnecessary loss of this key architectural element.

An additional positive aspect of restoring existing windows is the environmental impact. Historic windows are usually constructed of first growth wood, which is expensive and very hard to find in today's market. First growth wood is the original stand of mature trees; this is much more durable than second growth timber, which is often immature and has a high sapwood content, more susceptible to insect and fungi.[28] If new wood windows were desired, the choice would be to either further deplete dwindling supplies of first growth trees or settle for a lesser quality wood that will most likely not out-service existing windows.

When choosing steel, aluminum, or plastic as replacement materials, non-renewable natural resources are depleted as well.[29] Plastic windows have only been on the market for approximately 25 years and accelerated weathering suggests that they may only have a life span of that same amount of time. Early examples are breaking down and discoloring in UV light, the frames are more susceptible to thermal movement than wood, and when frames or sills are still made of wood, moisture problems are simply transferred there.[30]

An advantage of wood over modern materials such as aluminum and plastic is that wood is a good insulator, and wood frames do not transmit heat or cold as easily as metal windows. On the other hand, wood is difficult to maintain and seasonal changes affect the smooth

---

[27] William B. Rose, "The Role of Windows in Overall Building Performance: The Engineer's Story," Window Rehabilitation Guide for Historic Buildings, IV-13.
[28] Martin E. Weaver, *Conserving Buildings: A Manual of Techniques and Materials* (New York: John Wiley & Sons, Inc., 1997), 15.
[29] Framing Opinions: A National Campaign to Protect Our Legacy of Traditional Windows and Doors, (London: English Heritage, 1994), 2.
[30] Fidler, 8.

operation of components due to wood's tendency to swell in moisture.[31] A key downside to any replacement material, including wood, is design related. Historic wood windows were often handcrafted, which is almost never the case today, and achieving the appropriate detail is difficult with modern materials. Thus replacement windows rarely match the originals in detail or even general character.

Restoration Techniques for Glass, Sash, Sills, Frames, and Hardware

When it has been determined that windows will be repaired rather than replaced, a level of treatment must be decided upon to ensure that a desirable outcome is reached within budget parameters. The Secretary of Interior's Standards may be used as a guide to determine the appropriate level of treatment needed to achieve desired results, and *must* be followed if the property is under certain constraints such as rehabilitation for tax credit purposes, where the Standards must be strictly adhered to in order to be approved for financial incentives.

National Park Service Preservation Brief 9: The Repair of Historic Wooden Windows, outlines three categories of repair with each level representing increased difficulty, expense, and time. Repair Class I: Routine Maintenance, should be undertaken on all windows and can usually be accomplished without hiring a professional. This is recommended for windows that are operationally sound; it includes paint removal, removal and repair of sash, re-glazing, repair of frame, weatherproofing, and re-painting.[32]

Repair Class II: Stabilization, is for windows that have a greater degree of deterioration. Wood should be treated with fungicide and waterproofed, consolidated with epoxies, holes filled

[31] Kelley, III-5.
[32] Myers, 3.

with putty, as well as all steps in Repair Class I.[33] Epoxy consolidation consists of a thick liquid that penetrates into rotted wood fibers and cracks, then hardens into a flexible plastic with structural integrity.[34] There is a wide range of epoxy products serving a variety of purposes, and each must be researched thoroughly before use.

For restoration of wood using epoxies, the basic process is two-step. According to James Marshall in *A Specifier's Guide to Epoxies for Restoration and Repair,* "first, the old wood is consolidated by application of a two-part penetrating liquid epoxy hardener [which] restores structural strength and integrity to wood fibers. Two clear liquids-a resin and a hardener-are blended and then poured or brushed onto the deteriorated wood." This primes the wood for application of wood-substitute putty consisting of a resin paste and hardener paste mixed together. The putty fills gaps and holes, building up the wood to a state that is highly resistant to insects, chemicals, and the elements.[35] This class of repair can be performed by the layperson, although care should be taken when using wood preservatives and epoxies due to potentially harmful chemicals.

The greatest amount of money, time, and skill will be needed for Repair Class III: Splices and Parts Replacement. The expertise of a skilled joiner and carpenter should be sought for windows that are greatly deteriorated, which requires splicing new pieces of wood into existing members, duplicating parts such as muntins, rails, and sills, and removal of sash from frame.[36] Varying levels of repair may be needed when taking an entire window stock into consideration, which is why it is important to perform preliminary documentation and conditions assessment.

---

[33] Myers, 5.
[34] John C. Leeke, "Wood Window Sills," Window Rehabilitation Guide for Historic Buildings, V-4.
[35] James R. Marshall, "A Specifier's Guide to Epoxies for Restoration and Repair," *Clem Labine's Traditional Building*, 11 January/February 1998, 20.

Each component of a window must be restored individually, while remaining sensitive to the unit as a whole. The art of wood window restoration is also a science, and new technologies for these organic materials are continually being developed. The following is a discussion of conventional techniques used to restore wood window components in a historic context. This must be read with the understanding that new developments will emerge in material science, improved techniques will arise, and philosophies will change over time. The hope is that all of this advancement will expand our knowledge of and appreciation for historic fabric.

Sash Removal

For most repairs beyond routine maintenance, the sash will need to be removed from the frame to allow for easier handling. First, the delicate interior stops and parting beads must be pried loose by running a knife along the intersection with the jamb to break the paint, then gently working them loose with a putty knife.[37] If a parting bead or stop is broken in the process, an exact replication must be made to ensure a weather-tight fit.[38]

Double-hung sash have an internal system of cords and weights that allow the sash to be raised and lowered. This cord must be cut by pulling the top sash down a bit and cutting the exposed cord, then raising the lower sash and doing the same, taking care that the weight does not drop into the weight pocket.[39] This can be avoided by tacking the cord to the frame before cutting. Weights should be removed and identified with exact location, as each window is unique and will not shut properly without the correct weight. If the window becomes lighter or heavier during restoration due to paint removal, re-glazing, or additional hardware, extra weights

---

[36] Myers, 6.
[37] Myers, 3.
[38] Fidler, 4.
[39] Fidler, 2.

can be added when the sash cord is re-installed. For the window to work properly, the pair of weights should be heavier than the total weight of the sash.[40] Weather-stripping should be removed at this time as well.

The sash can then be removed and identified one at a time. Some recommend marking each sash and all glass with permanent ink as to location and orientation.[41] This will suffice for glass, but ink may be lost in paint stripping unless an unpainted surface is marked. A permanent technique is to assign each window a number, and stamp this into the side of one stile with a letter stamping kit and hammer (for example, N-03). Sash should be stored in a vertical manner and window openings should be enclosed with sheets of acrylic or plywood.

Paint Removal

Before paint removal proceeds, any desired paint analysis should be performed to determine layers of colors and types of paint used. This is a very specialized field and is usually reserved for properties seeking museum quality restoration. Once the sash are taken out, paint should be removed from the frame with a heat gun and various paint removal tools such as a putty knife or carbide scraper.

There are several methods available to remove paint from the sash including abrasive, thermal, and chemical. The level of removal depends on the condition of existing paint which can range from a blistering, minor peeling, or wrinkling surface to excessive peeling, cracking or alligatoring. The first dilemma can be solved through sanding and scraping, while more deteriorated paint may have to be removed to bare wood by chemical or thermal means.[42] The

[40] Fidler, 4.
[41] John Greenwalt Lee, "Window Conservation and Repair Specifications," Window Rehabilitation Guide for Historic Buildings, V-11.
[42] Weeks and Look

Secretary of Interior's Standards for Rehabilitation adamantly state, "removing paints down to bare wood surfaces using harsh methods can permanently damage those surfaces; therefore such methods are not recommended. Also, total removal obliterates evidence of the historical paints and their sequence and architectural context".[43] Take care not to damage wood fibers and leave a sample of original paint when stripping to bare wood.

Recommended abrasive methods include manually scraping the paint with a putty knife or paint scraper, then sanding to smooth the surface. This can also be accomplished by mechanical means such as an orbital sander or belt sander. It is not recommended that rotary drill attachments, waterblasting, or sandblasting be used for paint removal.

Thermal removal can be accomplished with a heat plate, which is between 500 and 800 degrees Fahrenheit and is not hot enough to vaporize lead paint. Alternately, a heat gun operating at temperatures less than 750 degrees usually works better for details such as muntins.[44] Both of these methods work best on heavy paint buildup, which bubbles easily when heated and can be scraped off with a putty knife.

All glass should be removed or covered before the use of thermal methods, as the high temperatures can break irreplaceable historic glass.[45] Also take care not to scorch the wood by holding the heat source in one place for more than several seconds, especially in cavities where dust may catch fire. Further sanding may be needed after this treatment to "feather" remaining paint and prepare the wood for new paint. Blowtorches are an outdated and dangerous method of paint removal because of fire and lead toxicity dangers. Fire extinguishers should always be present at the workstation!

---

[43] Kay D. Weeks and David W. Look, *Preservation Brief 10: Exterior Paint Problems on Historic Woodwork* (Washington D.C.: National Park Service, September 1982); available from http://www.cr.nps.gov/hps/tps/briefs/brief10.htm#Purposes%20of%20Exterior%20Paint

[44] Weeks and Loss

Chemical methods of removal are not used very frequently, but certain situations may call for this treatment including: removal of paint from small details that cannot be reached or from muntins with intact glass that may be broken with other methods. Two types of chemical strippers are available: solvent-based, which can generally be used by a layperson, and caustic strippers which should usually be left to professionals. Caustic strippers should be rinsed off after dipping, as they can cause damage to wood fibers. Both of these have potential health and safety hazards.[46] Sash should never be sent away for dipping in hydrochloric acid or bleach, as these chemicals significantly alter the state of wood and leave a completely stripped look that is uncharacteristic of historic material.[47]

Lead Abatement During Paint Removal

Almost every building constructed before 1978 contains some level of lead paint, which is a toxic material causing damage to all systems of the body if levels reach a certain threshold after exposure. There is a great deal of literature and policy regarding the abatement of lead; property owners and contractors must become familiar with the dangers of lead exposure when working with historic properties, especially when paint removal is involved. The paper *Making Windows Lead-Safe* states, "Certain renovation activities, such as abrasive paint removal, dry paint preparation techniques, or demolition, can release tremendous amounts of lead dust into the air. The airborne dust presents an immediate hazard to workers, and the settled dust presents a long-term hazard to the residents."[48]

---

[45] Myers, 4.
[46] Weeks and Loss
[47] Fidler, 7.
[48] Jeff Gordon and Carol J. Dyson, "Making Historic Windows Lead-Safe," Window Rehabilitation Guide for Historic Buildings, IV-61.

Lead abatement can be very expensive and should be performed by professionals. This involves "permanent" removal, which is defined as 20 years by HUD Guidelines (see Appendix A). Abatement can be accomplished by complete removal of lead-based paint, removal and replacement of the lead-based paint component, enclosure of this component, or by encapsulating the surface with a special coating so that paint cannot flake.[49] Interim controls are also available which include paint stabilization, fixing windows in place, paint removal from friction surfaces, and dust control and cleaning.

It is imperative that at-risk workers be educated about the hazards of lead exposure, measures they must take to be protected, and symptoms of lead poisoning. There are three actions that must be a part of any work plan: adequate worker protection; containment of dust and debris; and proper clean up. Gordon and Dyson state however, "Significant training costs, the fear of bewildering regulations, and spiraling insurance costs all discourage contractor and worker training."[50] A two day training would suffice to educate workers about techniques to eliminate high dust levels, awareness of hazardous activities such as demolition and paint stripping, and proper worker protection. They would also learn how to contain lead-paint debris, proper cleaning techniques, and workplace monitoring for lead levels.[51] Failure to take these simple measures to educate and protect employees is negligence on the part of the employer.

[49] Gordon and Dyson, IV-68.
[50] Gordon and Dyson, IV-79.

Glazing Putty and Glass Removal

Glazing putty on historic windows has usually been baking in the sun for years and is often extremely hard. Sometimes this allows it to be easily chipped off, but usually it must be softened with an infrared heat gun or broken down with solvents.[52] Heat can be detrimental to historic glass, so great care should be taken to cover the glass with a non-combustible, heat-absorbing cloth sandwiched between two pieces of galvanized steel or some other such measure.[53] While heating, a putty knife or chisel should be inserted between the wood and putty, then glass and putty, to pry the glazing loose. Take care not to assert too much pressure on the glass itself to avoid breakage. Glazing points, which hold the glass to the glazing bars, must be removed before the glass can be lifted out.

All historic glass should be salvaged for future use, even if the window is deteriorated beyond repair; broken panes can be used in windows with smaller lights such as casements. Each pane of glass that will be put back into its original sash should be marked with orientation and light location; historic windows are quite irregular and panes often only fit in one light. The salvaged glass should be kept in a pre-determined storage system until re-glazing.

Repair of Wood Components

Those with appropriate tools and little skill can perform minor wood repairs such as epoxy consolidation, application of preservatives and fungicides, and painting. These measures are suitable for slight wood deterioration less than ¼" in depth.[54] More extensive repairs, such as duplicating muntin, rail, or stile profiles and rebuilding joinery, may want to be left to a mill or

---

[51] Gordon and Dyson, IV-79.
[52] Fidler, 6.
[53] Greenwalt Lee, V-19.
[54] Greenwalt Lee, V-13.

skilled carpenter. The mill can make a set of knives that imitates the profile of a muntin, which is then used in a shaper to cut pieces of timber with the desired profile. Any carpenter with a shaper can produce the new components, or it can be done at the mill.[55] The following will be an explanation of basic techniques for rail, stile, muntin/glazing bar (interchangeable terms, although the vertical member is often called a muntin), sill, and frame repair.

Sash repair should be performed before frame and sill repair so that putty and paint can cure while the latter are being restored. Planning such as this is imperative for smooth operation and timely completion. Proper planning is also essential to ensure that a minimal amount of historic fabric is lost. Thoroughly inspect windows for deterioration such as rot, insect damage, and cracks; only these sections should be replaced with new wood. The most deteriorated parts of a sash are usually the bottom rail and lower portion of the stiles where water may have accumulated, especially in the end grain and joints. Delicate muntins are often in need of repair as well. When investigating the frame and sill remember that the lower portion of jambs and mullions, as well as the top of the sill, has usually deteriorated at a greater rate due to the pooling of water.[56] Hardware should be removed at this time, if desired, and placed in bags marked with window location.

Choosing the appropriate species of timber for repairs is very important. The new and old wood should be the same species; otherwise the joints between the two will likely fail due to different rates of contraction and expansion. Use well-seasoned timber that matches the grain of the original.[57] Severely compromised wood can be treated in several ways: a dutchman repair let

[55] Information gathered from Jeff Larry, Preservation Carpenter at the President Lincoln and Soldiers' Home National Monument
[56] Illustrations may help to explain the following techniques, so refer to *Figures 2.3-2.7* while reading this section.
[57] Townsend and Clarke, 9.

into the existing member; a combination of epoxy resin consolidation and dutchman repair; or complete replacement of the deteriorated component.[58]

A dutchman repair is essentially a patch and involves removing the deteriorated section of wood at an angle so that it can receive the dutchman without popping out. Cut back the original wood ¼" beyond the deteriorated portion and consolidate the ends with epoxy for further protection.[59] Next a strip of similarly grained, same species wood is cut and let-in to the original member, then secured with epoxy or wood glue and clamped. Excess epoxy or glue should be wiped off with a rag. Once the glue dries, plane and sand the area to create a smooth, continuous surface with the original wood.[60] This treatment can be used on most sash parts and often does not require the disassembly of the sash.

A second option is to consolidate the wood with an epoxy and apply dutchman repairs where needed. Dismantle the sash by removing wood pins that hold the joints together; tap them through with a smaller object such as a dowel. Next, gently tap at the inside edge of the stile with a rubber mallet or block of wood to separate the joint and label all parts so they can be reassembled. Stand the deteriorated ends of the dismantled parts in a container of epoxy resin so that at least half of the rotted area is covered, and let them soak until the wood is saturated. The epoxy will rise up the wood through capillary action and the entire damaged area will be filled with resin. For damage other than at end grain, it may be necessary to drill 1/8" diameter holes at ½" intervals at deteriorated points, deep enough to hit sound wood. This will expose the end grain of the wood and allow better saturation when epoxy resin consolidant is applied. Wipe off

[58] Greenwalt Lee, V-14 – V-17.
[59] Greenwalt Lee, V-13.
[60] Greenwalt Lee, V-14.

excess resin and allow wood to dry.[61] If further patching is needed, follow previous instructions for dutchman repairs or fill gaps with epoxy putty.

If an entire component of the sash is deteriorated beyond repair, it may be reproduced to match the profile of the original material. The bottom rail and stile often have to receive new mortise and tenon joints, or the area surrounding the joint may have to be reconstructed in its entirety. (see *Figure 2.3*). The optimal way to join a new piece of timber with the old is with a splayed splice joint that has an undercut and step (see *Figure 2.4*). This method "gives maximum surface area for gluing and guarantees that moisture is directed to the outer face of the window".[62] These methods can be used on window frames as well, although it is best to perform frame repairs in situ.

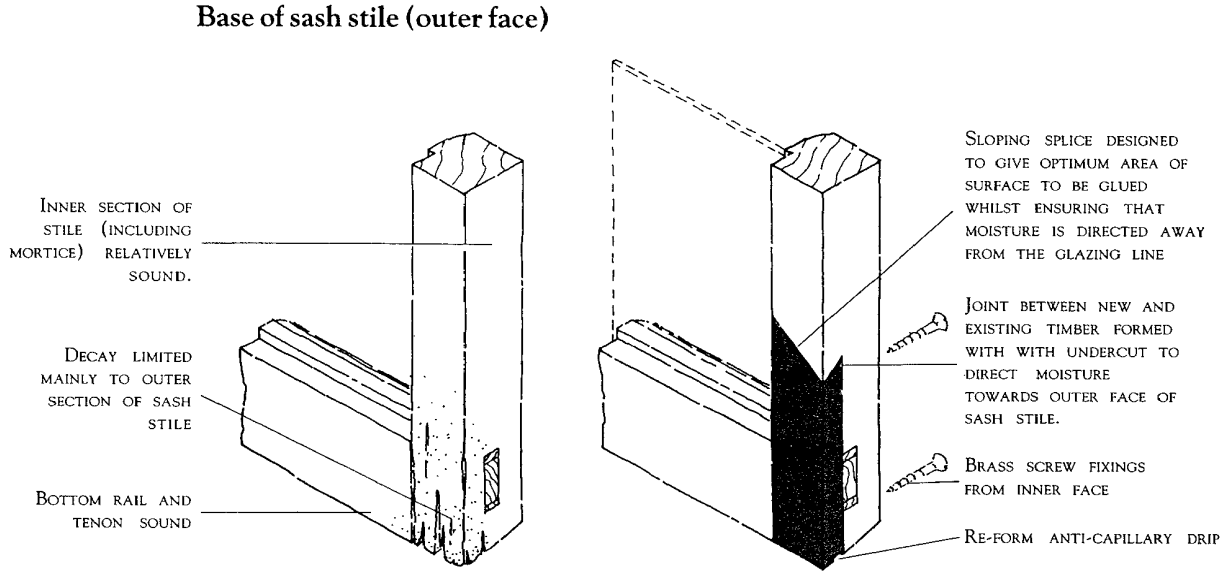

Figure 2.3 Sash Stile Repair, from "The Repair of Wood Windows," Towsend and Clarke, 11.

[61] Greenwalt Lee, V-16.

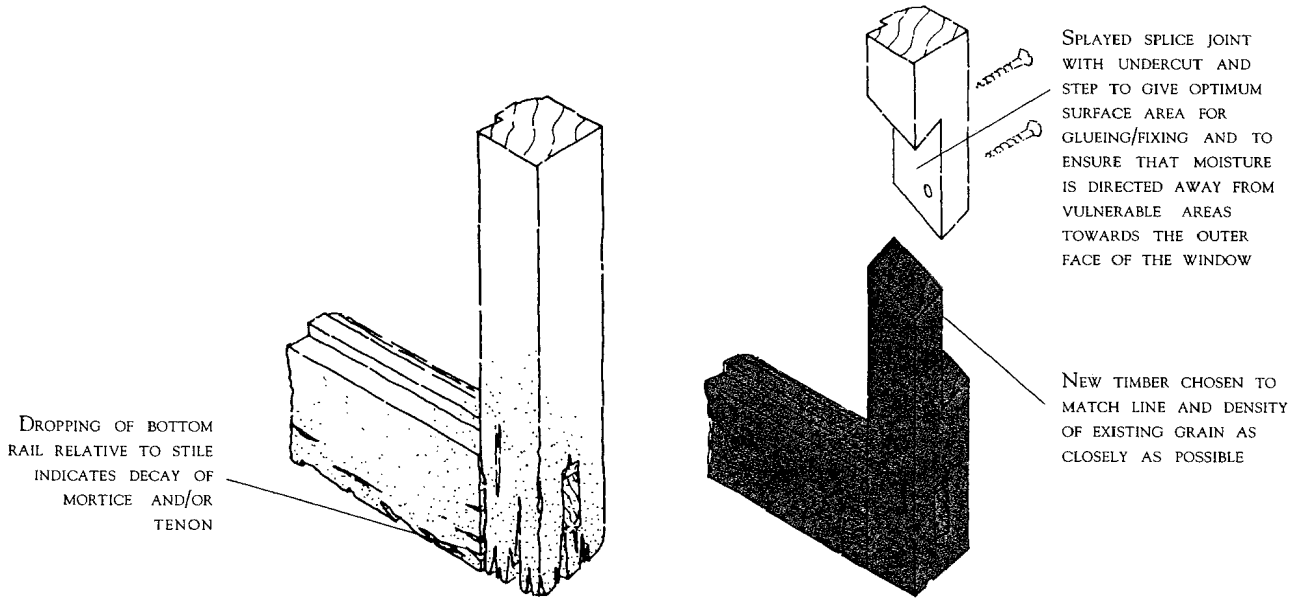

Figure 2.4 Rail and Stile Repair at Mortis and Tenon Joint, from "The Repair of Wood Windows," Towsend and Clarke, 11.

Glazing bars can be repaired in a similar manner, although profiles are often difficult to reproduce as discussed earlier. Repairing the tongue of a glazing bar (see *Figure 2.6 and 2.7*) can usually be accomplished without dismantling the sash; the entire tongue may be replaced or a dutchman repair can be made at the intersection of glazing bars.[63] Plane and sand all surfaces following repair to ensure a smooth connection with the existing wood.

---

[62] Townsend and Clarke, 11.
[63] Townsend and Clarke, 12.

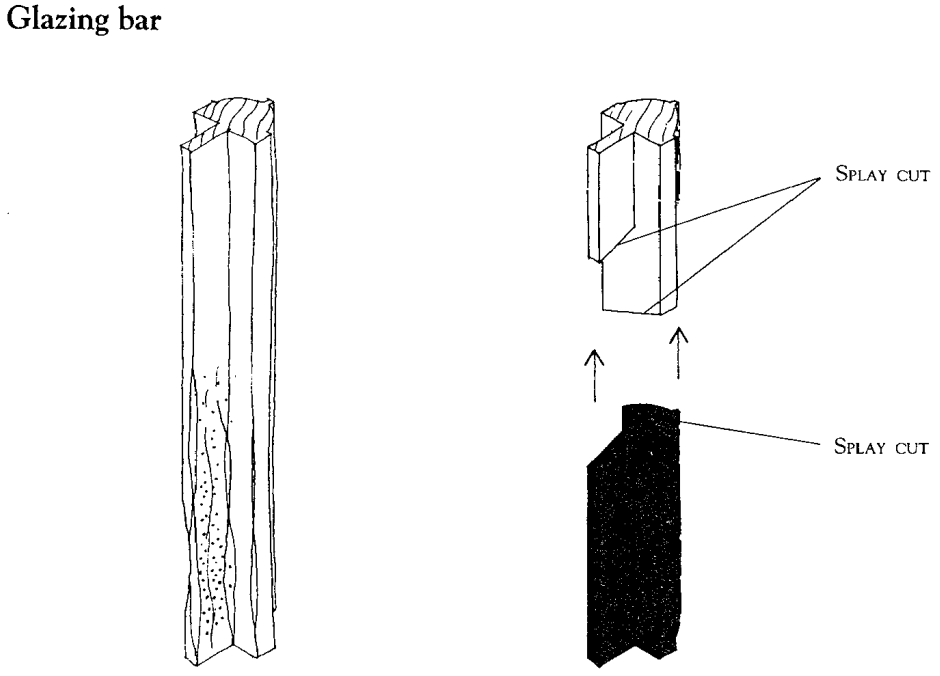

Figure 2.5 Illustration of Glazing Bar/Muntin Repair, from "The Repair of Wood Windows," Townsend and Clarke, 13.

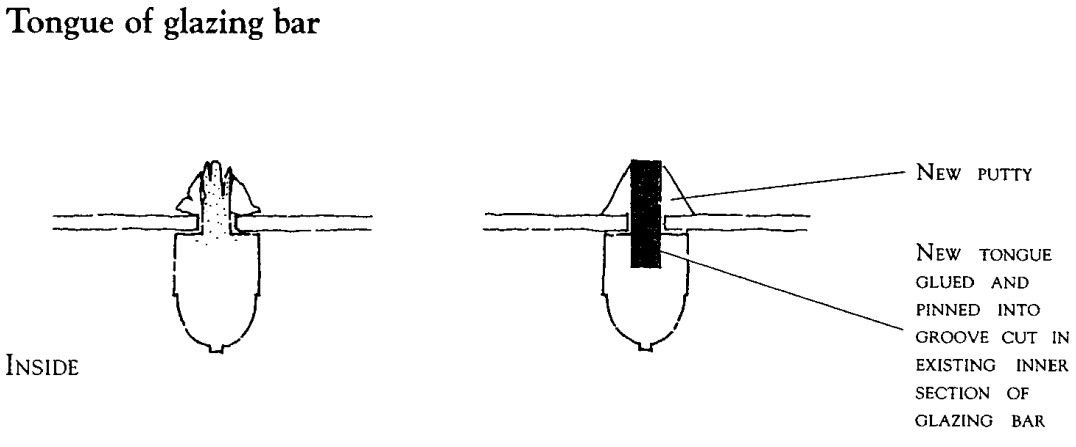

Figure 2.6 Illustration of Glazing Bar/Muntin Tongue Repair, from "The Repair of Wood Windows," Townsend and Clarke, 13.

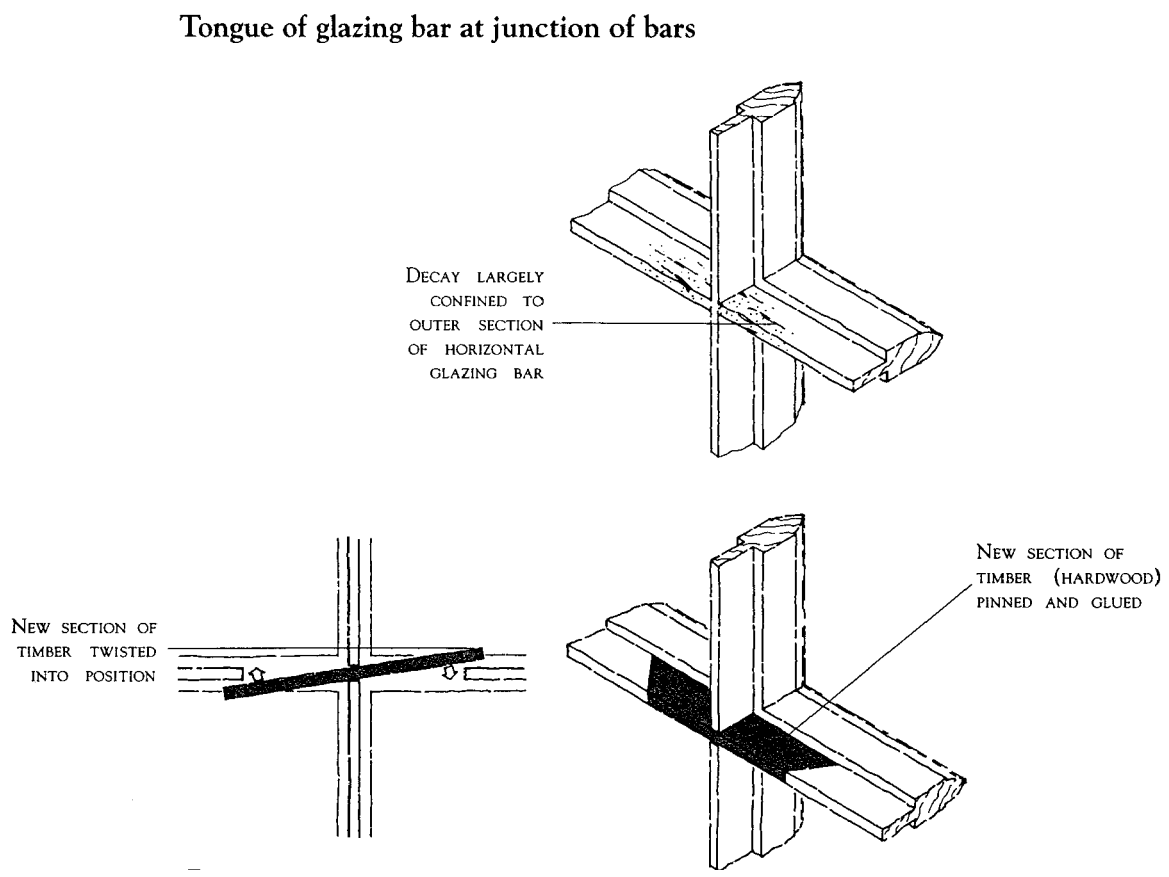

Figure 2.7 Illustration of Glazing Bar/Muntin Tongue Repair, from "The Repair of Wood Windows," Townsend and Clarke, 13.

Sill restoration is a very important step in this process because the sill is a structural part of the frame that the lower sash rests on. The sill also drains water away from the building, as it has a slight downward slope of approximately 10 degrees, extends past the face of the building, and has a drip bead cut into the under-side to prevent water from running back towards the building.[64] Despite this construction, the sill is a large horizontal member exposed to the elements and often having a great deal of deterioration.

[64] John C. Leeke, "Wood Window Sills," Window Rehabilitation Guide for Historic Buildings, V-3.

A sill with minor decay should be treated with epoxy consolidation and filler to restore the strength of the wood. The wood must be dry first in order for this process to work.[65] After paint has been stripped, all checks (a crack or flaw in lumber) should be clean out with a scraper. Then the checks should be primed with consolidant, which should be left to cure before filling the checks with epoxy filler.[66]

More extensive decay may require complete replacement of the sill and repair to the end of frame stiles. Replicate dimensions of the original sill for historical accuracy and to ensure a weather-tight and structurally sound fit. Even if it was not present before, a drip bead and siding groove should be added to accelerate water runoff.[67] Repaired or new sills should be fastened to the building with stainless steel screws and caulked with a polyurethane sealant.

Glazing

Once a sash/casement has been repaired and is in a sturdy, weather-tight condition, it is ready for glazing (the process of installing glass). Every surface should be sanded, free of dust, and treated with wood preservative. Glazing of wood windows should be carried out with linseed-oil putty, which is first applied to the glass rabbet in a small bead. The rabbet is the surface that the glass sits on and is adjacent to the tongue.[68] The appropriate pane of glass is then gently pressed into the putty and secured with glazing points, which are inserted into the tongue with a device similar to a staple gun. Extra putty should be removed so the joint is smooth.

Another bead of putty is then applied on top of the glass, forming a slanted joint between the edge of the tongue and the glass; this is accomplished by running a putty knife over the

[65] Leeke, V-4.
[66] Leeke, V-7.
[67] Leeke, V-4.
[68] Leeke, V-20.

surface of the compound. No glazing putty should be visible from the interior face of the window.

The distorted effect that historic glass produces in sunlight is often one of the most pleasing characteristics of a building. The original panes should always be salvaged when possible, but reproductions of historic glass are available and simulate the wavy nature of historic glass. In sash windows it is important that new glass be the correct thickness (and therefore weight) so that it does not disturb the counterbalance of the internal sash weights.[69] If a building is of a later time period and the windows do not already have glass with irregular properties, the effect should not be imitated.

Painting

Bare wood should not be left untreated for an extended amount of time. A new coat of paint will ensure that all of the previous repair work is protected, with an additional layer of defense against the elements. As soon as wood preservatives have cured, an oil primer should be applied to all surfaces including glazing putty.[70] When painting putty, the paint line should extend 1/8" onto the glass to form a tight seal.

The next choice is whether to use an oil (alkyd) or latex (acrylic) topcoat. If the previous paint was oil-based and was not stripped down to bare wood, oil should be applied again for better adhesion. In the case of total paint removal, an oil-based primer should be applied first, followed by two coats of either an oil-based or latex topcoat from the same manufacturer. The topcoat should be applied as soon as the primer is dry, which is usually 48 hours, because

[69] Townsend and Clarke, 19.
[70] Sam Williams, Mark Knaebe and William Feist, "Why Exterior Finishes Fail: Government Scientists explain why paint cracks, blisters and peels on your house, and how you can prevent it," *Fine Homebuilding*, Volume 110 (June/July 1997): 65.

primers are not weatherproof.[71] Remember that while preservatives are curing and paint is drying, the frame and sill can be repaired, primed, and painted in the same manner.

Sash Reinstallation

Before the sash or casement is re-installed, the window should be fitted with weather stripping. This simple step will significantly reduce air, noise and dust infiltration without affecting the historic fabric of the building. There are many forms of weather stripping on the market, so one should be chosen that insulates well, is durable, and blends aesthetically with the building.[72] Manufacturer's recommendations should be followed when installing weather stripping. Other methods of weatherproofing have been previously discussed and include double-glazing, installation of storm windows, and UV films.

For reinstallation, the basic removal process is reversed. Parting beads and stops are returned and sash cords of the same size are replaced if they were deteriorated. The cord is threaded over the pulley with a weight attached to the end so that it drops to the base. The cord is retrieved and tied to the sash weight, then the system is reconnected to the sash stile.[73] If the sash do not open or close properly, the weights may need to be adjusted.

Although what you have just read may seem long-winded, it is only a sampling of the research, technology, and techniques available to those with a strong interest in historic window restoration. When making decisions on any project, the individual building must be critiqued, and solutions sought for its unique characteristics. Experts should be consulted to ensure that proper techniques are applied, that the project is in compliance with codes and historic

[71] Weeks and Look, www.cr.nps.gov/hps/tps/briefs/brief10.htm
[72] English Heritage, "Draughtproofing and Secondary Glazing," Framing Opinions, 2.
[73] Fidler, 3.

preservation guidelines, and most importantly that the historic character of the property is maintained.

A major window restoration project was undertaken at the President Lincoln and Soldiers' Home National Monument in February 2004. An immense amount of planning took place before a restoration crew ever stepped onto the property, and the ensuing result was more than a year of restoration to return all fifty-nine windows to their original, Lincoln-era state. The following is a history of the property, its significance regarding Abraham Lincoln, and an explanation of current circumstances and future plans for the house. After this introduction to the monument, a thorough analysis of the window restoration will be made in comparison to what has been previously discussed, with recommendations for other historic properties with similar goals in mind.

CHAPTER 3

The President Lincoln and Soldiers' Home National Monument

Past, Present, and Future

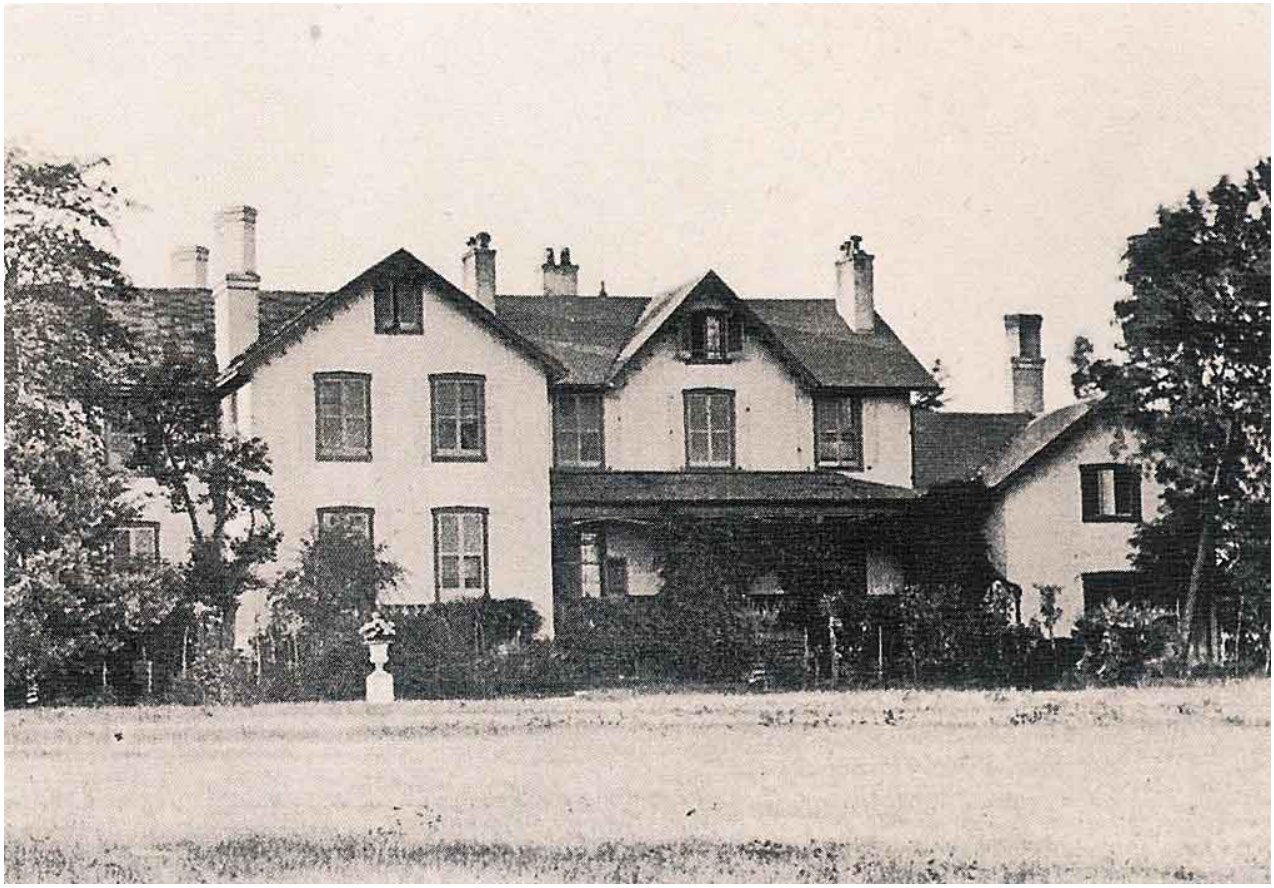

Figure 3.1 South Elevation, ca. 1860, President Lincoln and Soldiers' Home National Monument The Lincoln Museum, Fort Wayne, Indiana. IN #3993.

1842-2000

An impressive gothic revival cottage, where one of our country's most influential leaders resided, sits atop a hill overlooking downtown Washington D.C. and the United States Capitol. The cottage and surrounding 250 acres of land and adjacent buildings sit quietly amidst a busy D.C. neighborhood on the Armed Forces Retirement Home property, few people realizing what lies beyond the imposing iron gates. The day will soon come when the public is invited here, to wander the halls and grounds where many prominent occupants and esteemed military veterans lived, and where President Abraham Lincoln alledgedly penned the Emancipation Proclamation.

This history will begin in 1842, the year that prominent D.C. banker George Washington Riggs, Jr. commissioned his home, named Corn Rigs, designed by local architect William H. Degges. The Gothic Revival style was growing in popularity with the publication of Andrew Jackson Downing's *Cottage Residences* (1842); the home that Degges built closely resembles a design in Downing's book labeled, Design II, English or Rural Gothic Style cottage.[74] Today the cottage is "a rare example of an Early Gothic Revival structure of its period in the Washington D.C. area."[75]

The cottage that exists today was constructed in several phases throughout the mid-nineteenth century, the first configuration being a two-and-a-half story, symmetrical, three-bay house built of brick. The brick was stuccoed at an early date and the cross-gable roof was clad in slate shingles. A porch, which was removed in 2002 due to significant alterations, ran along the entire south façade of the original three-bay structure.[76] Jib windows that opened onto the porch mark the first story of the south elevation. The remaining windows on the first and second

[74] David Schuler, "Apostle of Taste: Andrew Jackson Downing 1815-1852," in *Lincoln's Sanctuary – Abraham Lincoln and the Soldiers' Home,* Matthew Pinsker (New York: Oxford University Press, 2003), 128.
[75] Geier Brown Renfrow Architects, *Study for the Restoration of Anderson Cottage* (Washington D.C., August 1995), 4-5.

stories have six-over-six double-hung sash and lugged architraves. Each gable in the attic is marked by an eight-light casement, and the basement openings are awning windows that open inward.[77]

At this same time, an outbuilding of similar construction and with coordinating decorative features was built close to the eastern bay of the building, possibly to be used as a "summer kitchen". Soon after, the two structures were connected with a two-story hyphen, and a one-story entry vestibule was added to the north façade. The north, south and east elevations of the outbuilding are pierced with diamond-paned casement windows.[78]

Several architectural elements in addition to diamond-paned casements and lugged architraves relate the original building to the Gothic Revival style, including ornamented chimneys and decorative bargeboards, finials, and brackets adorning the moderately steep cross-gables.[79] After much investigation into the original porch configuration, it has been decided that flattened, pointed arches, also a Gothic Revival element, supported the one-story porch. The north entrance is also a decidedly relevant element, as it is a large, paneled double-door topped with a Gothic arch.[80]

The Lincoln Cottage underwent extensive renovation after the property changed hands in 1851. The Riggs sold their home and the surrounding 256 acres of land to the federal government after funding was appropriated for The Military Asylum, an institution to house and care for retired or disabled military personnel. According to the 1851 Act of Congress establishing the Home, "…soldiers who had served honestly and faithfully for 20 years and men, whether pensioners or not, who had been disabled by wounds or disease in the service and in the

---

[76] The Hillier Group, *Lincoln Cottage Pre-Design Study Report* (Washington D.C., September 2000), 3.
[77] The Hillier Group, 3.
[78] The Hillier Group, 4
[79] The Hillier Group, 3

line of duty, were entitled to the benefits of the asylum".[81] The Riggs' house was initially used to accommodate such inmates, and in 1857 was renovated to house the Deputy Governor of The Asylum after a larger building was constructed for the soldiers.

At this point in time the Riggs Cottage was referred to as Anderson Cottage after Major Robert Anderson who was the Union commanding officer at Fort Sumter[82] and played a large role in pushing legislation through Congress to establish The Military Asylum.[83] The Army Appropriation Act of 1859 changed the name of the complex from The Military Asylum to The Soldiers' Home for euphemistic reasons due to poor public relations.[84]

Along with name changes, occupant turnover, and new construction on the surrounding campus, The Anderson Cottage underwent an overhaul of its own. At some point between 1851 and 1857 a western wing was added to the structure, which almost doubled the footprint of the original house.[85] Although a date of construction for this addition has not been confirmed, a lithograph by E. Sachse & Co. dated 1861 shows The Anderson Cottage in its present configuration. According to the Geier, Brown, Renfrow Historic Structure Report, "In this print, the house consists of the original 1842-43 house block, the small eastern wing and connector, and a large wing to the west. A verandah spans the original house block on the south side."[86] The addition is also a cross-gable, stuccoed brick structure, but with a brick foundation marked by a granite water table; the original roof was standing-seam metal that has since been replaced with asphalt shingles. A cast-iron balcony was installed at the first floor of the south elevation.

---

[80] Virginia and Lee McAlester, *A Field Guide to American Houses* (New York: Alfred A. Knopf, Inc.), 198.
[81] From 1851 Act of Congress establishing The Military Asylum, in Geier, Brown, Renfrow HSR, 21.
[82] William H. Clinton, "President Lincoln and Soldiers' Home National Monument –By the President of the United States of America - A Proclamation", in The Hillier Group, 201.
[83] Geier, Brown, Renfrow, 21.
[84] Geier, Brown, Renfrow, 27 and Pinsker, 172.
[85] The Hillier Group, 4.
[86] Geier, Brown, Renfrow, 28.

Window fenestration is similar to that of the original house, as jib doors are placed at the southern façade where the ornate cast-iron balcony used to sit. The majority of the windows are six-over-six double-hung sash and lugged architraves, except for casement windows marking the attic level within the gable ends.[87] Basement windows are paired or single four-light, square windows. A prominent feature of the addition's north elevation is a bay window with diamond-light casements, adding to the Gothic Revival character of the building.

The exterior of the Lincoln Cottage has not been altered significantly since this time period with the exception of re-installing the cast-iron balcony at the western end of the south elevation to allow for a veranda to be built onto the addition, extending east and connecting with the original porch. In 1962 an elevator shaft was installed at the south end of the western elevation; in 1996 the stucco was replaced for the second time (first time being in 1897) in addition to replacing slate shingles and metal roofing with asphalt. Cosmetic changes such as paint color have also altered the exterior of the building.[88] Several historic windows were removed to accommodate air-conditioning units or mechanical vents.

[87] The Hillier Group, 5.
[88] The Hillier Group, 6.

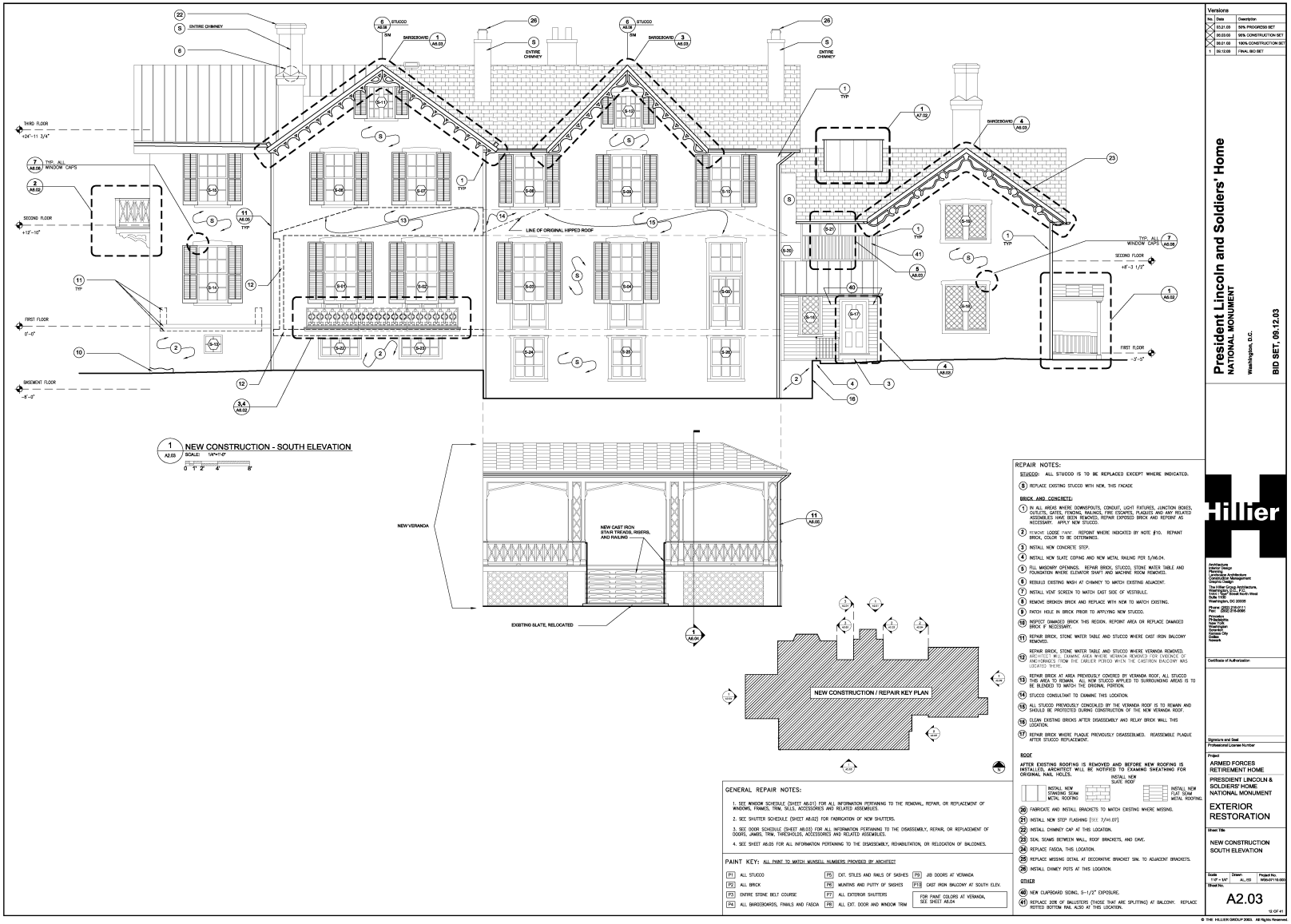

Figure 3.2 South Elevation, Hillier Architecture Bid Set 09.12.03, A2.03

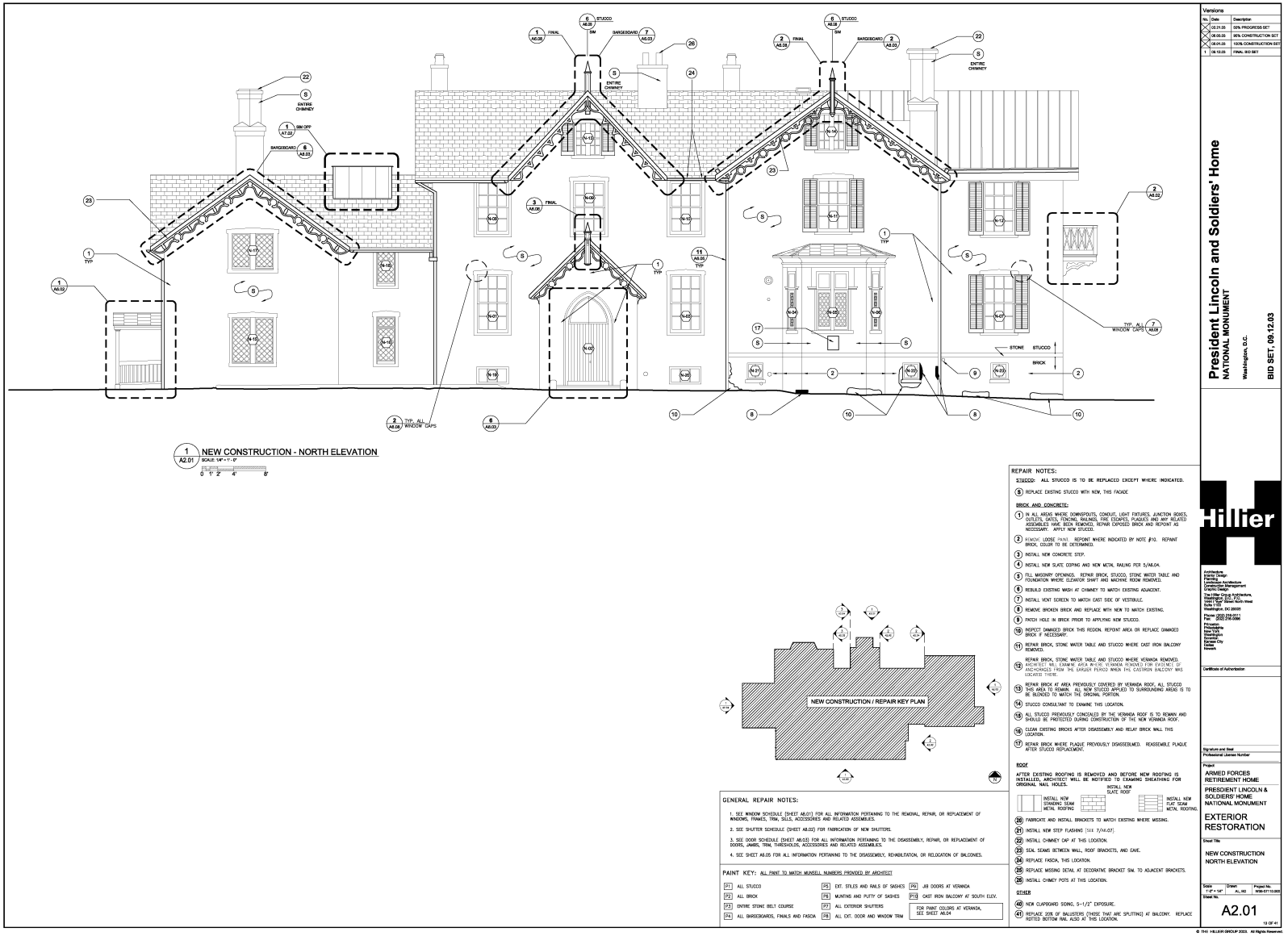

Figure 3.3 North Elevation, Hillier Architecture Bid Set 09.12.03, A2.01

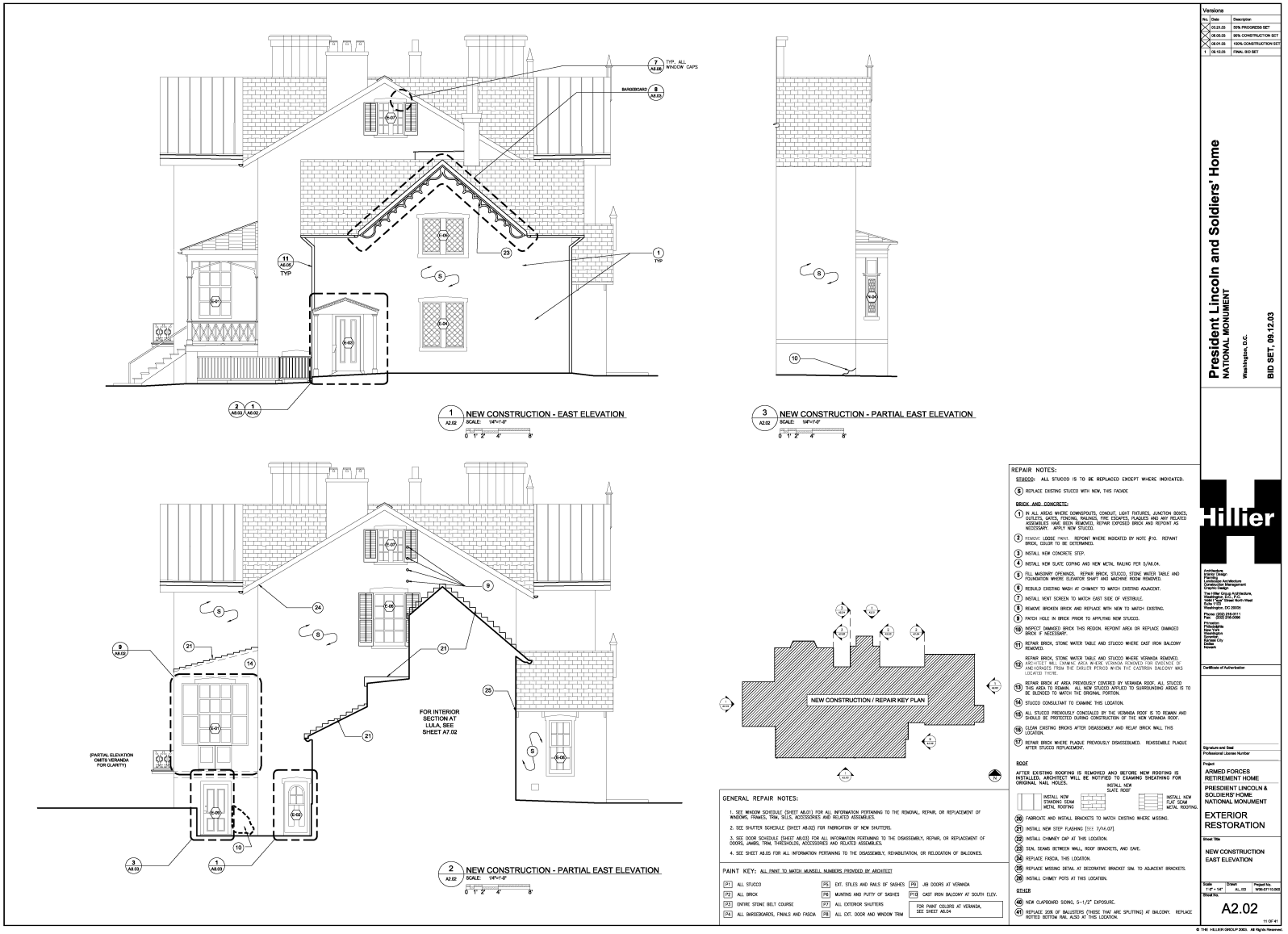

Figure 3.4 East Elevation, Hillier Architecture Bid Set 09.12.03, A2.02

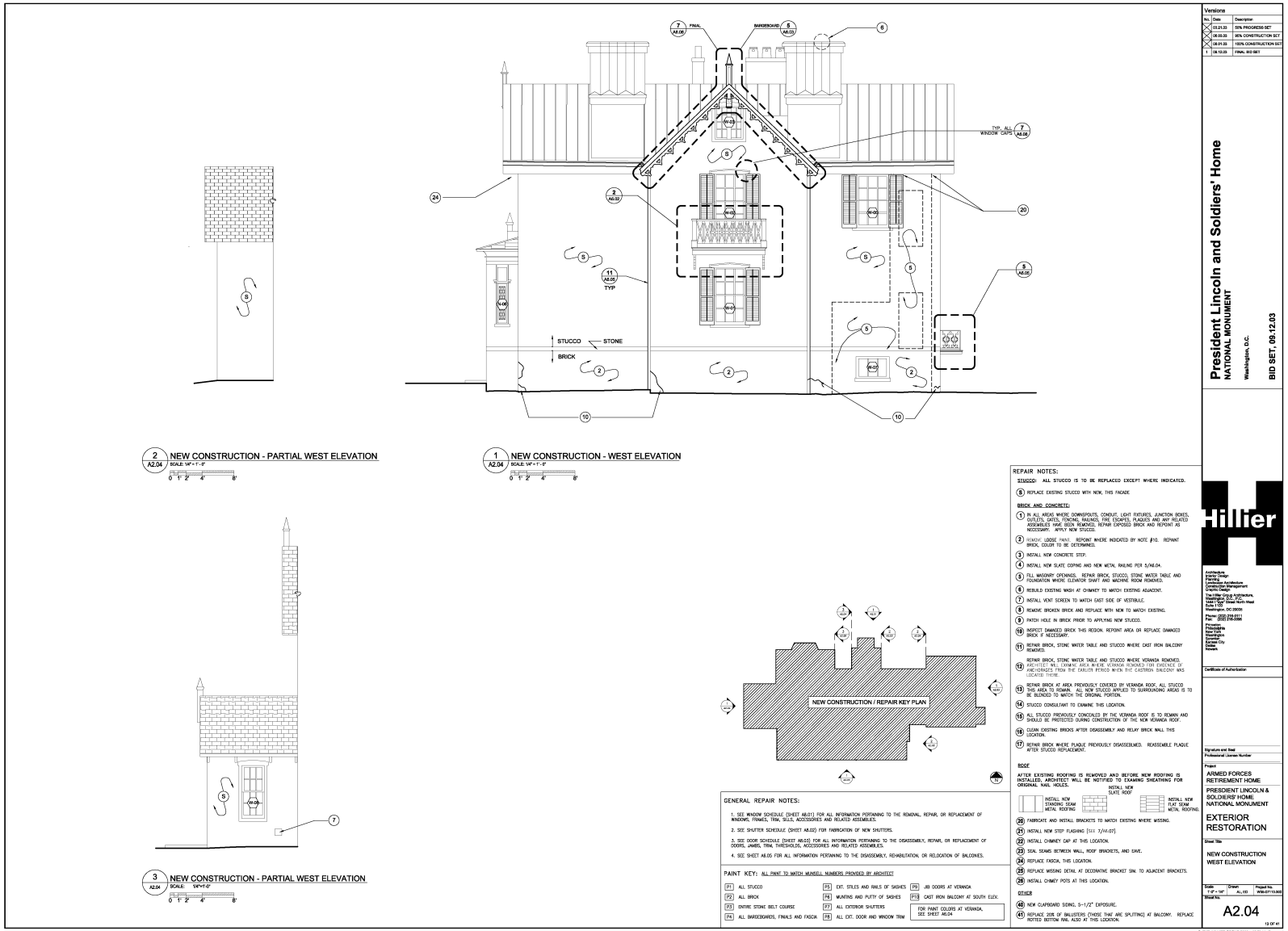

Figure 3.5 West Elevation, Hillier Architecture Bid Set 09.12.03, A2.04

A Retreat for the Lincoln Family

In the midst of anguish over the loss of their twelve-year-old son Willie in February of 1862, the Lincolns made their way into the higher grounds of Washington D.C. where they hoped for respite and protection from the progressing Civil War. Ironically, their destination was the Soldiers' Home where they would reside in the old home of George W. Riggs; the site housed wounded soldiers, and the incessant sound of cannon fire was a constant reminder of President Lincoln's duty as Commander in Chief of a warring nation. Matthew Pinsker writes,

> Situated directly next to the asylum, the Riggs home was comfortable but offered constant reminders about the painful stakes of military conflict. Crippled veterans regularly filled the nearby paths. One side of the elegant cottage now also faced a national military cemetery, hastily dedicated after the defeat at Bull Run and, by the summer of 1862, full of fresh graves. Thus, even while attempting to escape from their private grief and the national crisis, the Lincolns still found themselves surrounded by the somber echoes of war.[89]

Despite this deterrent, the Lincoln's would continue to return every summer of his presidency, spending a total of thirteen months and almost one quarter of his term at this "Summer White House".

President Buchanan had previously spent time at the Soldiers' Home, as did several presidents after Lincoln including Rutherford B. Hayes and Chester A. Arthur, and may have suggested the home as a retreat for the mourning Lincolns.[90] The pastoral landscape and private cottage, with a view down to the Capitol, were certainly a welcome change from the constant stress of the White House and swampy downtown Washington D.C.

The Lincolns first moved to the cottage in mid-June of 1862, staying until early November. The next year they returned for about 5 months and in 1864 their stay was slightly

[89] Pinsker, 5.
[90] Pinsker, 186.

shortened from early-July to mid-October due to mounting stresses of the war.[91] They would not return again, as President Lincoln was assassinated on April 14, 1865 just shortly before they were to go back to their beloved summer home.

The Soldiers' Home served as a retreat for the Lincoln family, although the president rode downtown almost every day and returned in the evenings. A detailed account of Lincoln's association with the Soldiers' Home is available in Matthew Pinsker's recently published account, *Lincoln's Sanctuary: Abraham Lincoln and the Soldiers' Home.* The National Trust for Historic Preservation commissioned Pinsker to research this subject, as very little was previously known about the Soldiers' Home and how Lincoln's presidency was affected by his time spent there.

In the forward to this book, Gabor Boritt writes, "Pinsker's book suggests that the privacy afforded the president by the Soldiers' Home, the quiet it gave him to think deeply, and the interaction with common people that the place and the daily travel to and from the White House allowed provided Lincoln with an important part of the power he needed to lead as perhaps no other president has done before or since."[92] The research and discoveries that Pinsker made will aid immensely in the interpretation of this site as a future house museum and as the leading source of information about Abraham Lincoln's life as president.

Many people saw Lincoln come and go on his daily commutes to the White House, but a renowned writer who often witnessed this trek, offers possibly the best description in his wartime journal dated Wednesday, August 12, 1863. Walt Whitman writes:

> I SEE the President almost every day, as I happen to live where he passes to or from his lodgings out of town. He never sleeps at the White House during the hot season, but has quarters at a healthy location some three miles north of the city, the Soldier's home, a United States military establishment. I saw him this

[91] Pinsker, 5.
[92] Pinsker, xi.

> morning about 8 ½ coming in to business, riding on Vermont Avenue, near L Street. He always has a company of twenty-five or thirty calvary, with sabres drawn and held upright over their shoulders. They say this guard was against his personal wish, but he let his counselors have their way. The party makes no great show in uniform or horses. Mr. Lincoln on the saddle generally rides a good-sized, easy-going gray horse, is dress'd in plain black, somewhat rusty and dusty, wears a black stiff hat, and looks about as ordinary in attire, &c., as the commonest man. A lieutenant, with yellow straps, rides at his left, and following behind, two by two, come the calvary men, in their yellow-striped jackets. They are generally going at a slow trot, as that is the pace set them by the one they wait upon. The sabres and accoutrements clank, and the entirely unornamental *corte`ge* as it trots towards Lafayette square arouses no sensation, only some curious stranger stops and gazes. I see very plainly ABRAHAM LINCOLN'S dark brown face, with the deep-cut lines, the eyes, always to me with a deep latent sadness in the expression. We have got so that we exchange bows, and very cordial ones. Sometimes the President goes and comes in an open barouche. The calvary always accompany him, with drawn sabres. Often I notice as he goes out evenings-and sometimes in the morning, when he returns early-he turns off and halts at the large and handsome residence of the Secretary of War, on K street, and holds conference there. If in his barouche, I can see from my window he does not alight, but sits in his vehicle, and Mr. Stanton comes out to attend him. Sometimes one of his sons, a boy of ten or twelve, accompanies him, riding at his right on a pony. Earlier in the summer I occasionally saw the President and his wife, toward the latter part of the afternoon, out in the barouche, on a pleasure ride through the city. Mrs. Lincoln was dress'd in complete black, with a long crape veil. The equipage is of the plainest kind, only two horses, and they nothing extra. They pass'd me once very close, and I saw the President in the face fully, as they were moving slowly, and his look, though abstracted, happen'd to be directed steadily in my eye. He bow'd and smiled, but far beneath his smile I noticed well the expression I have alluded to. None of the artists or pictures has caught the deep, though subtle and indirect expression of this man's face. There is something else there. One of the great portrait painters of two or three centuries ago is needed.[93]
>
> -Walt Whitman, "Abraham Lincoln,"
> No. 45 (August 12, 1863), *Specimen Days*

This detailed account of Walt Whitman's presidential viewing appropriately describes the deep emotions that President Lincoln must have been bearing at that time. According to letters and diaries kept my Mrs. Lincoln, their respite at the Soldiers' Home was welcome and a cause for joy, if somewhat restrained. She wrote in a letter dated August 25, 1865 to Elizabeth Blair Lee, "How dearly I loved the "Soldiers' Home" & I little supposed, one year since, that I should

[93] Pinsker, xiii.

be so far removed from it."[94] The Lincolns were preparing for their fourth summer at the Soldiers' Home when the president was assassinated; he rode out to visit the home the day before he was fatally shot by John Wilkes Booth.[95]

In addition to relief from his emotional anguish, President Lincoln also formulated many of his policies throughout the Civil War while residing at the cottage. Of utmost importance is his writing of the second draft of the Emancipation Proclamation, which by several accounts was completed at the Soldiers' Home in September of 1862, although this has not been officially confirmed.[96] The famous painter Frances B. Carpenter describes the way Lincoln related this event to him in February 1864:

> Finally came the week of the battle of Antietam. I determined to wait no longer. The news came, I think, on Wednesday, that the advantage was on our side. I was then staying at the Soldiers' Home (three miles out of Washington). Here I finished writing the second draft of the preliminary proclamation; came up on Sunday; called the Cabinet together to hear it and it was published on the following Monday.[97]

There has been much discussion as to the validity of various accounts of this historic act, but Carpenter's description, although it was written two years after the event, seems to bear truth. Francis Carpenter was a well-known painter who frequently worked in the White House and who wrote his own memoir shortly after Lincoln's death. The Emancipation Proclamation was indeed published on Monday September 22, 1862 and distributed to the public on Tuesday September 23, 1862.[98]

The President Lincoln and Soldiers' Home National Monument has an ongoing history, which includes serving as the summer home for several other presidents including President

---

[94] Geier Brown Renfrow, "Study for Restoration," in *The Lincoln Cottage Pre-Design Study Report*, The Hillier Group, 9.
[95] Pinsker, 204.
[96] Earl Schenck Mieres, ed., "Day By Day," in *The Lincoln Cottage Pre-Design Study Report*, The Hillier Group, 8.

Hayes from 1877-1880 and President Arthur from 1882-1884.[99] In 1884 President Cleveland purchased his own summer White House, and the Soldiers' Home chose to convert the cottage into an infirmary, which was cause for interior renovation and modifications. For the most part the home served this same purpose until recently, as well as being used as offices and dormitory space.

The Lincoln era has been chosen as the most significant time period in the history of the President Lincoln and Soldiers' Home National Monument. Many books have been written on the life of Abraham Lincoln; from his upbringing in Illinois, to his pursuit in law, and on to the presidency. There have been books analyzing his Civil War policies, his merit as a leader, and the overarching influence that this man had on our country's history. The sheer number of tomes that exist prove the significance and interest in Abraham Lincoln, but until quite recently, very little was known about the Soldiers' Home and how it influenced Lincoln's presidency.

The President Lincoln and Soldiers' Home National Monument will soon be brought back to life and will be introduced to the public as the premier center for Abraham Lincoln studies. Much preliminary research and architectural investigation has taken place to plan for the restoration and interpretation of this site. The players involved have been numerous. Very soon this Gothic Revival beauty will return to its Lincoln-era state of glory and will be revealed to those still unaware of its significance. Lincoln scholars, history buffs, military veterans and students will see a new side of their hero, will wander the home where he anguished over the Civil War, will experience much more than can ever be found in the pages of a book.

---

[97] Geier Brown Renfrow, 31.
[98] Pinsker, 31.
[99] William J. Clinton, "President Lincoln and Soldiers' Home National Monument – A Proclamation," in The Hillier Group, 201.

2000-2005: Planning for a New Life

Figure 3.6 View of the south side of the property, Sherman Building on the right

The President Lincoln and Soldiers' Home National Monument bears a recent history that attempts to bring the home back into the public spotlight. For years, residents of the Soldiers' Home have shared folklore about Lincoln's stay there, but there were never any attempts to preserve this legacy. In 1973 the cottage, three adjacent pre-Civil War buildings, and six surrounding acres of land on the U.S. Soldiers' and Airmens' Home property (former name of Armed Forces Retirement Home) were designated as a National Historic Landmark.

The National Register nomination lists military and political significance as the basis for nomination, but makes no mention of architectural significance, despite the cottage being one of the only extant examples of Early Gothic Revival architecture in Washington D.C. The chief basis for nomination is the property's historical significance as the only surviving military

asylum of three that were founded in 1851.[100] The lack of detail in the National Register nomination reveals how far researchers have come in realizing the architectural significance of the cottage and the property's association with President Lincoln.

On July 7, 2000, President William J. Clinton declared the cottage and the surrounding 2.3 acres as the President Lincoln and Soldiers' Home National Monument. Efforts to gain national recognition for the home were spearheaded by then First Lady Hillary Rodham Clinton and the National Trust for Historic Preservation, who had included the site on their annual list of America's 11 Most Endangered Historic Places in 2000.[101] The status of National Monument affords the home protection under federal law and assigns the Armed Forces Retirement home this task:

> For the purpose of preserving, restoring, and enhancing the public's appreciation of the monument, the Armed Forces Retirement Home shall prepare, in consultation with the Secretary of Interior through the National Park Service, a management plan for this monument within three years of this date. Further, to the extent authorized, the Armed Forces Retirement Home shall promulgate, in consultation with the Secretary of the Interior through the National Park Service, regulations for the proper care and management of the objects identified above.[102]

Since this date, the National Trust for Historic Preservation has formed a partnership with the Armed Forces Retirement Home to bring the national monument into the public spotlight through stewardship, restoration efforts, and ultimately opening the cottage as a house museum, scheduled for 2007. The President Lincoln and Soldiers' Home National Monument will be restored under museum-quality specifications to a period of significance between 1862 and 1864, when Lincoln and his family resided there.

---

[100] Benjamin Levy and Blanche M. Higgins, *National Register of Historic Places Inventory-Nomination Form for U.S. Soldiers' and Airmens' Home,* (Washington D.C.: National Park Service, 1973), in The Hillier Group, 194.
[101] Richard Moe, "Afterword", in Pinsker, 189.
[102] William J. Clinton, "President Lincoln and Soldiers' Home National Monument – A Proclamation", in The Hillier Group, 201.

A great deal of activity commenced after President Clinton's proclamation, and the subsequent 4 years have been prolific in the sense of information gained through historical research and architectural investigations. In September 2000 The Hillier Group of Washington D.C., now called Hillier Architects, was hired to thoroughly analyze the home and prepare a restoration plan, building on the *Anderson Cottage Historic Structure Report* that Geier Brown Renfrow Architects published on February 20, 1985 and their follow-up *Preservation Plan* from July of the same year. The Hillier Group's *Lincoln Cottage Pre-Design Study Report* was issued on January 31, 2001 with a later revision being published January 17, 2003.[103] The study analyzes current conditions of the cottage, identifies significant historic features, establishes a program for future visitors, and recommends restoration measures to protect historic features.

Equally important to the architectural history and restoration, is placing the site in context with the time period and figures being interpreted. The key step taken by the National Trust for Historic Preservation was to commission historian Matthew Pinsker to perform an in-depth study of Abraham Lincoln's connection with the Soldiers' Home, and subsequently publish this research in his historical account, "Lincoln's Sanctuary – Abraham Lincoln and the Soldiers' Home (2003)". Without the knowledge gained of Abraham Lincoln's daily and private life in connection with his civic persona and how it relates to the Soldiers' Home experience, the interpretive approach that the National Trust seeks would not be possible.

Late in 2004 the bidding process began to hire a general contractor and restoration contractor to oversee exterior restoration of the President Lincoln and Soldiers' Home National Monument. J.S. Cornell and Associates was hired as the general contractor and Historic Structures' Stephen Ortado, as the restoration contractor. Numerous subcontractors were also brought on to restore masonry, stucco, roofing, and other aspects of the exterior restoration.

---

[103] The Hillier Group, 1.

In addition to being hired as the restoration contractor, Stephen Ortado was also enlisted because of his expertise with historic window restoration. The Historic Structures crew spent the next year (and counting) meticulously restoring all 59 windows to museum-quality specifications. Exterior restoration is expected to be completed within the next few months and interior restoration will start soon thereafter; by 2007 the entire cottage will have been restored to an interpretive period spanning three years that the Lincolns resided there.

The remainder of this thesis will focus on an analysis of the window restoration process at the President Lincoln and Soldiers' Home National Monument, including a discussion of planning methods and restoration procedures, as well as the unique technology and techniques employed. These methods will be compared with conventional wood window restoration procedures as discussed in the second chapter, and recommendations will be made to translate the information to other historic properties.

CHAPTER 4

Window Restoration at the President Lincoln and Soldiers' Home National Monument

Figure 4.1 Casement Window, President Lincoln and Soldiers' Home National Monument

Planning and Documentation of Window Restoration

To ensure that a minimal amount of historic fabric was lost, a great deal of research, investigation, and planning occurred before window restoration began. Players involved in the planning process made decisions regarding window treatment based on historical research such as builder's specifications, historic structure reports, and advice from the National Park Service. Much of the planning was ongoing due to the nature of restoration work; problems are not always apparent upon initial investigation, as a building must be deconstructed to truly understand its nature.

In February 1985, Geier Brown Renfrow Architects produced the *Anderson Cottage Historic Structure Report* and a subsequent *Study for the Restoration of Anderson Cottage* in August of that year. The reports were an account of property history, architectural description, and conditions assessment. Initial activity to develop a restoration strategy was slow; it was not until 2000 when the cottage was designated as a National Monument, that a solid restoration plan for the President Lincoln and Soldiers' Home National Monument began to form.

The Hillier Group of Washington D.C. was hired in September 2000 to lead a design team in analyzing the cottage, with an initial duty to build on the Geier Brown Renfrow reports. Much of the information in Hillier's *Lincoln Cottage Pre-Design Study Report* came from those reports, with additional research to determine existing conditions, identify significant spaces and features, establish a public visitation program, and recommend restoration treatments.[104]

[104] The Hillier Group, 1.

A significant goal of the design team was to assess existing window conditions and produce a window schedule that identified each unit with number, type, size, and needed repair (see *Figure 4.2).* Basic repair procedures were spelled out for four treatment options: 1) repair and reinstall all sash in original location and configuration, 2) repair and reinstall sash in new configuration, 3) fabricate and install replacement window to match specific existing window, 4) reinstall existing window currently in storage on site.[105]

The window identification number is labeled on elevations to aid in identifying window location. This is helpful if the entire bid set is on hand, but the large set of drawings is quite cumbersome and often not available. An easy solution would have been to include corresponding room numbers for each window on the schedule, with floor plans on-site, designating room numbers for cross-reference. In the first stages of restoration Historic Structures developed their own window schedule with corresponding room numbers and conditions, accompanied by smaller floor plans. This window schedule is portable and easy to cross-reference when information is needed.

The Secretary of the Interior's Standards

The President Lincoln and Soldiers' Home National Monument has great historical and architectural significance and has been included in the National Register of Historic Places, is a contributing resource to a National Historic Landmark, and is a National Historic Monument.[106] Because the property is federally owned, any changes to the property must be reviewed under

[105] Hillier Architecture, *Window Schedule for the President Lincoln and Soldiers' Home National Monument,* Washington D.C., Bid Set 09.12.03, Sheet A8.01. A bid set is the complete series of construction drawings for a project produced by an architect or engineer. There can be several versions, as plans are revised, hence the date. Computer Aided Design is generally used to produce renderings in today's market rather than drafting by hand.
[106] The Hillier Group, 1.

Section 106 of the 1966 National Historic Preservation Act.[107] In addition, the restoration project receives federal funding and therefore must also comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The work at the cottage falls under the categories of restoration, preservation, and rehabilitation. As directed by President Clinton when he proclaimed the property a National Historic Monument, "in managing the monument, the Armed Forces Retirement Home shall consult with the Secretary of the Interior through the National Park Service."[108]

The National Park Service was enlisted to play a very important role in window restoration at the President Lincoln and Soldiers' Home National Monument. In 2003, experts at the Historic Preservation Training Center (HPTC) in Frederick, Maryland served as agents of the National Park Service to develop a time estimate and treatment protocol for historic window sash preservation. The HPTC preserved eight sash and two jib doors (five entire units) from the cottage in compliance with Secretary of Interior's Standards.[109] Key officials from the HPTC were Chris McGuigan, NPS Exhibits Specialist, and Thomas McGrath, HPTC Superintendent.

---

[107] The National Historic Preservation Act of 1966 is the federal law protecting historic and archeological resources. Under the provisions of Section 106, federal agencies must alert State Historic Preservation Officers and the Advisory Council on Historic Preservation to any federal project that might affect historic properties so they can identify ways to avoid or minimize adverse impacts to these properties. This is only advisory, and the federal agency has the final say in proceedings. From Samuel N. Stokes, A. Elizabeth Watson and Shelley S. Mastran, *Saving America's Countryside: A Guide to Rural Preservation,* (Baltimore: The Johns Hopkins University Press, 1997), 325.

[108] President William Clinton, *President Lincoln and Soldiers' Home National Monument-By the President of the United States of America-A Proclamation.*

[109] Task Agreement Number 003 between The United States Department of the Interior, National Park Service National Capital Region, Historic Preservation Training Center, and the National Trust for Historic Preservation in the United States for *The Preservation of Historic Window Sash from the President Lincoln and Soldiers' Home National Monument and the Development of Associated Time Estimates and Treatment Protocol*, (Washington D.C.: September 2, 2003) 1.

The HPTC reviewed and modified treatments recommended by Hillier Architecture, then prepared a time estimate based on how long it took to complete each of the ten window sash/doors.[110] The methods used for preservation were then recorded for the Final Draft Treatment Protocol (February 11, 2004), which is the official procedure that must be followed for all window restoration at the cottage.[111] The conservation philosophy decided on is "Retention Preferable to Replacement, which means repair strategies are designed to maximize the retention of historic fabric while making the windows weather resistant for long-term use and serviceable for cyclical maintenance. The key principle is to minimize water infiltration, the cause of cracking, checking and deterioration of wooden sash and door elements." [112] The goal is to produce museum-quality restoration with a 100 year solution.[113]

The HPTC began onsite project work on September 30, 2003 and submitted weekly reports thereafter, detailing work performed, projected work for the upcoming week, safety, weather, personnel on project, and general comments. Besides sash removal and reinstallation, most work was done at the training center in Frederick. Methods described in the protocol will be discussed later in *Execution of Restoration.* Minutes from a November 11, 2003 meeting at the HPTC with key players can be found in the appendix. The minutes are a valuable demonstration of the thought process and chief goals desired for this restoration. The Historic Preservation Training Center's commitment was fulfilled with submission of the Final Draft Treatment Protocol on February 11, 2004.

---

[110] Chris McGuigan, *The Preservation of Historic Window Sash and Doors from the President Lincoln and Soldiers' Home National Monument Final Draft Treatment Protocol*, National Park Service, Historic Preservation Training Center, Frederick, MD: February 11, 2004, 10.
[111] Task Agreement Number 003, 2.
[112] Chris McGuigan, *Final Draft Treatment Protocol*, 1.
[113] Minutes from November 12, 2003 meeting at the Historic Preservation Training Center in Frederick, MD, 2.

J.S. Cornell and Associates won the bid for general contractor; Bill Shainline is their representative and Project Manager. Bill has a joinery shop at his home in Pennsylvania and will make replacements for seven sash that are either non-historic, have been reconfigured, or are beyond repair, according to window schedule procedures #3 and #4.[114] He will also mill shutters, window casings, muntins, parting beads, and stops when replacement parts are needed. Stephen Ortado of Historic Structures was awarded the bid to restore the remaining 47 window units (48 total sash) according to protocol and serve as Site Supervisor. Much of their work overlaps, as Historic Structures crew still have to glaze, paint, and install replacement sash.

Much of the planning for window restoration is ongoing as the project proceeds. A meeting is held every week with Richard Ortega, Andrea Lowery, David Overholt, Bill Shainline, and Stephen Ortado to discuss issues regarding the entire exterior restoration. Submittals and quality control panels are a very important step that contractors take to have proposed work and products approved by the architects and Preservation Projects Director.

Submittals include schedules, measured drawings, and product samples. As each phase of restoration begins, drawings are made of historic components that are to be removed (for record of what once was) and proposed reconfiguration. Samples of all products such as paint, epoxy, glazing compound, wood filler, and many more are submitted for approval. Quality control panels are samples of work, such as dutchman repair or glazing technique, that are approved before the remainder of work commences.

There is a great deal of discussion amongst architects and supervisors to ensure that problems are solved with appropriate but realistic solutions. However, satisfactory solutions were not always forthcoming, and there is quite often miscommunication regarding treatment options, procedure, and protocol. A major cause of this problem is the lack of proximity of the

[114] Hillier Architecture, *Window Schedule*, A8.01.

window restoration workshop to the actual job site. The shop is located on the Armed Forces Retirement Home Property but is approximately a half-mile away, just a little too far out of reach for easy access. The window restoration crew is often working in the shop for extended periods of time with little supervision. Mistakes and miscommunication are inevitable with such a large project and numerous people involved, but errors could have been prevented if regular trips were made to the shop to check progress. Another factor contributing to miscommunication is the hierarchy of supervisors; it is often unclear who to report to when questions or concerns arise.

Documentation of Historic Fabric and Restoration Progression

An important aspect of the planning process is extensive documentation of project progression. Recording all aspects of an historic restoration, especially for museum-quality restoration such as this, is extremely important for future investigation. Future historians or conservators may have questions regarding the nature of materials, construction techniques, or history of the property. Imagine if previous alterations to the building's fabric had been thoroughly recorded – the vast amount of time recently spent on investigation into building materials and construction would have been greatly minimized. This project is adding, and occasionally removing, another layer of history to the President Lincoln and Soldiers' Home National Monument, which is imperative to record for future investigations.

The author was the Project Documentation Specialist in charge of recording all selective removals, investigations, material changes, and repairs for each phase of exterior restoration and for all trades. Documentation was accomplished through photography, written statements, and measured drawings of existing conditions and final product. A daily log was kept of all work

performed, weather conditions, and participants; this was then compiled in a weekly report for the architects and supervisors.

Another duty of the Project Documentation Specialist was to archive all historic material removed from the building, whether it was to be reinstalled, or simply recorded as historic artifacts. Each piece of historic fabric was tagged with an item description, date, property owner, and who removed the architectural fragment. Then an Architectural Fragments Field Inventory Form was filled out with the above information as well as materials/finish, condition/ conservation requirements, storage location, and additional remarks. All smaller items were placed in sealed bags and everything was stored in Room 302 of the house.

Archival documentation for window components followed the same protocol, with several additional steps. All hardware including pulleys for sash weights, screws, and sash locks were bagged, labeled, and stored until sent for cleaning. Each double-hung sash was stamped with window location and number (keyed to Hillier window schedule; example: N-03) on the side of one stile with a number/letter punch kit and hammer; casement windows were stamped on the top of the top rail. All parting beads and stops were stamped on the flat edge with the corresponding window number, and bundled in sets with masking tape (also labeled with window number) to be transported to the shop. The stamp leaves a permanent but inconspicuous indentation in the wood that will be visible even when painted. All glass was labeled with a permanent marker as to location and orientation within the sash, so historic glass can be returned to the proper light.[115]

The duties of a documentation specialist could have comprised a full-time position on this project, however the author's time was greatly weighted toward actual window restoration. The National Trust for Historic Preservation and the Armed Forces Retirement Home place great value in careful documentation, but not enough time was allowed to thoroughly fulfill these needs. When interior restoration begins, a full-time employee needs to be hired to approach documentation from a holistic point of view, with resources available (mainly time) for thorough documentation.

The first step that Historic Structures took when commencing window restoration in February 2004, was to document basic window conditions and create a window schedule for cross-reference with Hillier Architecture construction drawings. Film and digital photographs were taken of all windows; each photo was recorded with an inventory form relaying location, film speed/type, photographer, and date. The development process for film became cost prohibitive and cumbersome, so from that point on only digital photographs were taken. This makes documentation much easier, as digital photos can be individually labeled and saved onto disks at regular intervals. Photographs have been taken throughout the window restoration process to record conditions, every repair, and unusual circumstances that arise.

The window schedule contains window number (corresponding with Hillier schedule), room number (corresponding with Hillier floor plans), and overall window condition prior to restoration including any broken panes or obvious deterioration of sash and frame.[116] This window schedule is very helpful in correlation with 8 ½" x 11" floor plans, which are easy to carry around the site when performing further documentation.

---

[115] Chris McGuigan, *Final Draft Treatment Protocol,* 2.
[116] Paige Wojcik, *Lincoln Cottage Window Conditions Prior to Restoration, (Window Schedule),* February 9, 2004.

Another important aspect of documentation is maintaining as-built drawings; as selective removal or restoration occurs, each item is marked with the date on the corresponding page in Hillier Bid Set 9.12.03. This is an area of documentation duties that caused the most difficulty. The process is simple enough, but because a great deal of time was spent in the shop working on windows while exterior restoration continued at the cottage it was difficult to track progress of all trades while not on-site.

Historic Structures maintained their own as-built drawings for each individual window unit. Sketches of each unit labeled with window number and type were drawn and organized in a binder by elevation. Broken panes were marked with an "X" and can be compared with original conditions in the Historic Structures window schedule. All areas of repair are shaded and labeled as to type of repair, and the location of identification stamp and paint sample are marked.[117]

[117] Paige Wojcik, *Compilation of Field Sketches of Each Window Unit with Repairs and Documentation, 2004.*

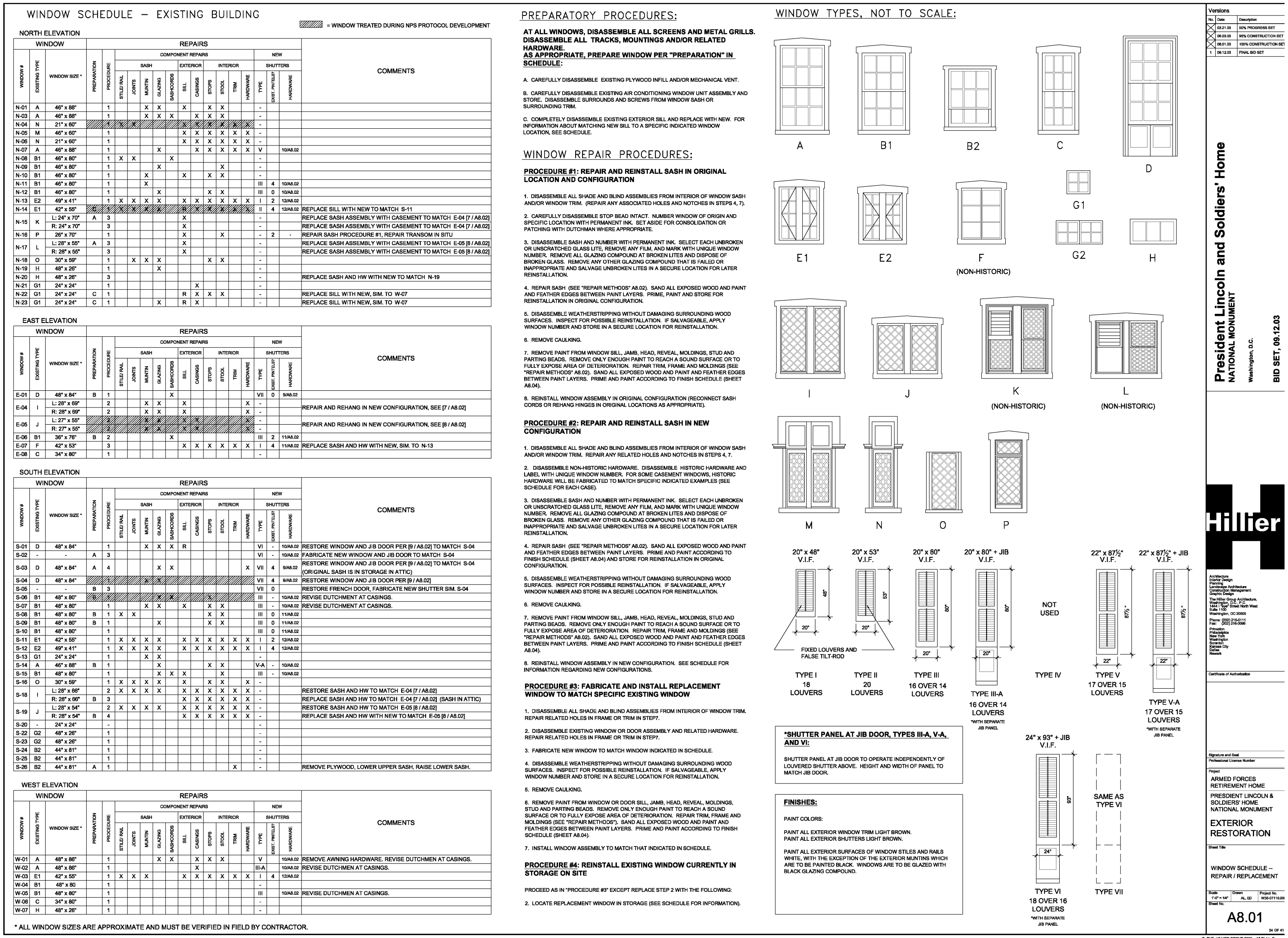

Figure 4.2 Window Schedule, Hillier Bid Set 9.12.03, Sheet A8.01

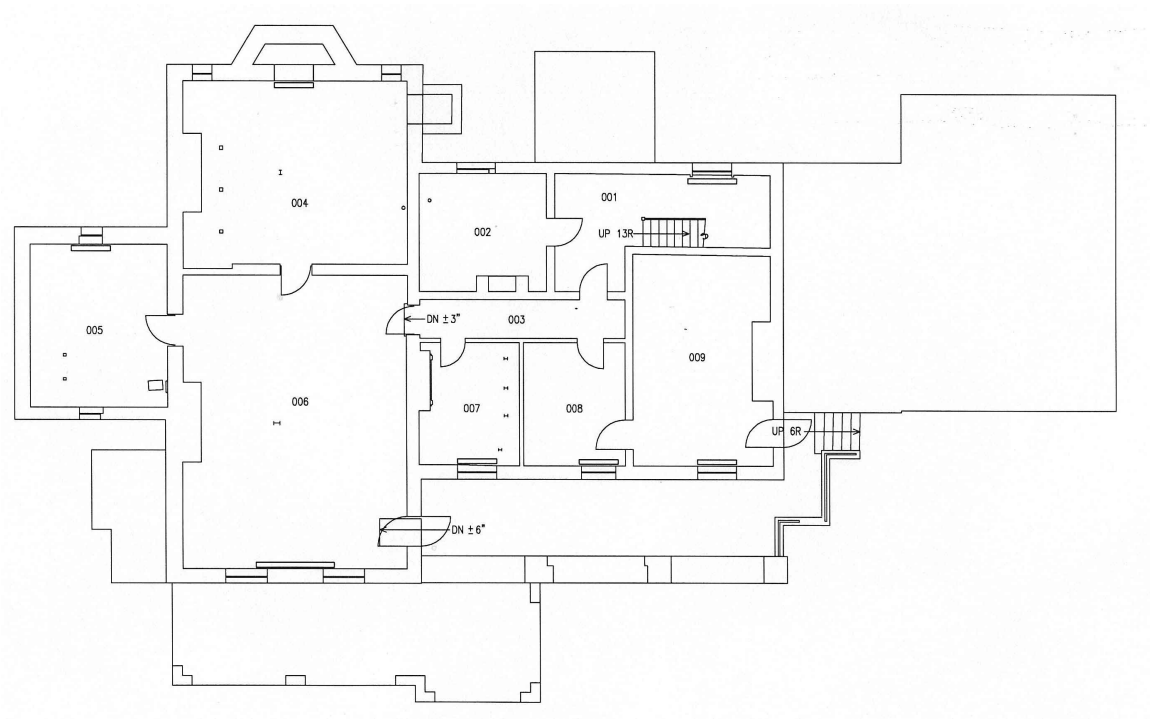

Figure 4.3 Basement Plan, President Lincoln and Soldiers' Home National Monument, Hillier Architecture, Washington, D.C. 2001.

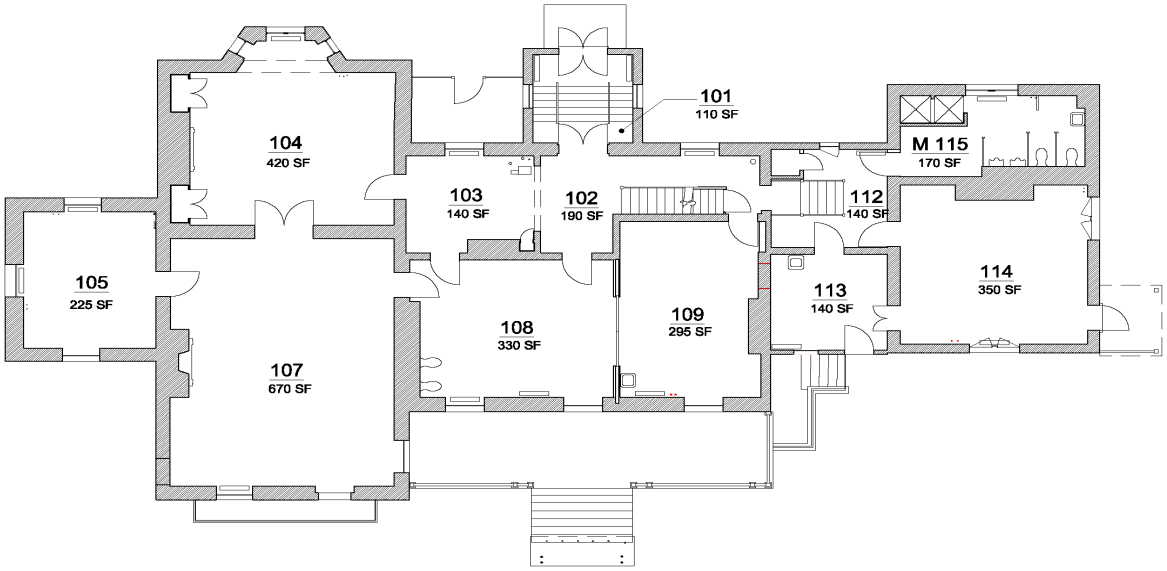

Figure 4.4 First Floor Plan, President Lincoln and Soldiers' Home National Monument Hillier Architecture, Washington, D.C. 20004.

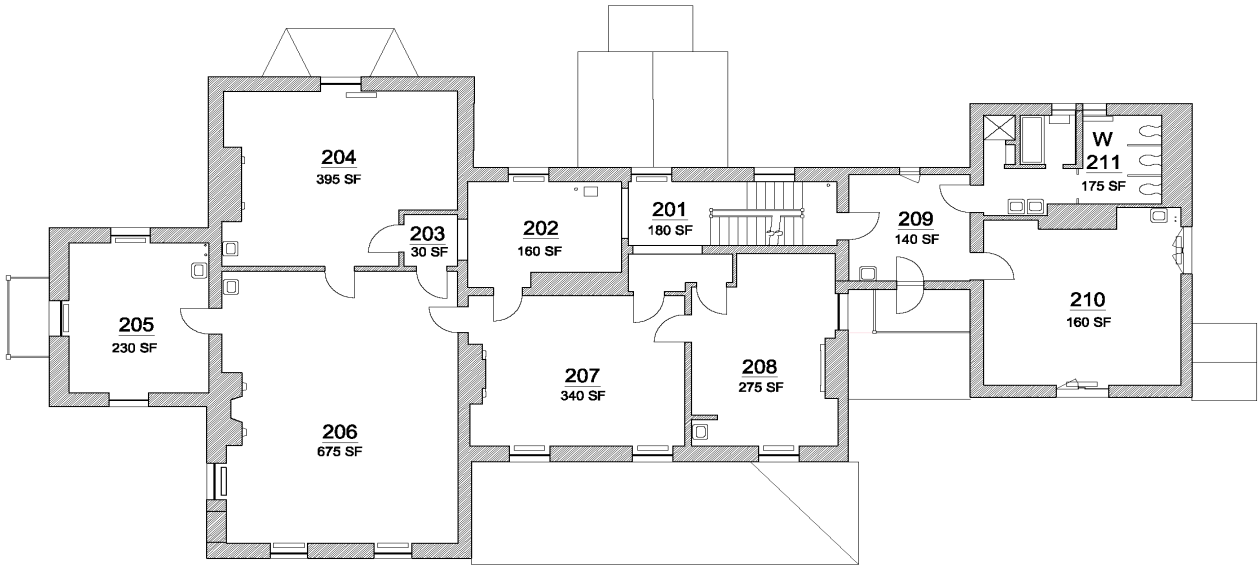

Figure 4.5 Second Floor Plan, President Lincoln and Soldiers' Home National Monument Hillier Architecture, Washington, D.C. 2004.

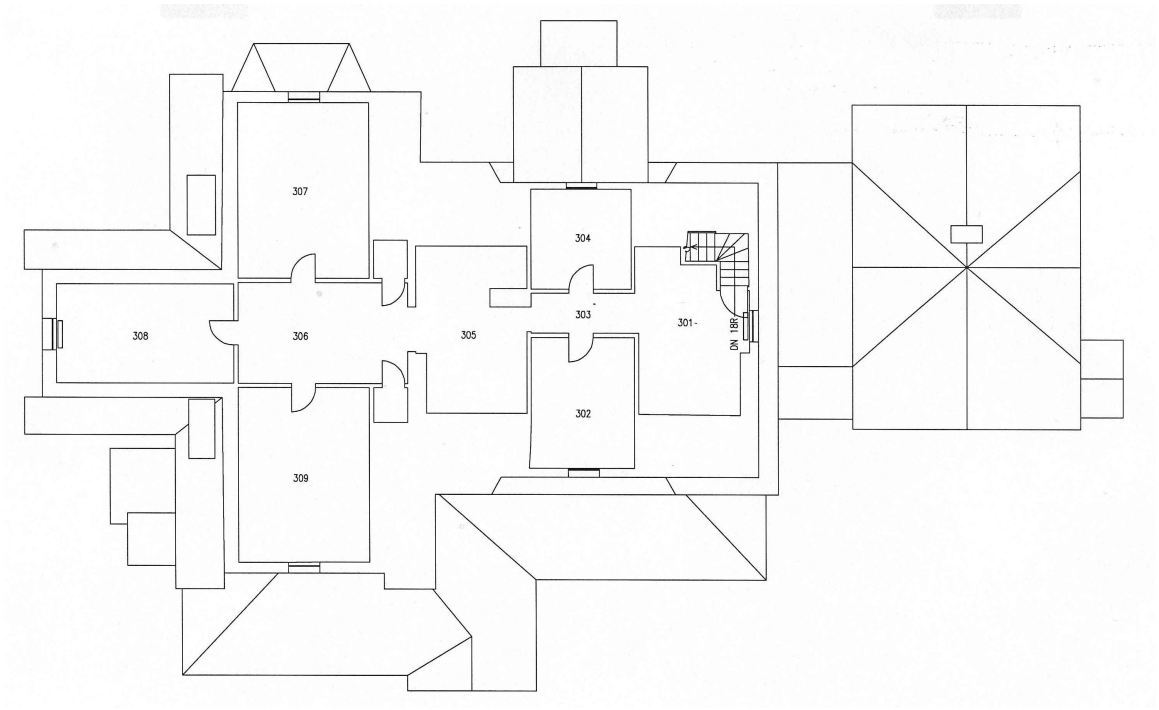

Figure 4.6 Third Floor Plan, President Lincoln and Soldiers' Home National Monument Hillier Architecture, Washington, D.C. 2001.

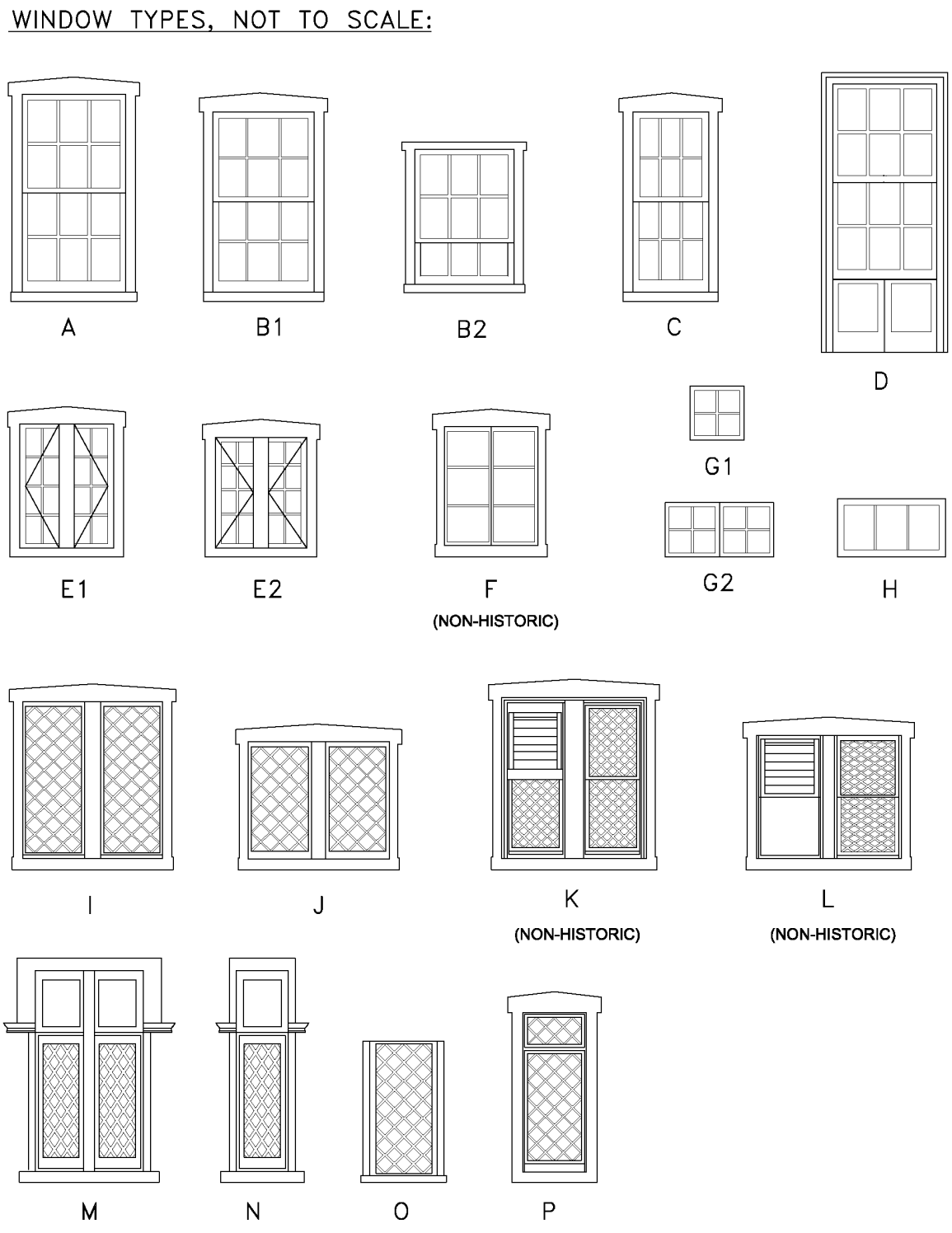

Figure 4.7 Window Types found at the President Lincoln and Soldiers' Home National Monument, Hillier Architecture Bid Set 9.12.03, sheet A8.01

Window Types, Construction, and Design

The President Lincoln and Soldiers' Home National Monument is fortunate to have many extant historic windows in its stock. Fifty-eight window units pierce the walls of the cottage and all but three are historic, although they date from varying time periods. There are nineteen types of windows of four predominant configurations: double-hung, casement, awning, and jib.[118] All historic windows are constructed of pine with mortise and tenon joinery and fairly thin muntins typical of early 1840's windows.[119] Most units are glazed with historic cylinder glass[120] and are topped with lugged architraves, except for casements in the bay window on the north façade.

The majority of the windows are double-hung sash in differing sizes. There are ten types of casement windows: paired 4-light casements in the basement; the units on the lower two stories are glazed with diamond panes, four topped with transoms; while garret windows are paired, 8-light or 3-light casements. Four of the basement windows are four-light square awning types. There is a single three-light window on the west elevation. Five jib doors with double-hung sash will return to use on the south side of the building.[121]

Builder specifications for the original 3-bay structure built in 1842 state that the main story of the house should contain "seven box window frames, 12 lights sash 14 by 20 inches, three of these to be for jib windows, running down to the floor – carpet sill of cherry or mahogany – windows double hung, with outside parting and inside beads of Carolina pine."[122]

---

[118] Hillier Architecture, *Window Schedule Bid Set 09.12.13.*
[119] Leeke, *A Window on Sash,* 50.
[120] W.H. Degges, builder's specifications, July 23, 1842 from "Business papers, George W. Riggs, Jr., 1836-1852. Papers of the Riggs family, container 67, Manuscript Division, Library of Congress," in Geier, Brown, Renfrow, 5.
[121] Hillier Architecture, *Window Schedule Bid Set 09.12.13.*
[122] W.H. Degges, builder's specifications, July 23, 1842 from "Business papers, George W. Riggs, Jr., 1836-1852. Papers of the Riggs family, container 67, Manuscript Division, Library of Congress," in Geier, Brown, Renfrow, 3.

The specifications do not make any mention of second-story windows except that they should be "in every respect the same as the principal floor as to the quality of materials and finish".[123]

> There are specifications for basement windows consisting of, "six window frames…three 14 x 14 - 9 lights sash – the others small to be determined by Mriggs hereafter – and one outside, and three inside doors & frames in basement – the outside frames to be solid, three inch Carolina, reveilled, with bead on edge window frames do ("do" = ditto?) - with outside, parting triside heads of heart yellow pine where (there?) are two sections to the windows – sash to have heart yellow pine meeting rails – to fit with a head – finish with plain jamb casings and mouldings…".[124] The specifications also mention the desire for, "neat jack arches to all outside openings…good & sufficient lintels over all doors & windows – window sills of locust, worked to imitate stone – panel or Venetian blinds to all the windows except those in gable end of garret…glass shall be best Washington Cylinder glass."[125] Degges' building specifications concur with windows that exist today.

North Elevation

A large bay projection with diamond light casement windows and Italianate hood moldings marks the eastern bay of the western addition.[126] These windows are topped with fixed pane transoms, and surrounded by heavy, bulbous casings. The Historic Preservation Training Center (HPTC) of the National Park Service restored window N-04 in the bay. There are also diamond-light casement windows on the dependency, the lower one topped by a fixed-pane transom. Non-historic diamond light double-hung sash windows on the eastern addition will be rebuilt to accommodate casements, as the windows were reconfigured with metal louvers for ventilation purposes.

---

[123] The Hillier Group, 132.
[124] W.H. Deggs, in Geier, Brown, Renfrow, 2.
[125] W.H. Deggs, in Geier Brown,Renfrow, 4.
[126] The Hillier Group, 13.

The remaining windows on this façade are six-over-six double-hung sash, except for paired eight-light casements in the gables and awning windows in the basement.[127] Most of the windows are in fair condition except for the basement window west of the entry, which has been modified with a vent infill. The westernmost garret window N-14, also restored by the HPTC, had a severely deteriorated sill and squirrel damage, which was also the case in the entry vestibule windows where a squirrel was trapped and tried to eat its way out through the muntins.

East Elevation

Paired diamond light casement windows mark the easternmost elevation of the cottage – the second story unit E-05 was restored by the HPTC. The eastern end of the original structure is significantly obscured by the dependency, but two windows remain and are visible from the south side. The second story window is a six-over-six double-hung sash, and a pair of non-historic three-light casements pierces the gable. A pair of eight-light casements will be built to replace this and replicate all other garret windows.[128] A jib door opens onto the far end of the south verandah on the east wall of the western addition.

South Elevation

The basement level of the south façade has three six-over-three double hung sash on the original block of the house, as well as four-light paired casements and an awning window that opens inward. On the first story five openings were originally jib doors, opening onto the south verandah and the iron balcony of the western addition. A new jib door and double-hung sash will be fabricated for opening S-02, which had been replaced with a modern door. The HPTC

[127] Hillier Architecture, *Window Schedule Bid Set 09.12.03.*
[128] Hillier Architecture, *Window Schedule Bid Set 09.12.03.*

restored jib door S-03. The remaining windows will be restored as well, with the exception of opening S-05, which will be filled with a pair of restored French doors that date from the time of western addition construction.[129] According to the Geier Brown Renfrow report, "the right-hand window [of three opening onto the south verandah] lower sash and moveable apron on the left hand were modified to form a door with four lights each."[130]

The remaining windows on the first and second stories are all six-over-six double-hung sash with the exception of the dependency and connector, which are pierced by diamond light casements. The eastern casement on both floors of the dependency has been altered with an air conditioning unit and will be replaced with new sash. The western casement of the pair will be restored.[131] The HPTC restored window S-06. All garret windows are paired eight-light casements.

West Elevation

The one basement window is a three-light awning window, the only one of its type found on the building. The first and second story windows are six-over-six double-hung sash, while the garret windows are paired eight-light casements. All windows are in fair condition.

Construction Materials and Design

According to the Historic Preservation Training Center, original sash components are Eastern White Pine (Pinus Strobus), which is suitable for replacement material.[132] New muntins were milled using White Pine, but Historic Structures made sash repairs in Spanish Cedar and

[129] Hillier Architecture, *Window Schedule Bid Set 09.12.03.*
[130] Geier Brown Renfrow, 81.
[131] Hillier Architecture, *Window Schedule Bid Set 09.12.03.*
[132] Chris McGuigan, *Final Draft Treatment Protocol*, 6.

sill repairs in walnut and oak (which were originally locust according to Degges' Builder Specifications). Other materials used in the construction and operation of windows are: brass or iron hardware, pure linseed oil glazing putty, and cotton sash cords.

The color scheme for exterior features was investigated with photographic evidence and ultimately defined with a detailed paint analysis, performed by expert Frank Welsh. Photographs from the late 1850s and early 1860s suggested that a polychromatic paint scheme may have been used for exterior woodwork, and others show that it may have been painted a light color soon after the western portion of the verandah was constructed (just prior to or during the Lincoln period).[133] Hillier's *Lincoln Cottage Pre-Design Study Report* states, "When the western addition was built, door and window trim was painted white, as were the rails and stiles of the windows. Muntins and putty were painted black. This color scheme was applied not only to the main house and the addition, but also to the connector and the kitchen wing."[134]

The final color analysis results from Frank Welsh concur with this description, with the exception that all exterior window trim and exterior shutters are to be painted light brown (see *Figure 4.8).* All exterior rails and stiles are to be painted white, with the exception of exterior muntins, which are to be painted black.[135] The black exterior muntins are an unusual treatment and may have been painted that way to simulate leaded windows or to make the sash appear as if there were no muntins. The fashion of the time for window sash was turning towards fewer lights with larger panes of glass. During daylight hours the glare of the sun would darken the glass so that black muntins almost blend in and after sunset they would merge with the night.

[133] The Hillier Group, 5.
[134] The Hillier Group, 5.
[135] Hillier Architecture, *Window Schedule Bid Set 09.12.03.*

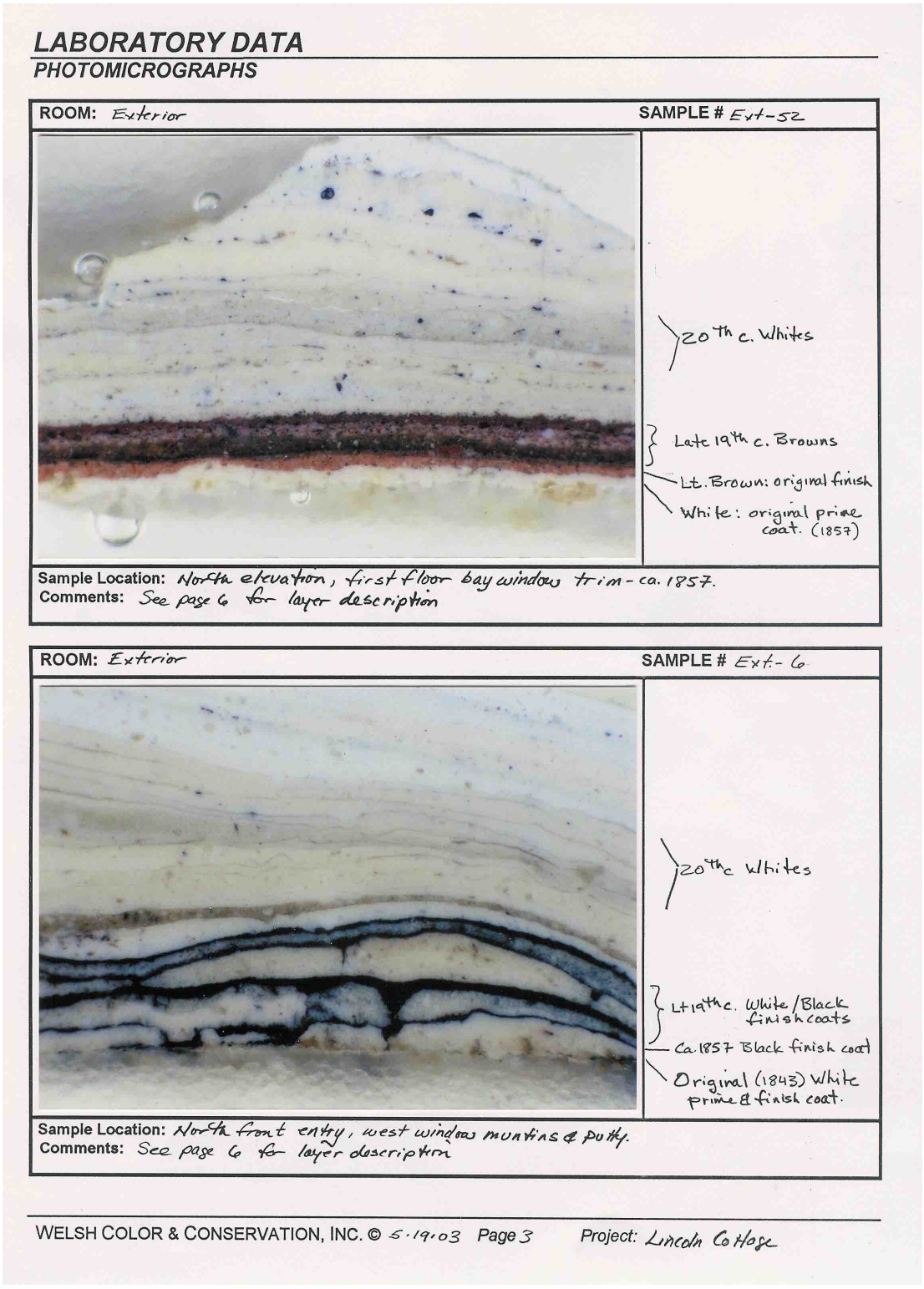

Figure 4.8 Exterior Colors, President Lincoln and Soldiers' Home National Monument. Welsh Color & Conservation, Inc. *(copyright)* 5/19/2003.

Execution of Window Restoration

The Historic Preservation Training Center released their Final Draft Treatment Protocol on February 11, 2004, signaling the start of an extensive window restoration campaign that should conclude within a month of this writing. The following will be a detailed account and analysis of window restoration technique and technology employed at the President Lincoln and Soldiers' Home National Monument. The goal is a museum-quality final product with an approximate 100-year life span, requiring a minimal amount of maintenance.[136] This can be achieved if the Historic Preservation Training Center protocol is strictly adhered to.

Historic Structures' crew arrived on-site early in February 2004, just in time to view final installation of jib door S-03 and double-hung sash S-06 by HPTC staff. Staff was very helpful in explaining the procedure in a step-by-step manner, so the crew could take notes for future reference.

Proper restoration should provide a final product that is structurally sound, weather tight, and will require only routine maintenance. To achieve this, the building as a whole must be taken into consideration and secured at vulnerable points. While windows were out of their frames and being repaired off-site, the structural integrity of lintels were investigated by LePore Masons and re-pointed where necessary. Drainage systems were updated to ensure proper water runoff, modern roof materials were replaced with slate and standing seam galvanized metal, and stucco was replaced on the entire building. The exterior restoration as a whole should ensure a sound building that will allow for proper and prolonged use of newly restored windows.

---

[136] Sophia Lynn, *Minutes from the November 12, 2003 meeting at the Historic Preservation Training Center in Frederick, MD*, 2.

Sash/Casement Removal

All sash/casements were removed from the building in a systematic manner, coinciding with scaffold installation. Scaffolding was secured to the building with wood braces that were constructed to project from the interior, out through various window openings. Window removal occured as scaffolding braces were needed.

The process of dismantling double-hung sash from their frame began by removing parting beads and stops, in order to free the sash. Protocol recommends removing interior window casing as well, but this was not necessary.[137] The paint line between sash and jamb was cut with a knife, and then a lever action was used to pry the delicate pieces away from the frame, working from top to bottom. Many parting beads were broken in the process, but most stops were salvaged. Protocol states that, "Any breakage of wooden elements will be repaired immediately, small pieces are difficult to store and are often lost on site."[138] However, repairs were not made immediately - broken pieces were taped together and moved to the workshop for gluing at a later time. Nails were removed from all components through the back of the moldings so as not to damage the exterior surface.[139] Weather-stripping was removed and discarded. Throughout the project care was taken to use tools in a delicate manner so as not to leave indentations, holes, or any such markings on historic surfaces.

The sash cords were cut so that sash could be removed from the jambs, and were stamped as to window location and number. Each sash was individually wrapped in bubble-wrap and placed in vertical crates fabricated on-site, so they would not be damaged while being

---

[137] Chris McGuigan, *Final Draft Treatment Protocol*, 1. Rather than citing the Protocol with a footnote every time it is referenced, it should be understood that this document was our reference and much wording may be similar due to the nature of technical writing. If treatment strays from the Protocol this will be discussed and cited.
[138] Chris McGuigan, *Final Draft Treatment Protocol*, 1.
[139] As documentation techniques were previously discussed, it should be assumed that all historic materials and samples of non-historic materials removed from the building were documented in the manner described earlier.

transported to the workshop. Next, storm window tracks were removed and discarded. All hardware including pulleys and weights, sash locks, and casement hinges were removed from windows and stored until refinishing. Casement windows were much easier to remove, as they simply had to be lifted out of their hinges.

Jambs were completely stripped of paint, using carbide scrapers and sand paper, before the window openings were temporarily enclosed with a system of acrylic panels framed in wood. Taller jib doors and small basement windows were covered with plywood. There were two frames for each double-hung sash opening and one for casements. The frames were pressure fitted into the jamb, using wedges to ensure a tight fit.

This system became very cumbersome, as frames were large and heavy and had to be removed quite often. Two people were needed to close a window; one held the upper sash to the top of the frame (very difficult for a short person, as windows were tall), and the other held the lower sash while trying to screw the two together. An alternative system using only one frame made with lighter materials would have been sufficient.

Glazing Putty and Glass Removal – An Experimental Technique

Once all sash were transported to the repair shop, glass was removed and windows were stripped of lead paint. The process used for glass removal, and proposed for paint removal, was an experimental technology first employed at the Historic Preservation Training Center for this project. A steam stripper was purchased by the HPTC for $7,000 and, after favorable results, was bought for work at the cottage as well.

The technology is simple: the stripper is a rectangular steel box, approximately 6’ x 4’, with interior shelves to hold sash, and a door that swings down from the bottom edge and locks

at the top. The steam producing mechanism is essentially the same technology found in a steam room. The box is turned on and steam is injected into the enclosed space until heated to the desired temperature (displayed digitally on the side of the machine). The door is opened and sash are inserted with the interior side of the window face down to prevent glass from falling out, then the door is locked. Heavy gloves and goggles should always be worn when inserting or removing sash; the steam is extremely hot and will burn. The sash are left in the stripper for approximately 15 minutes or until the steam heat has softened glazing putty and paint. Ideally, at this point the putty and paint can be easily stripped with putty knives.

The goal of this experimental technique was to reduce the amount of broken glass when removing hardened glazing putty. The conventional technique of softening putty with an infrared heat gun poses a great danger to historic window glass, as the heat will easily break panes if not applied in the correct manner. The HPTC calculated the number of broken panes caused by steam stripping and the results were very favorable: of a total of 172 glass lights, approximately 30 were broken prior to glass removal and two additional lights were broken by HPTC craftspeople in the process. The HPTC also tested moisture content before and after steaming; they found that the moisture content was between 8-16% prior to steaming and returned to that range within 48 hours.[140]

Steam stripping can also aid in lead paint abatement, as no harmful vapors are released, and the moist paint does not produce dust when removed with hand scraping tools. The HPTC used this technique for the eight sash and two jib doors they restored, and were satisfied with the

[140] Chris McGuigan, *National Park Service Historic Preservation Training Center Weekly Field Reports #02*. National Park Service, Historic Preservation Training Center, Frederick, MD.: October 14, 2003.

results.[141] Although the HPTC used only the steam stripper, protocol allows for steam and heat guns to be used for primary paint removal.

Historic Structures' crew did not feel as strongly about the efficacy of the steam stripping method, which may be due to the fact that we were working on a much larger scale. The steam did indeed soften the putty to a desirable consistency that was fairly easy to remove, but it returned to a hardened state within about 5 minutes. Four people had to work simultaneously on the same sash to remove all putty before it hardened. We usually had to heat the window again, sometimes several times, before all putty and glass was removed. Glass did break, but usually only if there was already a run or crack in the light before heating. This method was also not conducive to a large amount of paint removal, as only two or three sash (depending on size) could be steamed at one time. A crew of ten could work more efficiently with their own workspace, heat guns, and paint removal tools.

Despite the slow process, all putty, glazing points, and window glass was eventually removed from the sash. Glass had been previously labeled as to orientation and window number, and was stored vertically in crates, each piece separated by a piece of masonite or cardboard. Protocol says that glass should be labeled with blue 3M Scotch Masking Tape on the exterior of the window, but we used permanent markers directly on the glass.[142] The labels did not come off and were easily removed when the glass was cleaned. Broken historic glass was retained for use in smaller lights such as in diamond pane casements. Bed glazing was scraped out of all glazing bars to prepare a smooth surface for new glass.

---

[141] Chris McGuigan, *Field Report #02*.

Paint Removal

The protocol warns that "all sash contain lead-based paint and as a result OSHA, EPA, and other federal, state, and local standards should be complied with."[143] Two employees from Historic Structures were sent to lead abatement training prior to starting this project, as part of the contract with the National Trust for Historic Preservation. These were the only two employees who were ever educated about prevention and dangers of lead exposure. Historic Structures' crew were given OSHA certified respirators, but never taught how to use them (filters must be changed frequently). The crew worked in a fairly enclosed environment without proper ventilation measures taken. Lead dust was rampant, as windows were stripped for eight months without ever thoroughly cleaning the space.

The author for one, had no idea how dangerous lead exposure was and did not have the resources to protect herself. Subsequently blood lead levels were detected at the threshold where levels become dangerous and begin to cause permanent damage. This information is conveyed to warn workers in this field about the necessity for adequate protection – make sure you are educated, at your employer's expense, about the dangers of lead exposure and proper abatement techniques. Know your worker rights and policy regarding lead-based paint removal.

All paint was removed from sash with heat guns and various scraping tools, leaving a two-inch 'coupon' of paint on the interior and exterior of each sash, with lightly feathered edges. The 'coupon' is a patch of paint that will be available if future chromo-chronology is needed.[144] There was debate as to whether paint samples should be left on all sash, or only on representative windows for aesthetic reasons The final decision was that all sash, casings, and jambs should

---

[142] Chris McGuigan, *Final Draft Treatment Protocol,* 2.
[143] Chris McGuigan, *Final Draft Treatment Protocol,* 2.
[144] Chris McGuigan, *Field Report #02*.

have a 'coupon'. Sometimes an entire sash was stripped before realizing that a sample of paint was not left, but this should not be a problem as most windows do have a patch.

Exterior casings and sills were stripped using heat guns and heat plates. Heat guns work well for details, while heat plates are better suited for larger, flat surfaces. Roman numerals were found inscribed inside many of the windows jambs. Protocol says to sand all stripped wood with 100-grit paper, vacuum all surfaces, and wash with a solution of tri-sodium phosphate.[145] We wiped all surfaces down with mineral spirits after sanding, to prepare the surface for primer.

Hardware Treatment

All hardware is inspected by the Preservation Projects Director to determine which pieces should be salvaged, then is sent off-site to The Brass and Copper Shop in Frederick, MD to be chemically stripped of any remaining paint. The hardware is blasted with medium size glass beads at 90 psi, then polished with jewelers' rouge on a cotton buffing wheel. The iron hardware is clear-coated with acrylic lacquer, and the brass with a urethane coating.[146] The hardware that was restored for the HPTC windows came back in almost mint condition. This process has not been completed yet at the cottage and is holding up re-installation of sash. Another type of hardware to be used is bronze, sheet metal weather stripping, which will be inserted into sash where old weather stripping sat and will not be visible when the windows are closed.

[145] Chris McGuigan, *Final Draft Treatment Protocol, 2.*
[146] Chris McGuigan, *Final Draft Treatment Protocol, 2*

Criteria for Wood Repairs

All deteriorated wood was thoroughly inspected and was only repaired if one of three conditions were met according to protocol: 1) the joinery or sash was compromised; 2) the sash or door could not be made weather resistant; or 3) defects not repaired would reduce serviceability of the sash. No repairs were made for aesthetic reasons such as for general wear, and wood was not sanded to flatten worn areas. Painter's Putty wood filler was only used to fill holes to prevent water damage.[147]

The protocol identifies typical window repairs including total or partial putty bar replacement, repair of deteriorated or damaged material, joint repair, repair of tenon, and check repairs.[148] The Historic Preservation Training Center did not include casing or sill repair in the protocol, as they did not restore these components of their representative windows, but dutchman repairs to exterior window casings were made on-site. Some could be repaired in situ, while others had to be taken off of the building.

Contrary to conventional wood repair methods discussed earlier, the HPTC does not allow epoxy consolidatation for repairs larger than 4 cubic inches, but instead calls for dutchmen repair or complete component replacement. The greatest deterioration on most windows at the President Lincoln and Soldiers' Home National Monument was usually located on the bottom 1/3 of the sash, primarily at the joint. The HPTC provided custom knives for windows that they restored, but additional knives had to be ground for different component profiles to complete all repairs.[149]

---

[147] David Overholt, *Field Report from October 22, 2003 Meeting at the HPTC, 1.*
[148] Chris McGuigan, *Final Draft Treatment Protocol,* 7.

If necessary, the sash was disassembled and all parts were labeled with a pencil. The deteriorated wood was cut back ¼" beyond the damaged area and a wood preservative was wicked into the end grain to prevent fungus from attacking further.[150] The dutchman was cut from custom stock to be slightly bigger than the intended repair. It was secured with carpenter's glue and clamped, then cut and planed to match historic joinery. [151] The sash was reassembled with old and new components, then joints were stabilized with a wood pin. The same procedure is followed when replacing an entire component, except the discarded material should be tagged and submitted to the National Trust.

Protocol calls for the length of joints to be maximized by using scarf joints (angled) rather than butt joints (flat), which lengthens the gluing surface between original wood and new and allows for screws to be inserted if need be.[152] All repairs should be attached with Titebond II exterior carpenter's glue rather than being secured with an epoxy glue. This makes the repair easier to reverse if necessary. Because of unclear communication, several dutchmen were mistakenly made with butt joints and others were secured with epoxy, all of which had to be reversed and repaired again.

When epoxy repairs were executed for smaller areas of deterioration, the wood was first cleared of any deterioration, primed with thinned epoxy, then filled with flexible epoxy filler putty. Once the putty hardened it was shaped to the contour of surrounding wood.[153] Historic Structures used the West End Epoxy System for all repairs where it was allowed.

Extensive sill repair and sometimes replacement was needed for six sills that either had powder post beetle damage or significant weathering. All sills except S-19 are on the north side

---

[149] Chris McGuigan, *Final Draft Treatment Protocol,* 3.
[150] David Overholt, *Field Report from October 22, 2003 Meeting at the HPTC, 1*
[151] Chris McGuigan, *Final Draft Treatment Protocol*, 3.
[152] David Overholt, *Field Report from October 22, 2003 Meeting at the HPTC, 1*

of the building, which does not receive much sunlight, most likely contributing to rot. Three complete replacements are called for on Hillier's Window Schedule, while three other deteriorated sills were discovered during window restoration.

An example of sill repair is for window N-09. The deteriorated walnut sill was removed and the outer 1 ½" inch of material was sawed off and saved. This was laminated onto the front of a new 5 ¼" white oak sill. The new material was shaped to fair into the original and was attached with epoxy and screws. Other sills were repaired by clearing out all checks and cleaning with denatured alcohol. Then the checks were coated with epoxy consolidant and built up with epoxy filler, sanded, shaped, and reinstalled. Three sills were completely rebuilt.[154]

Application of Surface Treatments

All wood surfaces were sanded prior to treatment, then a water-repellant wood preservative called Wood Life was brushed onto the sash. The preservative contains a chemical biocide that kills wood rot fungus; as mentioned before, this was wicked into all end grain before performing dutchman repairs.[155] Next, one coat of white alkyd primer (Dutchlac Brand) was applied to all surfaces, followed by three top coats of white acrylic paint (Dutchlac Brand) everywhere except glazing beds and bars.

All exterior casings and sills were primed immediately after being stripped and repaired, as bare wood should not be left to the elements for an extended amount of time. The final word regarding exact exterior color schemes did not come until a later date, when paint analyst Frank Welsh declared that all casings, bargeboards, soffits, fascia, and finials would be painted a light brown color (see *Figure 4.7).* Painting of these components commenced at that point.

---

[153] Chris McGuigan, *Final Draft Treatment Protocol,* 4.
[154] Paige Wojcik, *Notes from Sill Repair*, June 21, 2004.

Glazing

The historic glass that was removed from the sash was quite dirty, so every pane was cleaned with a slurry of ground pumice stone and windex. The mixture was rubbed into the grime and wiped off with a rag, then streaks were cleaned off with a dry rag. This treatment removed the permanent marker that identified the window, so it was re-written on a piece of blue painter's tape and reapplied after cleaning.

All lights were re-glazed using pure linseed oil putty for bed and face glazing. Protocol never made mention of this, but at some point a decision was made to mix lampblack (a black powder colorant) into the putty compound before glazing. This is presumably so that white glazing compound will not show through when the muntins are painted black. Chris McGuigan mentions in Field Report #10 that, "Face-glazing and edges of the putty [glazing] bars were then primed with a grey-tinted alkyd primer."[156] This may have been the HPTC's solution to that problem, but it was never mentioned in the protocol. The lampblack mixture was extremely messy, leaving black, ink-like markings on freshly painted surfaces.

The Historic Preservation Training Center and others chose Bendheim Light Restoration Glass as the best solution for replacement glass, as existing glass varies in color, thickness, and irregularities.[157] As much historic glass was reinserted as possible, although it was often hard to fit old panes back into their original light, after sash repair made them plumb again. Large sheets of Bendheim glass were cut into individual panes and secured with diamond glazing points.

---

[155] David Overholt, 2.
[156] Chris McGuigan, *Field Report #10,* December 15, 2003.

Face glazing was tooled to form a smooth, tight bond between glass and sash. In addition to being very messy, the linseed oil putty was extremely soft and difficult to work with. It took approximately a month for the putty to cure and form a skin that could be painted and allow for glass cleaning. Other types of putty compound are on the market that are much easier to work with, but this was the historic type originally used for glazing. The glazing was primed with an alcohol-based primer called Prime-It, then painted black. The paint line extends 1/32" over the putty and onto the glass, forming a seal.

Sash Reinstallation

All hardware has not been restored as of this writing, and therefore sash have not been reinstalled yet. The removal procedure is basically reversed for sash reinstallation. Restored sash should be transported in protective coverings back to the cottage. These are the steps that the Protocol lays out: 1) remove temporary panels [store for later use]; 2) re-string sash weights using Samson cotton sash cord (Samson Technologies Aetna Sash Cord product code 002, cotton braid sash cord with a nylon inner core, all white); 3) reinstall existing pulleys [windows may have to be weighed and compared with sash weights to ensure that the sash will close properly]; 4) install new bronze weather-strip; 5) re-install existing sash doors into historic jambs; 6) re-install hardware.[158]

---

[157] David Overholt, 3.
[158] Chris McGuigan, *Final Draft Treatment Protocol,* 5.

Figure 4.9 A stack of 'almost' restored windows - notice how the muntins almost disappear into the background when sun is shining on them

CHAPTER 5

Analysis of the Final Product and

Recommendations for Other Wood Window Restoration Projects

The restored windows of the President Lincoln and Soldiers' Home National Monument are an outstanding example of museum-quality restoration. Innovative methods that were introduced, such as steam stripping, the use of paint coupons on all window components, and mixing lampblack colorant into glazing compound should not have a significant effect on building materials, but only time will tell. For the most part, conventional wood window restoration techniques were used throughout the process, but the extra measure of care, documentation, and precision are what set this project apart.

I believe that in some cases, too much precision was used. It is easy to get carried away with sanding to make that worn spot just perfect, to fill every knick and hole with putty. It is almost as if one subconsciously thinks, "I have gone to so much trouble, have taken so many steps to give this window a new life. Shouldn't I make it shine?" But the philosophy should not be to make a window look as if it was constructed yesterday. Many of these windows are 163 years old, as is the original building. They are supposed to be worn and weathered, to blend with the patina of the entire building, as long as their serviceability is not affected.

Structurally speaking, the windows are sound; muntins and joints are repaired so that the entire sash is square, will fit in its frame better, and operate smoothly. All deteriorated wood has been removed, and existing wood treated with preservatives to prevent water, insects, and fungus from attacking again. The choice of wood can be questioned, as pine was the original material

and cedar was used for repairs. Sills were also repaired using several different species of timber. Using a steamer that subjects wood elements to a great deal of moisture also seems counterintuitive, but hopefully all windows returned to their original moisture content without undesirable results. Will these different species of woods be compatible when exposed to the elements? Did steam compromise the structural integrity of the sash? These questions remain to be answered.

Most of the glass placed back into the windows is historic, but Bendheim Light Restoration Glass melds well with the original, producing the desireable effects of irregularity and viscosity. A method other than lampblack colorant should be used in the future to tint glazing compound in preparation for black paint. Darker primers are available that would be much easier to apply.

Retaining a patch of old paint on every window element may cause problems for future maintenance, as new paint may not adhere properly; this is a sacrifice made to follow museum-quality restoration practices. Paint coupons should have been retained on only representative windows, because the square of rough, historic paint diminishes the aesthetic effect of newly restored sash. This also leaves lead paint that is encapsulated but not abated.

Painting the muntins black is an unusual treatment, and it remains to be seen whether the design serves its purpose. The entire color scheme at the cottage was determined by paint analyst Frank Welsh and consists of colors drawn from nature. The stucco is a beige color, the south verandah light gray, all remaining exterior wood elements are light brown, and the roofing material is mostly Vermont purple slate with the western addition clad in metal.

Two major issues encountered on this project are pertinent points to discuss: time management and safety. A successful, smooth operation is fundamentally grounded in proper timing and time management. Every trade working at the President Lincoln and Soldiers' Home National Monument was dependent on the weather, which is the nature of exterior restoration. Roofers cannot work in the rain or snow. The masons and stucco crew needed warm weather for their materials to be properly applied and have lasting results. Paint, epoxies, and other materials used by Historic Structures can only be applied at temperatures above a certain threshold. Beyond that, no one wants to work outside when it is 15 degrees and windy in Washington D.C., therefore careful planning had to occur so that every trade was on-site and productive at the right time of the year.

All exterior window work was accomplished in the warmer months and actual sash restoration was saved for inclement weather and cold temperatures, although the work sometimes overlapped. The temperatures started to drop before all exterior painting was completed, but the stucco crew was still working, making it difficult to paint around their work. Every day was a constant puzzle to solve, of what trades would be working on which side of the house so that safety, craftsmanship, and time were not compromised.

Safety was stressed regarding scaffolding, hardhats, protective eyewear, electricity, and the use of heat on exterior elements. Historic houses are a fire waiting to happen; if exposed to heat, dust and debris that build up in places that cannot be seen can smolder for hours without being noticed. Many structures have been lost to fire during restoration. Therefore, at this project heat guns/plates had to be turned off one hour before leaving the job site, and the area where heat was used had to be watched for thirty minutes. On Fridays (because no one would be around for two days) the cut-off time was noon. Fire extinguishers and water were always part

of the work gear. This procedure greatly cut into productivity, as paint had to be scraped by hand for those remaining hours. Safety was *not* stressed regarding lead paint exposure. Apparently the danger of losing a historic house to fire is more important than losing your mind to lead.

Maintenance of restored windows should be cyclical. Sealants and paint must be inspected every couple of years, taking care not to seal windows too tightly, preventing them from breathing. Broken glass should be re-glazed immediately, and glazing compound replaced if it is cracking or otherwise deteriorating. Sills may require the most maintenance as they are exposed to the elements, causing paint to fail at a faster rate. The cause of any wood or paint deterioration must be investigated immediately, as it could signal a larger moisture problem. All components of the house should be maintained to protect the building as a whole, as every architectural element is interrelated.

Viewed from a distance, the cottage seems to have been restored to its glory days when President Abraham Lincoln walked the halls, ideas of emancipation and worries of war and personal troubles consuming his mind. This is somewhat of a mirage, as the house is only a pristine shell, cloaking the greatly altered interiors that await restoration. Standing alone, the restored windows are in prime condition to serve a new life for many years to come. Are all other elements of the cottage's exterior structurally sound enough to allow for a serviceable life? With the amount of work that took place over the past year, not to mention the years of previous planning, the building should be in mint condition.

Is today's technology sufficient to provide an extended future for windows, the "100-year solution" desired by the National Trust? Steam strippers, heat guns, epoxies, restoration glass - how will these treatments affect historic wood? Will they weather well with time?

Buildings are organic. They move and breath, they age with time, which is the only measure that will give us an answer. We will not always be here to see the results, but the hope is that the history of this house has been recorded sufficiently to serve future historians and preservationists. They will look at the President Lincoln and Soldiers' Home National Monument with fresh eyes, with enlightened philosophies and innovative technologies affecting their vision of the cottage. What will they see for its future?

Recommendations for Other Wood Window Restoration Projects

The painstaking research, architectural analysis, extensive documentation, and hands-on restoration that were undertaken at the President Lincoln and Soldiers' Home National Monument would be a great challenge to duplicate for almost any property. The results are magnificent and desirable, but would be almost impossible for a property that does not have the financial support and stewardship of the federal government, the National Trust for Historic Preservation, and private contributors with a vested interest in Abraham Lincoln's life. There was also a great deal of publicity for the cottage, aroused by programs on The History Channel and Home and Garden Television, which launced this project into the public spotlight.

This extensive process has certainly been used before, and was even taken to a greater level on houses such as Monticello, Mount Vernon, Montpelier, and others. All of these are presidential sites, which plays a large role in advocacy and procuring financial backing. Essentially, cost is the deciding factor, and Jefferson, Washington, and Madison will not let you forget it as they peer out from their respective greenbacks. There are many people who have the will to undertake a similar project, but the final question is whether they have the money.

There *is* a way to approach window restoration at less significant properties. Much of the planning and documentation carried out at the cottage is too extensive, expensive, and time consuming for most buildings. There is no need to save every nail and broken piece of wood that is removed from a building, although the owner should not forego all planning, as it is a critical step to save money and time.

The budget for window restoration at the President Lincoln and Soldier's Home National Monument was prepared by the Historic Preservation Training Center, and was based on their restoration of 10 window units (sash). The National Trust for Historic Preservation paid the HPTC a total of $20,301 broken down as such:

LABOR:	
42 hours/unit x 10 units = 420 hours @32.00/hr	$13,440
MATERIALS:	
Weather-strip, wood, glass, primer, paint, acrylic, putty, plywood, sash cord, hardware finishing, abatement gear, etc	
$120/unit x 10 units	$1,200
Motorpool charges	$586
SUBTOTAL	$15,226
HPTC Overhead	$5,075
TOTAL	$20,301

Essentially, without motorpool charges and overhead, $1,500 was budgeted for each sash. The National Trust translated this into $95,000 for the approximately 65 window units restored by Historic Structures. The actual cost of restoration was $155,000.

The discrepancy in prices arose from additional costs not in the original budget including:

Steam stripper	$7,000
Plexiglass for temporary sash	$3,000
Labor for temporary sash construction	$6,000
Case of Bendheim restoration glass	$4,000

The budget also only allowed $6,000 for documentation, which became much more extensive than originally thought. Stephen Ortado, principle of Historic Structures, says that the usual cost for a window restored to this degree would be $3,000 per sash, and $180,000 would have been enough for this project. He would usually have the sash chemically stripped which only costs $200 per sash compared to thousands of dollars for the labor of heat stripping.

Experts should be hired to assess conditions, provide guidance, and possibly perform the work if repairs are more extensive. Many resources exist to guide the layperson through a window restoration project (see bibliography), but there is no substitute for a professional who may end up saving the project money in the long run. The Secretary of Interior's Standards for the Treatment of Historic Properties is a good resource to ensure that the historical integrity of the property is maintained. The Secretary of Interior's Standards *must* be adhered to when rehabilitating a property for financial incentives.

A window schedule is helpful to have and fairly easy to compile for any size project. The schedule will help to maintain focus on the most critical aspects of a job and will provide organization. Possibly the most important aspect of the planning process is preparing a budget and time schedule. Once again, a professional can offer realistic costs and time estimates so that the owner is not taking a stab in the dark.

Many of the restoration techniques employed for wood window restoration at the cottage can be performed by a layperson, but some would be extremely cost prohibitive. The steam stripper is the only piece of equipment that is too expensive and unnecessary for smaller projects, and more conventional methods are readily available. Carpentry repairs may want to be left up to professionals.

Heat guns/plates, sandpaper, and simple scraping tools can be bought at a hardware store to strip paint. The methods available for lead-paint abatement should be researched thoroughly for any property, as most buildings built before 1978 do contain lead paint. Depending on the method of abatement, costs will vary. It could become extremely cost prohibitive if abatement experts are hired to remove all traces of lead, but simpler measures are available such as encapsulation, dust control, or window replacement.

Glazing can also be a fairly easy process, but takes practice to cut glass in a straight line and produce a smooth joint with glazing compound. If there are many broken panes of glass the decision has to be made whether to replace with new glass, reproduction glass, or a combination of original historic and reproduction. All materials for this type of project are also available at a glazier's shop or hardware store. Instructions for painting, installing weather stripping, and sash removal/reinstallation are fairly straightforward and can be found previously in this paper as well as through other resources.

Property owners should take every step necessary to preserve their existing windows, as new materials do not compare to the aesthetics, energy-saving properties, and structural integrity of properly maintained historic wood windows. The process is time consuming but fairly simple, and the results (and sometimes the work) are extremely rewarding.

Conclusion

Historic restoration plays a large role in today's real-estate market, as many people are realizing the benefits of owning or working in historic buildings. These buildings have often been neglected and are in need of some measure of restoration to make them structurally sound and energy efficient. Windows are very important when discussing energy efficiency, as they

are the portals to the outside world. They prevent the elements from entering a building so that we can live comfortably, but in the process take a beating themselves.

When windows have deteriorated to a degree that they allow air, noise, and dust infiltration, many property owners take drastic measures to save money, such as replacing all windows with new. These issues are increasingly confronting historic preservation commissions, contractors, and owners. Property owners need to be educated about the fact that total replacement of historic windows is usually not more cost effective and energy efficient than preserving existing windows, which are often key in maintaining the historical integrity of a building.

The National Trust for Historic Preservation gained stewardship of an important presidential site in Washington D.C. and made window restoration a high priority of an exterior restoration campaign. Historic wood window restoration at the President Lincoln and Soldiers' Home National Monument was an extremely comprehensive process utilizing traditional window restoration techniques in conjunction with innovative technology. The extensive research, planning, documentation, and restoration allowed this key architectural element to be delicately restored to a sound, operable, and energy efficient state while retaining a great deal of historic fabric.

The planning process at the President Lincoln and Soldiers' Home National Monument was so extensive that it is not feasible for many properties, but lessons can be drawn from it and scaled down to a manageable size. The importance of retaining and maintaining historic wood windows cannot be stressed enough, as they are key architectural elements and serve a dual role as utilitarian and aesthetic components of the structures we inhabit.

Figure 5.1 Restored Window

References

Bouse, D., and G. Shemdin. "Period Joinery: Panelling, Fittings and Decorative Work." *Period Construction Technology* 7: 1-21.

Calloway, Stephen, and Elizabeth Cromley, ed. *The Elements of Style: An practical encyclopedia of interior architectural details from 1485 to the present*. 2nd ed. New York: Simon & Schuster, 1996.

Clinton, William H. *President Lincoln and Soldiers' Home National Monument-By the President of the United States of America-A Proclamation*. Washington D.C., July 7, 2000.

English Heritage. *Framing Opinions: A National Campaign to Protect Our Legacy of Traditional Windows and Doors*. London: English Heritage, 1994.

Feist, William C. "Replacement Wooden Frames and Sash: Protecting Woodwork Against Decay." *Preservation Tech Notes* 4: 1-3.

Fidler, John. "Sash Windows." *Traditional Homes Technical Information Leaflet* 4: 1-8.

Fisher, Charles E. "Planning Approaches to Window Preservation." *Preservation Tech Notes* 1: 1-3.

Fisher, Charles E. "Rehabilitating Windows in Historic Buildings: An Overview." *Construction Specifier* (1986): 1-10.

Fisher III, Charles E., Deborah Slaton, and Rebecca A. Shiffer, ed. *Window Rehabilitation Guide for Historic Buildings*. Washington: Historic Preservation Education Foundation, 1997.

Foulks, William G. "Specifying Wood Window Repair and Replacement." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. III-51 to III-56.

Geier Brown Renfrow Architects. *Anderson Cottage Historic Structure Report,* Washington D.C., February 20, 1985.

Geier Brown Renfrow Architects. *Study for the Restoration of Anderson Cottage*. Washington D.C., August 1985. 1-130.

Gordon, Jeff, and Carol J. Dyson. "Making Historic Windows Lead-Safe." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. IV-61 to IV-84.

Graf, Richard. "Designing a Replacement Window to Fit Your Needs." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. III-43 to III-4.

Hillier Architecture. *Window Schedule for the President Lincoln and Soldiers' Home National Monument*. Washington D.C. Bid Set 09.12.03. Sheet A8.01.

The Hillier Group. *Lincoln Cottage Pre-Design Study Report*. Washington D.C., 2001 (revised 2003). 1-201.

Jeff Larry, interview by author, 4 March 2005, Washington D.C., e-mail.

Kelley, Stephen J. "The Assessment of Existing Window Systems." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher III, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. III-3 to III-9.

Landry, Jean-Pierre W., and Lyette A.M. Fortin, ed. *Federal Heritage Buildings Review Office Code of Practice*. Canada: Minister of Supply and Services Canada, 1996.

Lee, John Greenwalt. "Window Conservation and Repair Specifications." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. V-11 to V-23.

Leeke, John. "Techniques for Two Timbers: Traditional and High-Tech Structural Wood Repairs." *Old-House Journal* September/October 1996: 62-67.

Leeke, John. "A Window On Sash: How to Make and Install Replacement Parts." *Old-House Journal* May/June 1995: 46-51.

Leeke, John C. "Wood Window Sills." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. V-3 to V-10.

Lynn, Sophia. *Minutes from the November 12, 2003 meeting at the Historic Preservation Training Center in Frederick, MD*.

Marshall, James R. "A Specifiers' Guide to Epoxies for Restoration and Repair." *Clem Labine's Traditional Building* 2 January/February 1998: 20-24.

McAlester, Virginia, and Lee McAlester. *A Field Guide to American Houses*. New York: Alfred A. Knopf, 2000.

McCluney, Ph.D., Ross. "Let There Be Daylight." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. IV-45 to IV-54.

McGuigan, Chris. *National Park Service Historic Preservation Training Center Weekly Field Reports #01-07*. National Park Service, Historic Preservation Training Center, Frederick, MD.: 2003.

McGuigan, Chris. *The Preservation of Historic Window Sash and Doors from the President Lincoln and Soldiers' Home National Monument, Final Draft Treatment Protocol*. National Park Service, Historic Preservation Training Center, Frederick, MD.: February 11, 2004. 1-10.

Myers, John H. "The Repair of Historic Wooden Windows." *Preservation Briefs* 9 (1981): 1-7.

O'Connor, Richard. "Making Window Glass, 1850-1993." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher III, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. II-3 to II-9.

Overholt, David. *Field Report from October 22, 2003 Meeting at the HPTC*. Frederick, MD.

Parrott, Charles. "The Muntin Problem: Double Glazing Multiple-Light Windows." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. V-25 to V-29.

Pinsker, Matthew. *Lincoln's Sanctuary: Abraham Lincoln and the Soldiers' Home*. New York: Oxford University Press, 2003.

Rose, William B. "The Role of Windows in Overall Building Performance: The Engineer's Story." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. IV-3 to IV-14.

Sandor, John. "Exterior Shutters, Awnings, Screens, and Storm Windows." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher III, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. II-11 to II-20.

Shapiro, Andrew M., and Brad James. "Retain or Retire? A Field Study of the Energy Impacts of Window Rehab Choices." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington: Historic Preservation Education Foundation, 1997. IV-15 to IV-27.

Stokes, Samuel N., A. Elizabeth Watson, and Shelley S. Mastran. *Saving America's Countryside: A Guide to Rural Preservation.* Baltimore: The Johns Hopkins University Press, 1997.

Stumes, Paul. "Reinforcing Deteriorated Wooden Windows." *Preservation Tech Notes* 14 (1986): 1-4.

Task Agreement Number 003 between The United States Department of the Interior, National Park Service National Capital Region, Historic Preservation Training Center, and the National Trust for Historic Preservation in the United States for *The Preservation of Historic Window Sash from the President Lincoln and Soldiers' Home National Monument and the Development of Associated Time Estimates and Treatment Protocol*. Washington D.C.: September 2, 2003. 1-9.

Townsend, Andrew, and Martyn Clarke. "The Repair of Wood Windows." *The Society for the Protection of Ancient Buildings Technical Pamphlet* 13: 1-24.

Tremblay, Jean-Yves, and Craig Sims. "Life Cylce Cost Analysis for Restored and Replacement Windows." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher, Deborah Slaton, and Rebecca A. Shiffer. Washington D.C.: Historic Preservation Education Foundation, 1997. III-11 to III-28.

Weeks, Kay D., and Anne E. Grimmer. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preservation, Rehabilitation, Restoration, and Reconstruction of Historic Buildings*. Washington, D.C: USDI, National Park Service, 1995.

Kay D. Weeks and David W. Look, *Preservation Brief 10: Exterior Paint Problems on Historic Woodwork.* Washington D.C.: National Park Service, 1992; available from http://www.cr.nps.gov/hps/tps/briefs/brief10.htm#Purposes%20of%20Exterior%20Paint

Waters, John, ed. "Glossary of Architectural Terms." *HIPR 6000 Course Packet*. Athens: Bel-Jean, 2001. 1-15.

Williams, Sam , Mark Knaebe, and William Feist. "Why Exterior Finishes Fail." *Fine Homebuilding* June/July 1997: 60-65.

Wilson, Kenneth M. "Window Glass in America." *Window Rehabilitation Guide for Historic Buildings*. Ed. Charles E. Fisher III, Deborah Slaton, and Rebecca A. Shiffer. Washington D.C.: Historic Preservation Education Foundation, 1997. 150-164.

Wojcik, Paige. *Lincoln Cottage Window Conditions Prior to Restoration (Window Schedule).* Washington D.C., February 9, 2004.

Wojcik, Paige and Laura Mancuso. *Compilation of Architectural Fragments Field Inventory Forms from the President Lincoln and Soldiers' Home National Monument.* Washington D.C., 2004.

Wojcik, Paige. *Compilation of Field Sketches of Each Window Unit with Repairs and Documentation.* Washington D.C., 2004.

Wojcik, Paige. *Notes from Sill Repair*. June 21, 2004.

Appendix A

Key Players Involved with the President Lincoln and Soldiers' Home National Monument

There have been many key players involved in this project that I will list for the sake of acknowledgement and reference, as they will likely be mentioned in subsequent chapters:

Richard Moe	President, National Trust for Historic Preservation (NTHP)
William Dupont	Graham Gund Architect of the National Trust for Historic Preservation
David Overholt	Preservation Projects Director (NTHP), The President Lincoln and Soldiers' Home National Monument
Sophia Lynn	National Trust for Historic Preservation
Angela Brown	Program Associate, National Trust for Historic Preservation
Erin Carlson	Project Associate, National Trust for Historic Preservation
Robert Sillman & Assoc.	engineering firm
J.S. Cornell & Assoc.	general contractor; Bill Shainline, Project Manager
Louis Berger Group, Inc.	archaeological and landscape investigation firm
Hillier Architecture	project architects; George Skarmeas, Rick Ortega, Andrea Lowery
Historic Structures	restoration contracting firm; Stephen Ortado, Site Supervisor
National Park Service	Chris McGuigan, representative from Historic Preservation Training Center
Andy Latygo	architectural conservator
LePore Masonry	masonry contractor
Wagner Roofing	roofing contractor
D.L. Boyd Stucco	stucco contractor

Advisory Committee on Authenticity

Appendix B

Glossary of Architectural and Window Terminology

architrave: the moulded frame around a door or window opening; in classical architecture, the lowest member of an entablature. 1

bay: one unit of a building that consists of a series of similar units; commonly defined as the number of vertical divisions within a building's façade (eg., window and door openings or the areas between columns or piers). 2

bay window: a projection with a window on a house façade. It may be curved (bow window) or angular in plan (canted). An **oriel** is a bay window on an upper floor. 1

cames: cast lead strips, usually of "H" section and soldered into place, used to fix small panes of glass in windows. 1

casement: a hinged window frame that opens horizontally like a door. 2

dormer window: an upright window lighting the space in a roof. When it is in the same plane as the wall, it is called a wall dormer, when it rises from the slope of a roof, a roof dormer. 2

fenestration: the arrangement of windows in a building. 1

garret window: attic window

glazing bars: the bars, usually of wood, that hold panes of window glass in place. 1

hoodmould: a projecting moulding above a door, window or other opening to protect it from rain; also called a drip mould or label. 1

jamb: the straight vertical side of a doorway, arch or window. 1

jib door: a concealed door flush with the wall and usually decorated to match it. 1

joinery: finished woodwork, such as that used on doors, windows, and stairs. 1

leaded lights: small panes of glass set into cames (lead strips) to form a window. 1

light: a section of a window, the pane or glass. 2

lintel: a horizontal structural or ornamental member over an opening, which generally carries the weight of the wall above it; often of stone or wood. 2

louver: one of a series of overlapping slats (for example, in window shutters). 1

mortise and tenon joint: a woodworking joint which is made by one member having its end cut in a projecting piece (tenon) which fits exactly into a groove or hole (mortise) in the other member. Once joined, the pieces are held together by a peg that passes through the tenon. 2

mullion: a vertical member separating (and often supporting) windows, doors, or panels set in a series. 2

muntin: a secondary framing member to hold panes within a window, window wall, or glazed door. 2

quarry: a small square – or diamond-shaped pane of glass used in leaded windows. 1

rabbeted: two members joined together by interlocking grooves cut into each; also spelled rabetted. 1

rabbet: a channel or groove cut into a surface edge (usually of wood) to receive another member. 1

rail: the main horizontal member of the frame of a door, window, panel, etc. 1

reveal: the inner surface of a doorcase or window opening, between the edge of the frame and the outer surface of the wall at right angles to it. The corresponding space above it is the soffit. 1

sash window: a window formed with sashes-that is; glazed wooden frames which slide up and down in vertical grooves by means of counterbalanced weights. The standard form has two moveable sashes and is termed a “double-hung sash”. 1

sill: the horizontal ledge at the bottom of a window frame. 1

stile: the main vertical member of the frame of a door, window, panel, etc. 1

tongue-and-groove: a method of joining wood so that the edge of one board has a tongue, or lip, that fits into a groove on the edge of another board. 1

transom: a light or window over a door or entryway. 2

* 1 references Calloway, Stephen, and Elizabeth Cromley, ed. *The Elements of Style: An practical encyclopedia of interior architectural details from 1485 to the present*. 2nd ed. New York: Simon & Schuster, 1996.
* 2 references Waters, John, ed. "Glossary of Architectural Terms." *HIPR 6000 Course Packet*. Athens: Bel-Jean, 2001. 1-15.

Appendix C

Historic Preservation Training Center Meeting Minutes Novemer 11, 2003

The following are minutes from a November 11, 2003 meeting at the Historic Preservation Training Center in Frederick, Maryland amongst Chris McGuigan(CM), Bill Shainline(BS), Stephen Ortado(SO), David Overholt(DO), Rick Ortega(RO), Rick Eierman(RE), David Cera, Sophia Lynn, and others. The minutes are a great demonstration of the planning thought process and chief goals desired for this restoration. Sophia Lynn transcribed the minutes - some abbreviations are spelled out for clarification.

- Chris will email me the draft protocol by C.O.B. on 11/19 and then I distribute to Rick, Gretchen, Bill Dupont, and David Overholt for review.
- Will glass and weather stripping be specific or will "equivalent" be acceptable?
- You'll use bronze or zinc weather stripping?
- Will HPTC run blanks for the general contractor?
- CM: We'll do it, if you want. Or we'll turn over our blanks to NTHP and it can do with them what it wants.
- Pulleys for sash weights were shown. They'd been 1) chemically stripped 2) bead blast-cleaned & are in excellent condition. They have lacquer finish now.
- Condition of pulleys upon removal? Face was heavily painted, some rust.
- DO: We're going for museum-quality restoration, 100-year solution.
- RO: Yes. We want to create maintenance free or low maintenance.
- Advantage to bead blasting is that you're getting rid of debris – it's a more thorough process than lubrication.
- We need to decide by 11/19 whether we issue new documents for the bidding process or just leave the allowance as it is.
- CM showed the artifact box. We proceeded to the "lead" shed. 4'x8' steam stripper. All windows and doors were put in there, explanation of the process. Heat guns could char – HPTC doesn't use that for these windows.
- CM: It's an open question whether the steam stripper will be a (required) part of the protocol. There are other methods. We paid almost 7K for this custom steam stripper. We've maintained orientation (out/in, top/bottom) of glass as it's removed. We do a light sanding job for the paint prep.
- RO: What level of prep on the historic material is a big question we intend to clarify soon. There's a difference between historic fabric that can be removed and stripped vs. material that cannot be removed.
- Stripped sashes and jib doors displayed:

- CM: 2" sample of finishes is preserved. We're not repairing for aesthetic reasons. If the structure or effective weather-stripping or the effectiveness of the window, then we repair.
- Window E-O5: some of the putty bars were scraped away to next to nothing so we repair.
- RO: We're trying to avoid epoxy repair as much as possible.
- CM: Exterior carpenter's glue is what we're using and a water repellant that gets absorbed into the wood.
- RO: Will your protocol discuss selection of wood? [We've viewed a patch on a dutchman].
- CM: Yes.
- RO: How far do we go in sizing a dutchman?
- CM: Until you hit good wood, then go a little further. We'll consult with Forest Products lab and Bob/Bill "Freist" if need be.
- RO: The general contractor's judgment will have an important role here.
- RE: Will the NTHP help make the judgment?
- DO: Yes, there will be day-to-day management. The protocol is to guide us all.
- CM: We're not epoxying on repairs, but are gluing for small repairs. If we use consolidant, it's a West System consolidant and we only use that in a situation where we won't create a water dam.
- SO: See the paint sample left on, that spot won't hold any paint. That's an issue.
- CM: Right, the question is whether these spots will be only on a few samples or al l windows.
- CM: Look at this jib door. We've preserved these substantial checks, that are large, and we question now what to do. Should we epoxy the checks?
- SO: You could use white lead.
- CM: Look at the see-thru check up here. If it were me, I'd open up the panel, insert a spline, tongue, groove, kerf, joints.
- SO: What if you encounter curve?
- CM: Right, what then?
- DO: For years at Lyndhurst we [inserted epoxy]. I'm not adverse to that.
- RO: If you've got skilled craftsmen, the do it.
- CM: If we take it apart, we replicate the joinery exactly. We'll be adding a joint, but the new joint will be concealed.
- SO: Could you just glue the panel together?
- RO: If there was glue there in the past, it didn't hold. In this case, we have to improve what's there to prevent air and water damage in the future.
- RO: Wood you're using?
- CM: NE White Pine. The wood here is red or yellow pine, difficult to get so we're using NE White Pine.
- Get Baldwin (hinge maker in Pennsylvania) contact info from Chris. Would Baldwin donate historic window hardware?
- CM: We'll use pure linseed oil, per Dave. We'll use slip tenons. Any blind joint needs to be primed, then the whole sash – including the putty bed – is primed.
- RO: Did you find points?
- CM: Yes, we found them.

- RO: Exterior – full painting. Interior of sash – one layer of prime and possibly one layer of paint (top coat of a neutral color will be needed because primer layer only protects for about 30 days).
- CM: [Showed up a rotted out sash cord holder]. This punky spot would be a good candidate for epoxy.
- RO: Right, because epoxy will not be exposed to the elements. That's o.k. by me.
- DO: Yes, that us of epoxy is o.k.
- SO: How many times have sash cords been replaced?
- CM: Based on nail holes, a number of times.
- BS: What kind of epoxies do you use?
- CM: Primarily we use West System. 3 systems – JP r46 is good, but it gets so hot. It can burn even an experienced handler.
- DO: The 2" paint strip could be encapsulated.
- CM: If it were me, I'd keep 2" strips from only a sampling of different time periods instead of having the paint strip samples for all sashes.
- SO: Solubar could be used.
- CM: Or shellac?

End of Notes