

# Historic Windows Technical Information

## Guidelines

### **The Secretary of the Interior's Standards**

The National Park Service (NPS) has published two sets of guidelines: 1) *The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines for Rehabilitating Historic Buildings*, and 2) *The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings*. These *Standards* provide illustrated recommendations for rehabilitating historic windows.

Links:

- *The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines for Rehabilitating Historic Buildings* : <https://www.nps.gov/tps/standards/rehabilitation/rehab/windows01.htm>
- *The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings*: <https://www.nps.gov/tps/standards/rehabilitation/guidelines/windows.htm>

### **National Park Service Window Guidance: Applying the Standards to common rehabilitation concerns**

The NPS published guidance on window replacement in order to meet the *Standards*. Guidance includes information on determining whether a window should be repaired or replaced, how to replace a window so it meets the *Standards*, and necessary documentation for window replacement.

Links:

- Evaluating Historic Windows for Repair or Replacement: <https://www.nps.gov/tps/standards/applying-rehabilitation/successful-rehab/windows-evaluating.htm>
- Replacement Windows that Meet the *Standards*: <https://www.nps.gov/tps/standards/applying-rehabilitation/successful-rehab/windows-replacement.htm>
- Documentation Requirements for Proposed Window Replacement: <https://www.nps.gov/tps/standards/applying-rehabilitation/successful-rehab/windows-documentation.htm>

### **DoD Legacy Project 07-382: Design Guidelines for DoD Historic Buildings and Districts**

The DoD Historic Design Guidelines are to assist DoD with its cultural resources stewardship and the proper treatment of historic buildings and districts in compliance with the National Historic Preservation Act. The guidelines are divided into three sections: an overview of cultural resources management in the DoD; design guidelines for preservation, repair, and replacement of historic features, including historic windows; and additional information for technical assistance in historic preservation methods.

Report: <https://www.denix.osd.mil/cr/cultural-resources-program-management/historic-buildings-structures/uploads/design-guidelines-for-dod-historic-buildings-and-districts-legacy-07-3821/>

Fact Sheet: <https://denix.osd.mil/cr/cultural-resources-program-management/historic-buildings-structures/uploads/design-guidelines-for-dod-historic-buildings-and-districts-legacy-07-382/>

### **Whole Building Design Guide DoD Unified Facilities Criteria (UFC)**

The UFC documents provide planning and restoration criteria for buildings and apply to the DoD and its components, in compliance with DoDI 4270.5 on Military Construction.

- DoD UFC documents: <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

## Technical Information

### Whole Building Design Guide DoD Unified Facilities Guide Specifications (UFGS)

The UFGS documents are a joint effort of the U.S. Army Corps of Engineers, the Naval Facilities Engineering Command, the Air Force Civil Engineer Center, and the National Aeronautics and Space Administration. These documents are used in specifying construction for Services and include technical guides for windows, including aluminum, steel, storm, wood, and plastic windows.

- DoD UFGS documents: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs>
- UFGS 08 01 52 Operation and Maintenance of Wood Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-01-52>
- UFGS 08 51 13 Aluminum Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-51-13>
- UFGS 08 51 23 Steel Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-51-23>
- UFGS 08 51 69.10 Aluminum Storm Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-51-69-10>
- UFGS 08 52 00 Wood Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-52-00>
- UFGS 08 53 00 Plastic Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-53-00>
- UFGS 08 56 53 Blast Resistant Tempered Glass Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-56-53>
- UFGS 08 56 63 Detention and Security Windows: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-08-56-63>

### National Park Service Preservation Briefs on Windows

For guidance on preserving, rehabilitating, and restoring historic buildings, the NPS Preservation Briefs provide recommended approaches for historic building repair and resolutions for common problems with historic structural features, including historic windows.

Links:

- The NPS Preservation Briefs: <https://www.nps.gov/tps/how-to-preserve/briefs.htm>
- The Repair of Historic Wooden Windows: <https://www.nps.gov/tps/how-to-preserve/briefs/9-wooden-windows.htm>
- The Repair and Thermal Upgrading of Historic Steel Windows: <https://www.nps.gov/tps/how-to-preserve/briefs/13-steel-windows.htm>

### National Park Service Preservation Tech Notes on Windows

The NPS Preservation Tech Notes listed and linked below offer practical guidance on techniques for successfully maintaining and preserving cultural resources, including a variety of historic window features, ranging in material and type.

Tech Note Links:

- The NPS Preservation Tech Notes: <https://www.nps.gov/tps/how-to-preserve/tech-notes.htm>
- [Planning Approaches to Window Preservation](#). Charles Fisher. 1984.
- [Installing Insulating Glass in Existing Steel Windows](#). Charles Fisher. 1984.
- [Exterior Storm Windows: Casement Design Wooden Storm Sash](#). Wayne Trissler and Charles Fisher. 1984.

- [Replacement Wooden Frames and Sash](#). William Feist. 1984.
- [Interior Metal Storm Windows](#). Laura Muckenfuss and Charles Fisher. 1984.
- [Replacement Wooden Sash and Frames With Insulating Glass and Integral Muntins](#). Charles Parrott. 1984.
- [Window Awnings](#). Laura Muckenfuss and Charles Fisher. 1984.
- [Thermal Retrofit of Historic Wooden Sash Using Interior Piggyback Storm Panels](#). Sharon Park, AIA. 1984.
- [Interior Storm Windows: Magnetic Seal](#). Charles Fisher. 1984.
- [Temporary Window Vents in Unoccupied Historic Buildings](#). Charles Fisher and Thomas Vitanza. 1985.
- [Installing Insulating Glass in Existing Wooden Sash Incorporating the Historic Glass](#). Charles Fisher. 1985.
- [Aluminum Replacements for Steel Industrial Sash](#). Charles E. Fisher. 1986.
- [Aluminum Replacement Windows with Sealed Insulating Glass and Trapezoidal Muntin Grids](#). Charles Parrott. 1985.
- [Reinforcing Deteriorated Wooden Windows](#). Paul Stumes, P.Eng 1986.
- [Interior Storms for Steel Casement Windows](#). Charles E. Fisher and Christina Henry. 1986.
- [Repairing and Upgrading Multi-Light Wooden Mill Windows](#). Christopher W. Closs. 1986.
- [Repair and Retrofitting Industrial Steel Windows](#). Robert M. Powers. 1989.
- [Aluminum Replacement Windows With True Divided Lights, Interior Piggyback Storm Panels, and Exposed Historic Wooden Frames](#). Charles Parrott. 1991
- [Repairing Steel Casement Windows](#). Chad Randl. 2002.
- [Aluminum Replacement Windows for Steel Projecting Units with True Divided Lights and Matching Profiles](#). Chad Randl. 2003.
- [Replacement Wood Sash Utilizing True Divided Lights and an Interior Piggyback Energy Panel](#). Charles E. Fisher. 2008.
- [Maintenance and Repair of Historic Aluminum Windows](#). Kaaren R. Staveteig. 2008.

### **U.S. General Services Administration Technical Preservation Guidelines**

*General Service Administration (GSA)'s Technical Preservation Guidelines: Upgrading Historic Building Windows* provides guidance on upgrading, retrofitting, and replacing historic windows in compliance with Section 106 of the National Historic Preservation Act and the Secretary of Interior's *Standards*. This guide includes a window analysis matrix to assist in identifying issues with historic windows, needed replacements, and related costs. Caroline Alderson. 2009.

Guidelines: <https://www.gsa.gov/cdnstatic/Windows.pdf>

### **Former DoD Program Comment for Rehabilitation Treatment Measures**

This program comment (PC) expired in 2018, but the content and technical guidance is still relevant. A handful of the rehabilitation treatment measures (RTM) were formally adopted in the PC, but many RTMs remained in draft form. The Office of the Deputy Assistant Secretary of Defense for Environment is working on a project to update all of the RTMs, including those RTMs that were never formally adopted in the PC, and develop a guidebook to share the technical recommendations more broadly (expected completion is 2021). The RTMs provide guidance and recommendations on window treatment in the following instances:

- Program Comment: <https://www.denix.osd.mil/cr/cultural-resources-program-management/historic-buildings-structures/uploads/program-comment-for-dod-rehabilitation-treatment-measures/>
- In Kind Replacement of Metal Windows (DRAFT—NEVER FORMALLY ADOPTED)
- Metal Window Restoration (DRAFT—NEVER FORMALLY ADOPTED)
- Storm Windows and Screens (DRAFT—NEVER FORMALLY ADOPTED)
- Wood Window Restoration (DRAFT—NEVER FORMALLY ADOPTED)

- In Kind Replacement of Wood Windows (DRAFT—NEVER FORMALLY ADOPTED)
- Window Hardware Fittings (DRAFT—NEVER FORMALLY ADOPTED)

Please note there is additional info related to RTMs on the DoD-only user side that requires CAC log-in. See log-in button at the top of the DENIX webpage for access.

## DoD Legacy Research

### **DoD Legacy Project 04-219: Performance Testing of Historically Appropriate Blast-Resistant Windows Volume 1 – Background and Testing Program.**

This study provides DoD with manufacturer-independent test data for historically compatible blast-resistant windows. The technical report details the process of designing and testing blast-resistant windows compliant with both UFC 4-010-01, the minimum engineering standards for antiterrorism measures, and the Secretary of Interior's *Standards*. The report also provides a directory of U.S. blast test facilities and blast-resistant window manufacturers. Volume II is not publicly available.

Report: <https://www.denix.osd.mil/cr/archives/uploads/performance-testing-of-historically-appropriate-blast-resistant-windows-volume-1-legacy-04-219/>

Fact Sheet: <https://www.denix.osd.mil/cr/archives/uploads/performance-testing-of-historically-appropriate-blast-resistant-windows-legacy-04-219/>

### **DoD Legacy Project 13-707: 20<sup>th</sup>-Century Building Materials and Suitable Substitutes, Windows Visual Guide**

The *20th-Century Building Materials and Suitable Substitutes Windows Visual Guide* is designed as a quick-reference tool for Cultural Resource Managers (CRMs), facility planners, architects, and engineers entrusted with preservation, maintenance, and navigation of the Section 106 process of the National Historic Preservation Act while balancing project needs and regulatory requirements. This Visual Guide is intended to provide the user with the ability to recognize and define steel, corrugated wire glass, and glass block windows as character-defining features in early- to mid-twentieth-century historic buildings (i.e., those buildings eligible for listing in or listed in the National Register of Historic Places, either individually or as part of a larger historic district). Each window type is explored to familiarize the user with the appearance of the material, construction methods applicable for identification or replacement, context of popular use, and in-situ examples in existing DoD architecture. The information and images in the Visual Guide are provided to assist the user in research, interpretation, and possible future mitigation.

Report: <https://www.denix.osd.mil/cr/lrmp/home/reports/20th-century-building-materials-and-suitable-substitutes-windows-visual-guide-legacy-13-707/>

## Case Studies

### **Fort Belvoir Family Housing Historic Window Pilot Study and MOA**

In 2012, Fort Belvoir Residential Communities (FBRC) and Fort Belvoir implemented a pilot study to rehabilitate the historic windows in one historic family housing unit to compare rehabilitation versus replacement using the following metrics: cost, construction time, energy conservation, sound attenuation, and lead-based paint. Fort Belvoir invited the Virginia State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) to participate in the review of the pilot study results as part of the windows treatment Section 106 consultation process. The study found that window rehabilitation, including the installation of a storm window, and wood window replacement are equally energy efficient, aesthetically pleasing, safe, mechanically functional, and create an improved quality of life for Soldiers and their families residing in historic units. However, wood window replacements were found to be faster to install, easier to operate for the everyday user, and more economical with regard to estimated long-term maintenance after factoring in storm

window maintenance for the rehabilitated windows. After additional consultation meetings, Fort Belvoir will replace the windows in 102 units, and 34 units will have their windows rehabilitated. In 2009, four mockup windows were created by FBRC, and the partnership selected one as the best replacement candidate. The rehabilitated units will showcase the different design types and styles indicative of each historic village and create a meaningful and intact representation of the original windows.

Links:

- Historic Wood Window Pilot Rehabilitation Final Report: <https://usarsustainabilitydotcom.files.wordpress.com/2017/11/materials-usar-cr-belvoir-window-report-2013-10-04-final-lowres.pdf>
- CRUD article on page 7: <https://www.denix.osd.mil/cr/cultural-resources-communication-outreach/cultural-resources-program-newsletter/cultural-resources-update-october-november-2014/>
- Army.mil article: [https://www.army.mil/article/129796/historic\\_window\\_replacement\\_to\\_begin](https://www.army.mil/article/129796/historic_window_replacement_to_begin)

### **Administration Building 409: Bringing Back the Commanding Officer's Building at Naval Air Station Patuxent River**

In 2017, Naval Air Station Patuxent River Complex (Pax River) completed a renovation of Administration Building-409 (B-409), used as the Installation Commanding Officer's headquarters. Built in the International Style, Administration Building-409 was built in 1942 and consists of a wood frame with long bands of wood sash windows. The building became a high priority for renovation due to deferred maintenance and the presence of lead paint, poor HVAC systems, and original asbestos Transite siding.

A major component of the project focused on the double-hung wood windows. The project called for removal of the lead-based paint from sashes and frames, replacement of all missing hardware, and return of the windows to operable condition. The contractor set up an on-site lead stripping operation for the sashes and frames. The contractor also replaced missing and broken glass panes in the sashes. Remarkably, after the lead-based paint was removed, not a single sash or window frame needed significant repair. The non-historic aluminum exterior storm windows were removed and replaced with an interior storm system called the Winsulator, comprised of interior clear acrylic storm windows held in place with magnetic strips. The lightweight interior storm windows are easily removed, allowing the windows to be opened as desired, while eliminating air leakage.

Cultural Resources *Update* newsletter article on page 6-7: <https://www.denix.osd.mil/cr/cultural-resources-communication-outreach/cultural-resources-program-newsletter/cultural-resources-update-summer-2017/>

### **National Trust for Historic Preservation Report**

This National Trust for Historic Preservation report, *Saving Windows, Saving Money: Evaluating the Energy Performance of Window Retrofit and Replacement*, was funded by the NPS National Center for Preservation Training and Technology (NPTT) and compares the costs and energy performances of retrofitting historic windows against replacing them.

Report: <https://forum.savingplaces.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=80dc79b4-3814-59ac-9abe-842685e77747&forceDialog=0>

### **National Center for Preservation Technology and Training Report**

This NPTT study, *Testing the Energy Performance of Wood Windows in Cold Climates: A Report to the State of Vermont Division for Historic Preservation, Agency of Commerce and Community (1996-08)*, investigated how to retain historic windows while optimizing energy efficiency.

Report: <https://www.ncptt.nps.gov/blog/testing-the-energy-performance-of-wood-windows-in-cold-climates-a-report-to-the-state-of-vermont-division-for-historic-preservation-agency-of-commerce-and-community-development-1996-08/>

## Program Alternatives

### **U.S. Army Prototype Programmatic Agreement Regarding Building Interiors**

This U.S. Army PPA template is regarding building interiors and contains a small section on windows.

Army PPA: [https://www.achp.gov/sites/default/files/prototype\\_programmatic\\_agreements/2018-07/ArmyInteriorsPrototypeProgrammaticAgreementFINAL\\_July2011.pdf](https://www.achp.gov/sites/default/files/prototype_programmatic_agreements/2018-07/ArmyInteriorsPrototypeProgrammaticAgreementFINAL_July2011.pdf)

### **U.S. Army Prototype Programmatic Agreement for the Privatization of Army Lodging**

This U.S. Army PPA template for the privatization of Army lodging contains a small section on windows.

Army PPA: [https://www.achp.gov/sites/default/files/prototype\\_programmatic\\_agreements/2018-07/Privatization%20of%20Army%20Lodging%20%28PAL%29%20%20Prototype%20PA%204-4-12%20Final.pdf](https://www.achp.gov/sites/default/files/prototype_programmatic_agreements/2018-07/Privatization%20of%20Army%20Lodging%20%28PAL%29%20%20Prototype%20PA%204-4-12%20Final.pdf)

### **U.S. Army Garrison-Rock Island Arsenal Memorandum of Agreement**

This U.S. Army MOA is regarding window replacement for historic buildings at the Rock Island Arsenal in Rock Island, Illinois. This MOA was later amended.

Army MOA: <https://www2.illinois.gov/dnrhistoric/Preserve/Places/Documents/MOA-PA/Window%20Replacement%20Amendment%201,%20Rock%20Island%20Arsenal%20Bldgs%2060,%2062,%2066,%2067,%2068.pdf>

Army MOA Amendment: <https://www2.illinois.gov/dnrhistoric/Preserve/Places/Documents/MOA-PA/Window%20Replacement%20for%20Bldgs%2060,%2062,%2068,%20RIA%20MOA.pdf>

### **Federal Emergency Management Agency Prototype Programmatic Agreement**

This FEMA PPA template for Section 106 of the National Historic Preservation Act includes language on windows.

FEMA PPA: <https://www.fema.gov/media-library-data/1411485257625-3934729ee7ec867282fbffc976102222/PPA.pdf>

### **Department of Energy Prototype Programmatic Agreement**

This DOE PPA regarding the Energy Efficiency and Conservation Block Grant Program, the State Energy Plan, and the Weatherization Assistance Program includes language on windows.

DOE PPA: [https://www.achp.gov/sites/default/files/prototype\\_programmatic\\_agreements/2018-07/DOE%20Prototype%20PA%20Final\\_Complete.pdf](https://www.achp.gov/sites/default/files/prototype_programmatic_agreements/2018-07/DOE%20Prototype%20PA%20Final_Complete.pdf)

### **General Services Administration Program Comment for Repairs and Upgrades to Windows, Lighting, Roofing, and Heating, Ventilating, and Air Conditioning, as Amended**

This GSA PC, amended in 2018, outlines Section 106 compliance for select repairs and upgrades to windows, lighting, roofing, and heating, ventilating, and air-conditioning (HVAC) systems within historic public buildings. These repairs and upgrades correspond to GSA's Technical Preservation Guidelines.

GSA PC: [https://www.achp.gov/sites/default/files/program\\_comments/2018-07/Federal\\_Register\\_Notice\\_of\\_Issued\\_GSA\\_Program\\_Comment\\_72718.pdf](https://www.achp.gov/sites/default/files/program_comments/2018-07/Federal_Register_Notice_of_Issued_GSA_Program_Comment_72718.pdf)

## Additional Links

### **Additional Links from the Washington SHPO**

The Washington State Historic Preservation Office (SHPO) has useful information and helpful links on preservation guidance, maintenance, repair, and replacement for historic wood windows.

WA SHPO: <https://dahp.wa.gov/historic-preservation/preservation-topics/window-preservation-guidance>

### **DC SHPO Historic Preservation Guidelines**

The District of Columbia SHPO offers its own preservation and design guidelines and technical assistance on window repair and replacement.

DC SHPO:

<https://planning.dc.gov/sites/default/files/dc/sites/op/publication/attachments/HPO%20Window%20Guidelines.%202010%202011.pdf>