

SUSTAINABLE PRESERVATION

SEPTEMBER 7, 2023
KAUA'I COMMUNITY COLLEGE

HISTORIC HAWAII FOUNDATION
NATIONAL PARK SERVICE



HISTORIC HAWAI'I FOUNDATION

A membership-based, statewide non-profit organization, Historic Hawai'i Foundation encourages the preservation of historic buildings, sites and communities relating to the history of Hawai'i.



The **National Park Service** preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

OUTLINE

- ❑ Welcome, Overview, and Introductions
- ❑ Historic Properties
- ❑ Preservation Treatments
- ❑ Sustainability Treatments
- ❑ Window Repair
- ❑ Discussion



Wheeler Army Airfield Building 104, O'ahu
Solar Installation Project, 2017

PRESENTERS

Kiersten Faulkner

Historic Hawai'i Foundation

Kiersten has been Executive Director since 2006. She holds a Master of Arts in Urban and Environmental Policy from Tufts University and is a member of the College of Fellows of the American Institute of Certified Planners (FAICP).

Elaine Jackson-Retondo

National Park Service

Elaine is Acting Program Manager, Cultural Resources and Science, in the NPS regional office. She earned her Doctorate in Architectural History and Masters of Architecture from the University of California, Berkeley and her Bachelor of Architecture from the University of Notre Dame.

Barbara Shideler, AIA

Mason Architects

Barbara has designed the restoration and renovation of significant historic buildings and residences in Hawai'i. She has a B.Arch. and a Graduate Certificate in Historic Preservation from the University of Hawai'i. She is the president of the Association for Preservation Technology – Hawaii-Pacific Chapter.

Lucien Swerdloff

Clatsop Community College

Lucien was the founding director and faculty of the CCC Preservation Program. He has an M. Arch from the State University of New York at Buffalo, and has worked on the restoration of numerous historic buildings.

Alan Shintani

Alan Shintani Inc.

Alan has been a general contractor for 37 years. Some of his achievements include the historical renovation of the Royal Mausoleum Chapel, Mauna Ala in 1984; 8(a) Contractor 1996; awarded Special Congressional Recognition by the City and County of Honolulu and the US Small Business Administration for Small Business Person of the Year 2002

Andrea Nandoskar

Historic Hawai'i Foundation

Andrea is the Education Program Manager and has been with Historic Hawai'i Foundation for 11 years. She oversees HHF's educational programs, seminars, workshops, lecture series and other outreach. She holds a BA in Literature from the State University of New York at Purchase.

Historic Preservation

ELAINE JACKSON-RETONDO

A solid green horizontal bar at the bottom of the slide.

HISTORIC PROPERTIES

Historic Register Listing

Historic properties can be listed on the:

- Hawai'i Register of Historic Places
- National Register of Historic Places

Benefits include recognition, community pride, education, heritage tourism, special consideration in codes, as well as tax credits.



Who decides?

Hawai'i Historic Places Review Board list properties in the Hawai'i Register and recommend properties for the **National Register**. Professional experts in architecture, archaeology, sociology, history, and Hawaiian Culture are nominated by the Governor. **The Keeper of the National Register** enters properties into the National Register of Historic Places.

HISTORIC PROPERTIES

Historic or Just Old?

1. Resources generally are **+50** years old;
2. **Significance** associated with criterion:
 - A (a) Event
 - B (b) Person
 - C (c) Architecture/design/technology
 - D (d) Archaeological significance
 - (e) Cultural importance
3. Retain **historic integrity** based on authenticity, rather than condition.



Montgomery House, Hā'ena State Park, Kaua'i. Photo by MASON

CAPITAL – National Register; lowercase = Hawai'i Register significance criteria

HISTORIC PROPERTIES

Historic Integrity

7 Aspects of Integrity

- Materials
- Design
- Workmanship
- Location
- Setting
- Association
- Feeling

Integrity is the ability of a property to convey significance.

The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance.

To retain historic integrity a property will possess several of the aspects.

HISTORIC BUILDINGS

HISTORIC Character

Historic character-defining features include visual aspects and physical elements that such as the overall shape of the building, its materials, craftsmanship, decorative details, interior spaces and features, as well as the site and environment that tell its story.

Actions that have **adverse effects** on character-defining features are not recommended under preservation regulations.



Wakamiya Inari Shrine, Hawai'i Plantation Village, Waipahu, O'ahu.
Photo by Historic Hawai'i Foundation

HISTORIC BUILDINGS

Historic Character Defining Features

Identify EXTERIOR visual aspects to understand distinctive features

- Overall setting and site
- Overall shape
- Roof and roof features
- Openings for windows and doorways
- projections and recesses on the building, such as lanai
- Exterior material color and patterning
- Trim and secondary features



Truslow Residence, Halaulani Place Historic District, Hilo, Hawaii Island.
Photo by Don Hibbard

HISTORIC BUILDINGS

Historic Character Defining Features

Identify INTERIOR visual aspects and identify the distinctive spaces, features and finishes

- Material
- Details and Craftsmanship
- Individual spaces and spaces that are related to each other
- Interior features that are part of the building
- Distinctive surface materials and finishes
- Exposed structural elements



East Honolulu Residence, Portlock, O'ahu. Photo by David Franzen

HISTORIC BUILDINGS PROTECTION

State Historic Preservation Division (SHPD) reviews federal, state, and local projects impacting the built environment often as part of the permitting process.

SHPD is comprised of three branches:

- Architecture
- Archaeology
- History & Culture

Kauaʻi Historic Preservation Review Commission (KHPRC) is a board of the County of Kauaʻi.



Kauaʻi County Building, Līhuʻe, Kauaʻi. Photo by MASON.

HISTORIC BUILDINGS Regulations and Codes

State & Federal laws for historic properties:

- Hawaii Revised Statutes Chapter 6E
- National Historic Preservation Act 1966

Codes

All codes afford some leniency for historic structures and allow for negotiation with building officials regarding specific issues that would alter the historic character-defining features of the building.

Technical Preservation Services
National Park Service
U.S. Department of the Interior

Home > How to Preserve > Preservation Briefs > 9 Wooden Windows

Preservation Briefs
See Preservation Briefs 1-47

Some of the web versions of the Preservation Briefs differ somewhat from the printed versions. Many illustrations are new and in color; Captions are simplified and some complex charts are omitted. To order hard copies of the Briefs, see [Printed Publications](#)®.

PRESERVATION BRIEFS

9
The Repair of Historic Wooden Windows
John H. Myers

Architectural or Historical Significance
Physical Evaluation
Repair Class I: Routine Maintenance

Historic six-over-six window preserved. Photo: NPS files.

Technical Preservation Services
National Park Service
U.S. Department of the Interior

Home > How to Preserve > Preservation Briefs > 32 Accessibility

Preservation Briefs
See Preservation Briefs 1-47

Some of the web versions of the Preservation Briefs differ. Many illustrations are new and in color; Captions are simplified and some complex charts are omitted. To order hard copies of the Briefs, see [Printed Publications](#)®.

PRESERVATION BRIEFS

32
Making Historic Properties Accessible
Thomas C. Jester and Sharon C. Park, AIA

Planning Accessibility Modifications
Accessibility Solutions
Consider an Addition for Accessibility
Making Historic Landscapes Accessible
Federal Accessibility Laws
Summary and References
Reading List

Download the PDF

Technical Preservation Services
National Park Service
U.S. Department of the Interior

Home > How to Preserve > Preservation Briefs > 41 Seismic Retrofit

Preservation Briefs
See Preservation Briefs 1-47

Some of the web versions of the Preservation Briefs differ somewhat from the printed versions. Many illustrations are new and in color; Captions are simplified and some complex charts are omitted. To order hard copies of the Briefs, see [Printed Publications](#)®.

PRESERVATION BRIEFS

41
The Seismic Retrofit of Historic Buildings Keeping Preservation in the Forefront
David W. Look, AIA, Terry Wong, PE, and Sylvia Rose Augustus

Introduction
Balancing Seismic Retrofit and Preservation
Earthquake Damage to Historic Buildings
Putting a Team Together
Planning for Seismic Retrofit
Assessing the Cost of Seismic Retrofit
Seismic Strengthening Approaches
Post-Earthquake Issues
Questions to Ask
Summary and References
Reading List

Download the PDF

Earthquake damaged building. Photo: NPS files.

SECRETARY OF THE INTERIOR'S STANDARDS FOR THE TREATMENT OF HISTORIC PROPERTIES

The **Standards** are a series of concepts about maintaining, repairing, and replacing historic materials, as well as designing new additions or making alterations.

The **Guidelines** offer general design and technical recommendations to assist in applying the Standards to a specific property. Together, they provide a framework and guidance for decision-making about work or changes to a historic property.

The screenshot shows the top navigation bar with links for INTRODUCTION, PRESERVING, REHABILITATING, RESTORING, and RECONSTRUCTING. The main heading is 'The Secretary of the Interior's Standards for the Treatment of Historic Properties + Guidelines for the Treatment of Cultural Landscapes'. A sidebar menu lists: Overview, Preservation Planning, Factors to Consider, Special Requirements, Using the Standards + Guidelines, Organization of the Guidelines, Terminology, Bibliography, and Acknowledgments. The main content area includes a paragraph about the standards' purpose and a detailed paragraph about their history, mentioning their origin in 1978 and subsequent revisions in 1992 and 1993.



The book cover features the title in bold, white, sans-serif font against a dark background. At the bottom, there are two circular icons: one showing a landscape and the other showing a building. The U.S. Department of the Interior and National Park Service logos are also present.



The book cover features the title in bold, white, sans-serif font against a dark background. At the bottom, there are two circular icons: one showing a landscape and the other showing a building. The U.S. Department of the Interior and National Park Service logos are also present.

HISTORIC BUILDINGS Preservation

Focuses on retention of historic fabric through conservation, maintenance and repair.



Main Post Office, Līhu'e, Kaua'i.
Photo by Historic Hawai'i Foundation



Kīlauea Plantation Head Bookkeeper's House, Kīlauea, Kaua'i.
Photo by Barbara Robeson

HISTORIC BUILDINGS Rehabilitation

Altering a historic structure to facilitate its continued use into the future while retaining the character defining features which make it significant



Kīlauea Elementary School Building B, Kilauea, Kauaʻi.
Photo by MASON

HISTORIC BUILDINGS Restoration

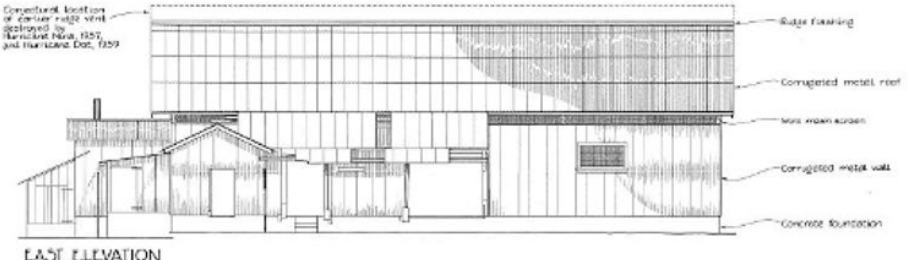
Restores historic property to most significant period of its history



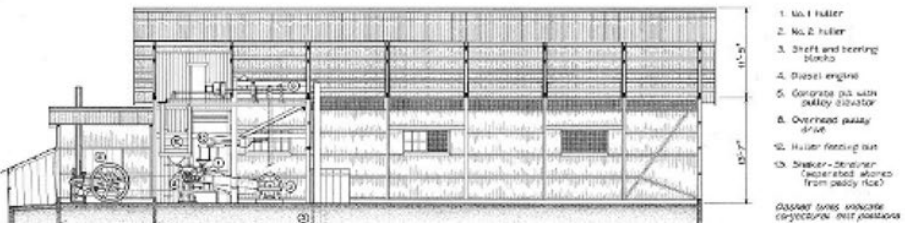
H.N. Greenwell Store, Kealahou, Hawai'i Island. Photos courtesy Kona Historical Society.

HISTORIC BUILDINGS Reconstruction

Rebuilds a lost property in new materials



EAST ELEVATION



Haraguchi Rice Mill, Hanalei, Kauai

HARAGUCHI RICE MILL - 1957
 15'-0"
 15'-0"
 135000 lbs. machine (structure mill postwork)

Sustainability

BARBARA SHIDELER

A solid green horizontal bar at the bottom of the page.

HISTORIC BUILDINGS

Sustainability

“The greenest building is the one
that already exists.”




~Carl Elefante, FAIA, past AIA president



Kōke'e Civilian Conservation Corps Camp, Kaua'i. Photo by MASON

SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION & ILLUSTRATED GUIDELINES ON SUSTAINABILITY



16		PLANNING	
RECOMMENDED		NOT RECOMMENDED	
	<p>Forming an integrated sustainability team when working on a large project that includes a preservation professional to ensure that the character and integrity of the historic building is maintained during any upgrades.</p>	<p>Omitting preservation expertise from a sustainability project team.</p>	
	<p>[16-18] Inherently sustainable features of historic buildings: Shutters and a deep porch keep the interior cool in a historic house in a warm climate (top); a skylight provides natural light to the interior of this mid-20th century house (center); partially glazed partitions and doors allow natural light into the corridor of a historic office building (bottom).</p>	<p>Analyzing the condition of inherently-sustainable features of the historic building, such as shutters, storm windows, awnings, porches, vents, roof monitors, skylights, light wells, transoms and naturally-lit corridors, and including them in energy audits and energy modeling, before planning upgrades.</p>	<p>Ignoring inherently-sustainable features of the existing historic building when creating energy models and planning upgrades.</p>
	<p>Prioritizing sustainable improvements, beginning with minimally invasive treatments that are least likely to damage historic building material.</p>	<p>Identifying ways to reduce energy use, such as installing fixtures and appliances that conserve resources, including energy-efficient lighting or energy-efficient lamps in existing light fixtures, low-flow plumbing fixtures, sensors and timers that control water flow, lighting and temperature, before undertaking more invasive treatments that may negatively impact the historic building.</p>	<p>Beginning work with substantive or irreversible treatments without first considering and implementing less invasive measures.</p>

HISTORIC BUILDINGS

Sustainable Strategies

- **Preservation expertise**, including local craftspeople
- **Traditional materials**, durable and repairable
- **Minimal adverse effect** to historic character
- **Inherent energy-efficient features** of the historic building
- **Operational changes** before altering the resource
- **Improve efficiency** of existing equipment, appliances, and systems with retrofits or replacements
- **Sustainable materials** when compliant with preservation priorities.

“Net zero” energy goals are difficult to achieve in a historic retrofit. Attempting to reach such a goal with a historic building would most likely result in significant alterations and loss of historic materials.



Kōke'e Civilian Conservation Corps Camp, Kaua'i.
Photo by MASON

HISTORIC BUILDINGS

Inherent Energy Efficient Features

- Identify and retain the existing **energy-efficient features** of the historic building and understand how they were intended to function. Historic structures often maximized natural light and ventilation in response to local climatic conditions.
- Retain and repair **durable** historic materials, such as mass walls in masonry construction.
- Retrofit treatments should be **reversible**, i.e., do not permanently alter or remove significant historic character-defining features.



Historic Kauai County Building, Līhu'e, Kaua'i.

HISTORIC BUILDINGS

Operational Changes

- Reduce “**phantom**” loads: turn off equipment when not in use. Install smart thermostats, motion sensors, and timers for lights and ventilation.
- Reduce the **thermal envelope** by not air conditioning spaces that do not require cooling.
- Use operable windows, overhanging eaves, awnings, ceiling fans, and vents to **control temperature and ventilation**. Install insulated shades and curtains to control heat gain and cooling loss through windows.
- Repair, rather than replace, **historic windows**. Add weatherstripping and replace sealants.
- Enhance **natural light** with the addition of neutral solar film to control UV and glare.
- Add **landscaping** to shade windows and roofs, where appropriate.

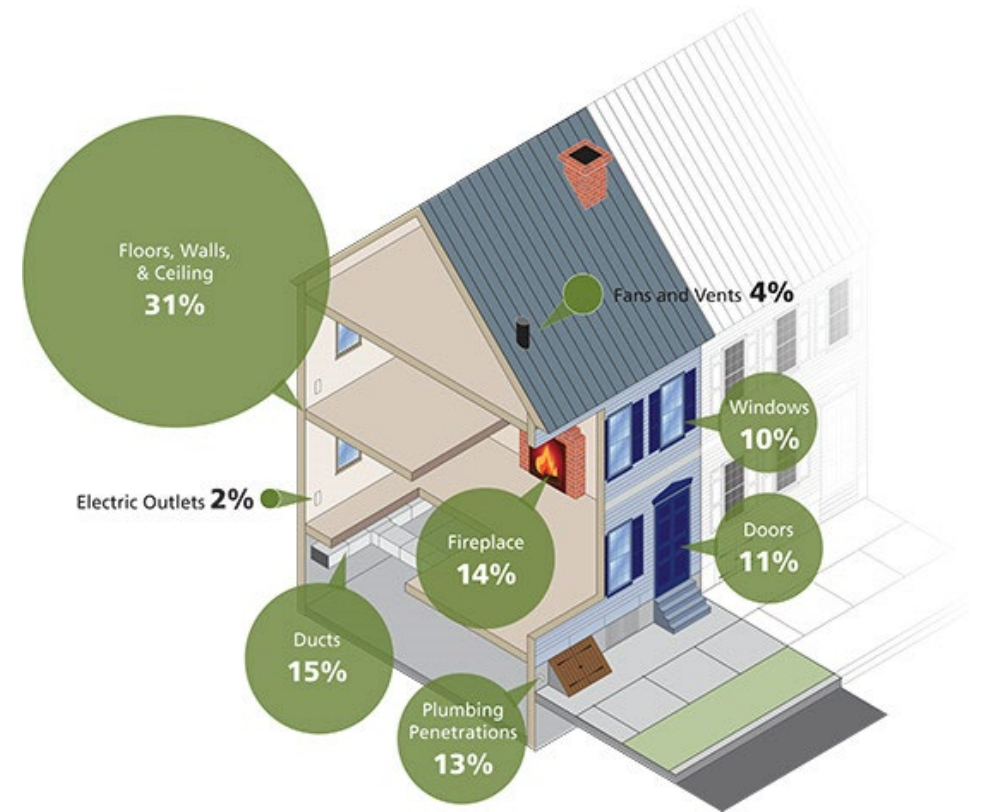


Castle Building, Kailua, O'ahu

HISTORIC BUILDINGS

Upgrade Building Components

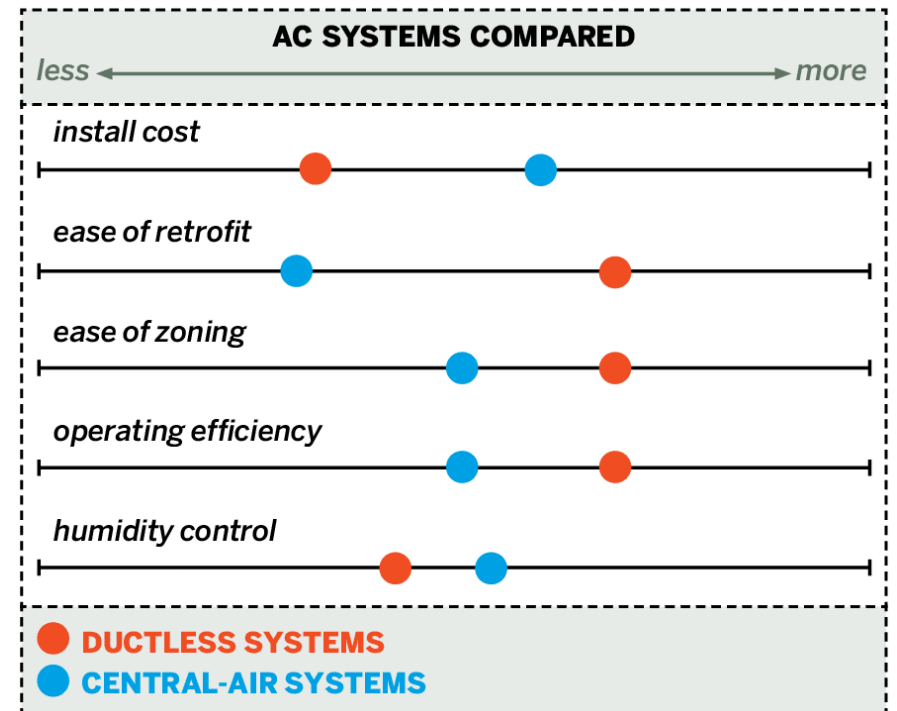
- Retrofit measures to historic buildings should achieve reasonable energy savings, at reasonable costs, with the **least impact on the historic character** of the building.
- Understand building science and potential impacts to materials, such as **moisture drive**, before implementing retrofit treatments.
- Reduce **air leakage** in conditioned spaces. Seal and insulate ducts and pipes. Add attic insulation.
- Relamp existing fixtures with energy-efficient **LEDs**.
- **Clean and service** mechanical equipment regularly to maximize efficiency.



HISTORIC BUILDINGS

Upgrade Equipment and Appliances

- Upgrade existing air conditioning systems to increase efficiency and performance within **normal replacement cycles**.
- Install **high-efficiency ductless (split)** equipment in lieu of ducted, central systems that may damage or obscure historic building materials.
- Supplement HVAC systems with **ceiling fans, operable windows** to reduce cooling needs.
- Install **high-efficiency** tankless water heaters that provide hot water on demand.
- Specify **Energy Star** appliances, particularly refrigerators, washing machines and dishwashers.



HISTORIC BUILDINGS

Renewable Energy

- Consider on-site solar technology only **after implementing appropriate treatments to improve energy efficiency**, which often have greater life-cycle cost benefits.
- Solar devices should have **minimal impact** on historic buildings and materials by placing them in locations with limited or no visibility, i.e., on flat roofs at a low angle or on a secondary roof slope.
- Consider installation on alternative locations, i.e. carports or adjacent structures.



Punahou Campus, O'ahu

HISTORIC BUILDINGS

Site Features and Water Efficiency

- Retrofit non-historic plumbing fixtures with **low-flow units**.
- Retain and improve existing **storm-water management** features, such as gutters, downspouts, rain barrels, and bio-swales.
- Install **permeable paving** where appropriate. Minimize new paving to reduce “heat island” effect.
- Retain significant landscape features. Add **natural sustainable features** to the site, such as shade trees, to reduce cooling loads for the historic building.
- Landscape with **native and/or xeriscape-friendly** plants.



Historic Cooke Estate, Mānoa, O'ahu

HISTORIC BUILDINGS

Daylighting and Windows

Recommended	Not Recommended
Reopening historic windows that have been blocked in to add natural light and ventilation.	Blocking in historic window openings to accommodate new building uses.
Installing light-control devices on the historic building where appropriate to the building type, such as light shelves in industrial or mid-century modern buildings, awnings on some commercial and residential buildings and shutters on residential buildings that had them historically.	Installing light-control devices that are incompatible with the type or style of the historic building.
Installing automated daylighting controls on interior lighting systems that ensure adequate indoor lighting and allow for energy-saving use of daylighting.	
Adding new window openings on secondary and less visible facades, where appropriate, to allow more natural light into the historic building.	Adding new window openings on primary elevations that will negatively impact the character of the historic building.

Window Restoration

LUCIEN SWERDLOFF

A solid green horizontal bar at the bottom of the page.

HISTORIC WINDOWS

Functions of Windows



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
- enhancing the **appearance** of a building

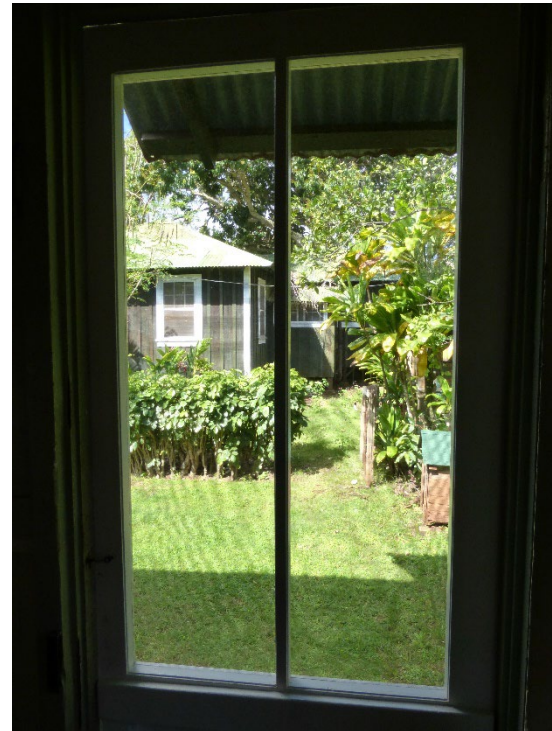
HISTORIC WINDOWS

Character Defining Features



Windows are typically some of the most significant character defining features of a building, reflecting:

- craftsmanship
- decorative detail
- material
- style



Grove Farm Homestead Museum,
Līhu'e, Kaua'i. Photos by HHF.

HISTORIC WINDOWS

Window Types

Types & Styles



Double (or Single) Hung

Whether your style is classic or contemporary, double or single hung windows are a beautiful choice for any home. Plus, their top & bottom (double) or bottom (single) sliding sashes provide very efficient ventilation.



Casement Windows

They feature one hinged sash that glides out, welcoming the breeze in. Most common in newer homes, casement windows are coveted for their clean, uncluttered views and effortless operation.



Awning

As practical as they are beautiful, these windows are hinged at the top and open out like an awning. Both traditional and contemporary designs, they're often placed above other windows & doors.



Bay and Bow

These windows reach out into the world allows you to have more windows to capture the view and enjoy the scenery. Bay windows are typically made up of three windows.



Sliding

One sliding sash glides open horizontally, allowing for easy operation — an ideal choice for difficult-to-reach places.

HISTORIC WINDOWS

Jalousie or Louver Window



Jalousie — a window consisting of a series of overlapping horizontal frameless louvers which pivot simultaneously in a common frame and are actuated by one or more operating devices so that the bottom edge of each louver swings outward and the top edge swings inward during operation.

HISTORIC WINDOWS

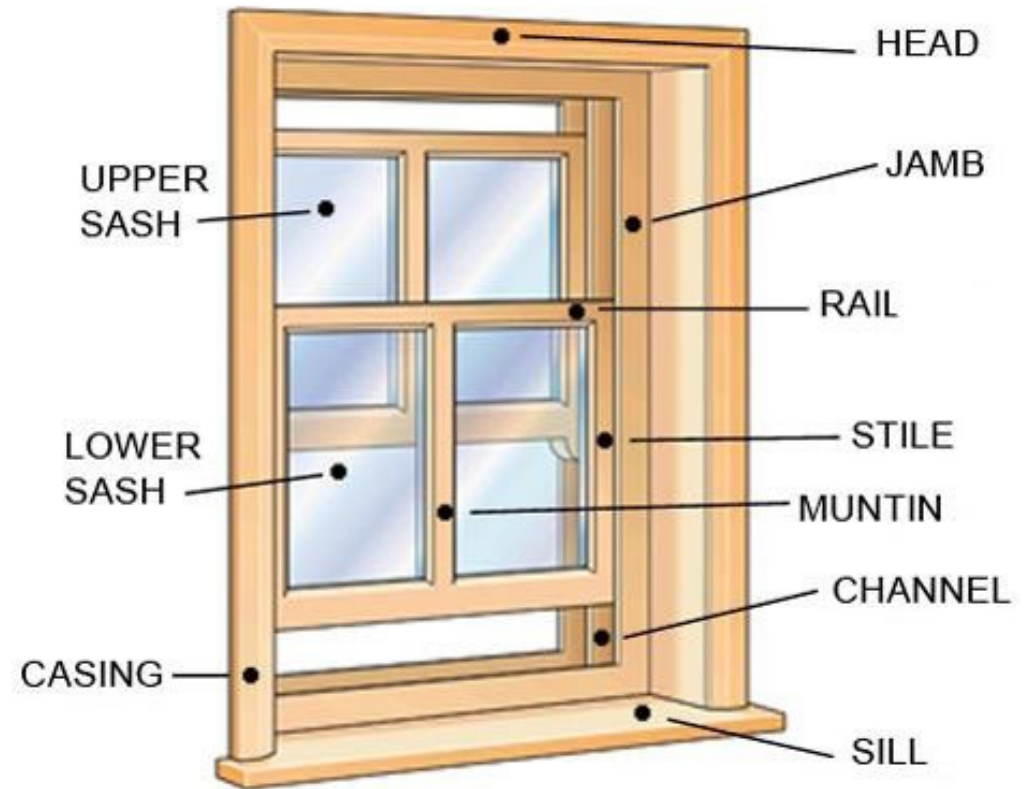
Anatomy of a Window

Frame — the surrounding structure of a window that fits into the wall and receives a sash.

Jamb/Head — vertical and horizontal members forming the side and top of the frame.

Sill — exterior horizontal member forming the bottom of the frame.

Casing — applied trim at the interior or exterior of a window frame.



HISTORIC WINDOWS

Anatomy of a Window

Sash — the operable part of a window that fits within a frame and holds the glazing.

Stile — vertical members of a sash.

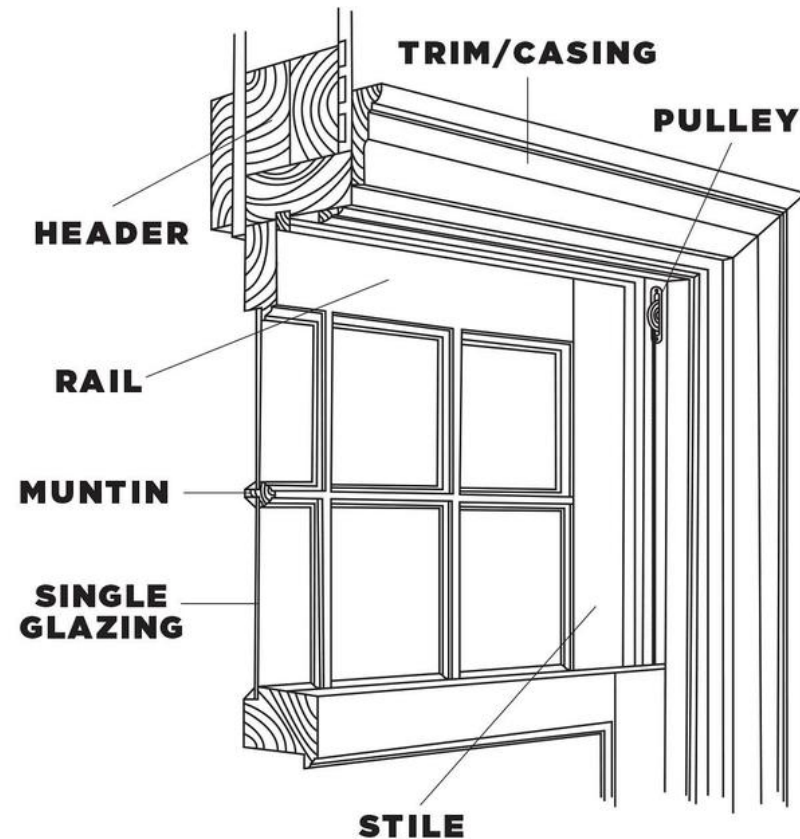
Rail — horizontal members of a sash.

Lite (light) — pane of glass used in a window.

Muntin — divider separating lites.

Stop — forms channel to hold sash.

Parting Bead — separates top and bottom sash.



HISTORIC WINDOWS

Reasons to Keep Your Old Windows



'Iolani Palace, Honolulu, O'ahu

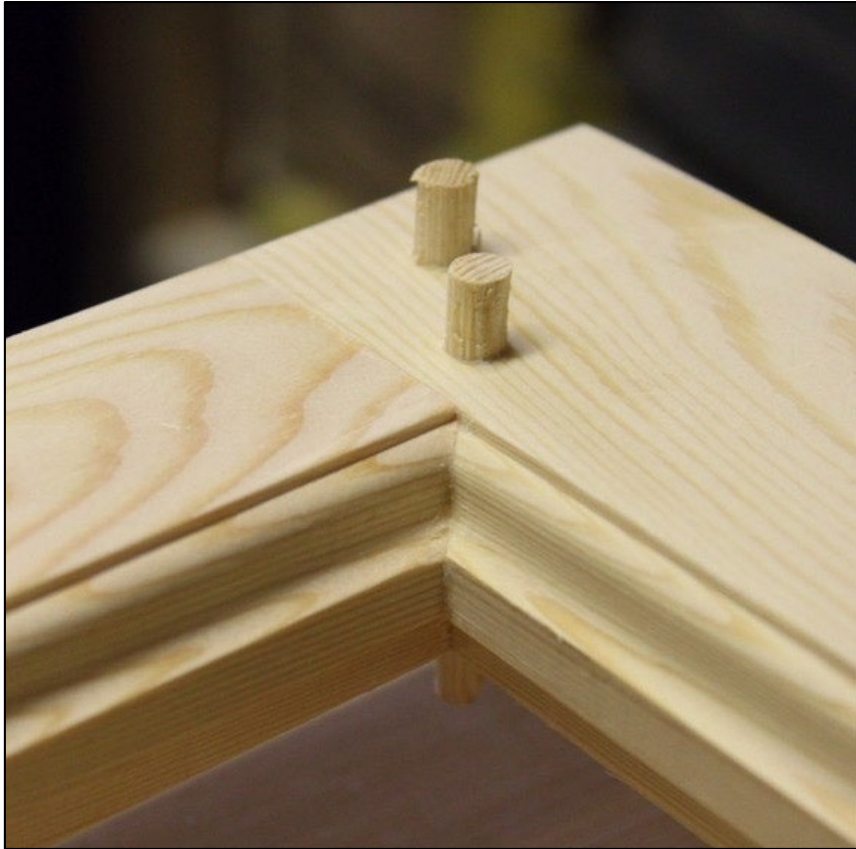
Authenticity

A large part of a historic home's character is held in its windows.

Original historic windows were custom built to fit their frames and complement the design of the house in a way that no replacement can.

HISTORIC WINDOWS

Reasons to Keep Your Old Windows



Quality

Materials: Old-growth lumber is denser, more dimensionally stable, and more rot and insect resistant than today's options.

Workmanship: Historic windows traditionally have pegged mortise and tenon joints that are the strongest and most stable joints made by Master Carpenters.

HISTORIC WINDOWS

Reasons to Keep Your Old Windows



Repairable

Wood windows are readily repairable.

Their parts (hardware, sash, and glass lites) are designed to be repaired or replaced when they reach the end of their useable life.

Historic Windows

Reasons to Keep Your Old Windows



Resale

Buyers of historic properties will pay a premium for homes with their original features still intact.

The most important features looked for by buyers are original floors and windows.

Historic Windows

Reasons to Keep Your Old Windows



Efficiency

Windows account for only 10-20% of energy loss in a typical home (much less than roofs and doors).

When kept in repair historic windows can be efficient windows. And, with simple retrofits, a single-paned window can match a replacement window's efficiency.

HISTORIC WINDOWS

Reasons to Keep Your Old Windows



Operability

The pulley and weight counter-balance system used in double-hung windows has not been improved upon. It provides the greatest ease of use through decades with minimal maintenance.

And wood windows are designed to operate smoothly with greater tolerances to building movement and other issues that inevitably arise in older buildings.

HISTORIC WINDOWS

Reasons to Keep Your Old Windows



Sustainability

The **greenest** window is the one that is already installed.

Most replacement windows have a lifespan of 20-25 years when a historic window can last several lifetimes.

By retaining your original windows, you keep materials out of the landfill!

HISTORIC WINDOWS

Repair

Old windows need repair when they are:

- Inoperable
- Damaged/deteriorated
- Leaky and energy-inefficient

Historic windows can be repaired and made (nearly) as **efficient** as new windows, but much longer lasting. Restoration can be **cost effective** and **sustainable**.



HISTORIC WINDOWS

Treatment Strategies

Maintenance – clean, paint, oil hardware

Preservation – spot putty, replace broken glass, re-rope, repair hardware

Restoration – strip paint, treat wood, reglaze, dutchmen, epoxy repair

Reconstruction – rebuild sash/jamb, replacement window



HISTORIC WINDOWS

Maintenance

Cleaning – Keep windows and glazing clean. This will prevent the glass from etching.

Inspection – Inspect for rot, termites or other deterioration. Address defects before they affect the function of the window.

Operability – Operate your windows, lubricate hinges or stays, tighten screws. Replace missing or damaged hardware.

Painting – Periodic painting will maintain windows and help reduce problems.

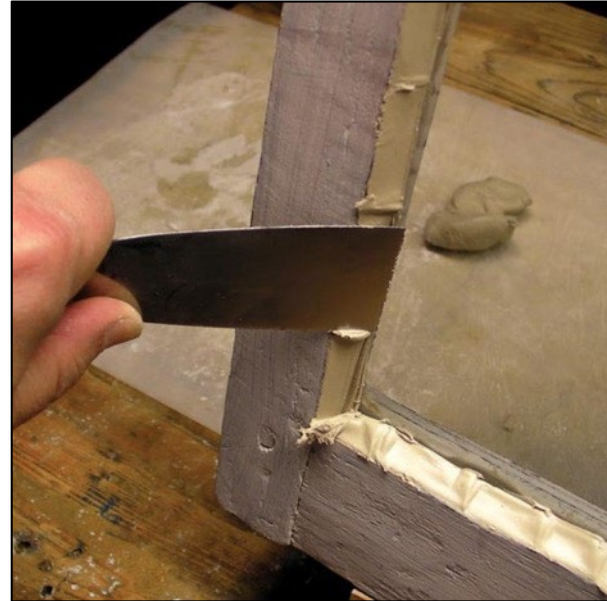


HISTORIC WINDOWS Preservation

Repair, renew, or replace:

- Caulking / sealants
- Weatherstripping
- Glazing putty
- Rope
- Hardware

In our tropical climate, we seal windows to keep the rain out and cool air inside.



HISTORIC WINDOWS

Restoration

Dutchman - Wood patch that replaces a damaged or missing area. The procedure involves removing a squared area around the defect and replacing it with new wood of the same species, grain pattern and color as the original.

Epoxy Repair – Wood epoxy is formulated for repair of wood windows, matching the tensile strength and other characteristics of the original. Consists of a consolidant and an epoxy paste for minor repairs of rot to complete reconstruction of profiles.



HISTORIC WINDOWS

Reconstruction

Missing windows or windows beyond restoration need to be replaced.

Reconstruction – custom made windows to match originals are more authentic and more expensive

Replacement – standard manufactured windows are less authentic and less expensive



What not to do.

HISTORIC WINDOWS

Replacement Windows

Vinyl

- PVC (poly vinyl chloride) is bad for the environment
- Thicker frames provide less opening.

Aluminum

- Pits and corrodes in salt air.
- Difficult to repair.

Window manufacturers boast that their windows are **Maintenance Free**. That may be true, because maintenance free means **Cannot Be Maintained**.



VINYL



ALUMINUM

HISTORIC WINDOWS

Replacement Windows

Wood - a wood window is more compatible with the aesthetic and functionality of original wood windows.

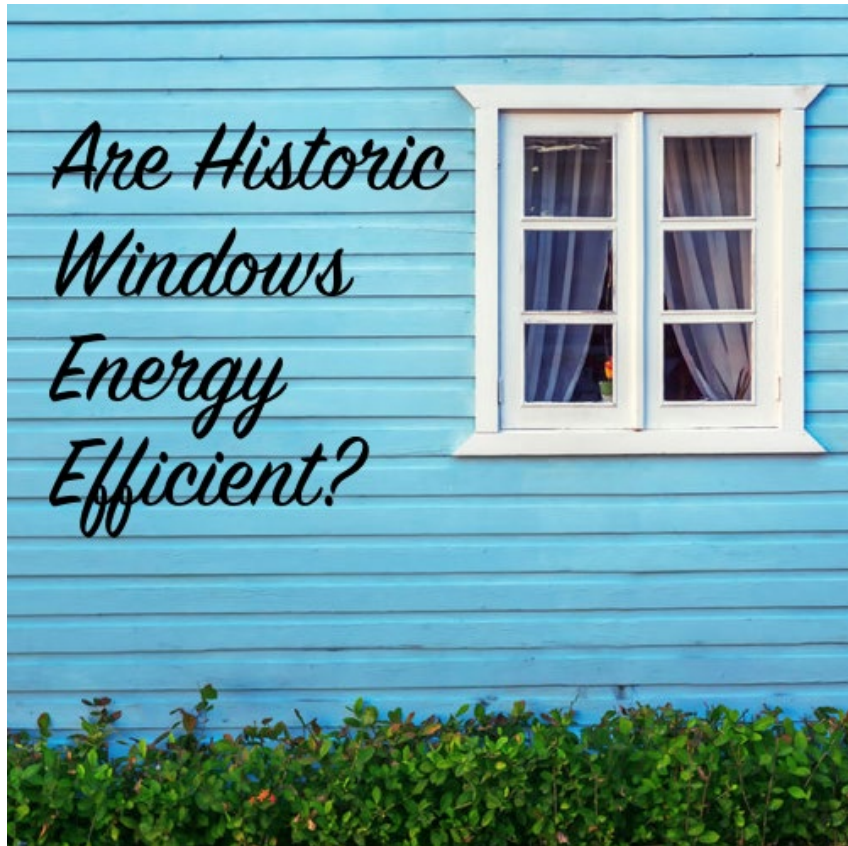
- May be available in standard design/size
- Can be custom made to match original



WOOD

HISTORIC WINDOWS

Energy Efficiency

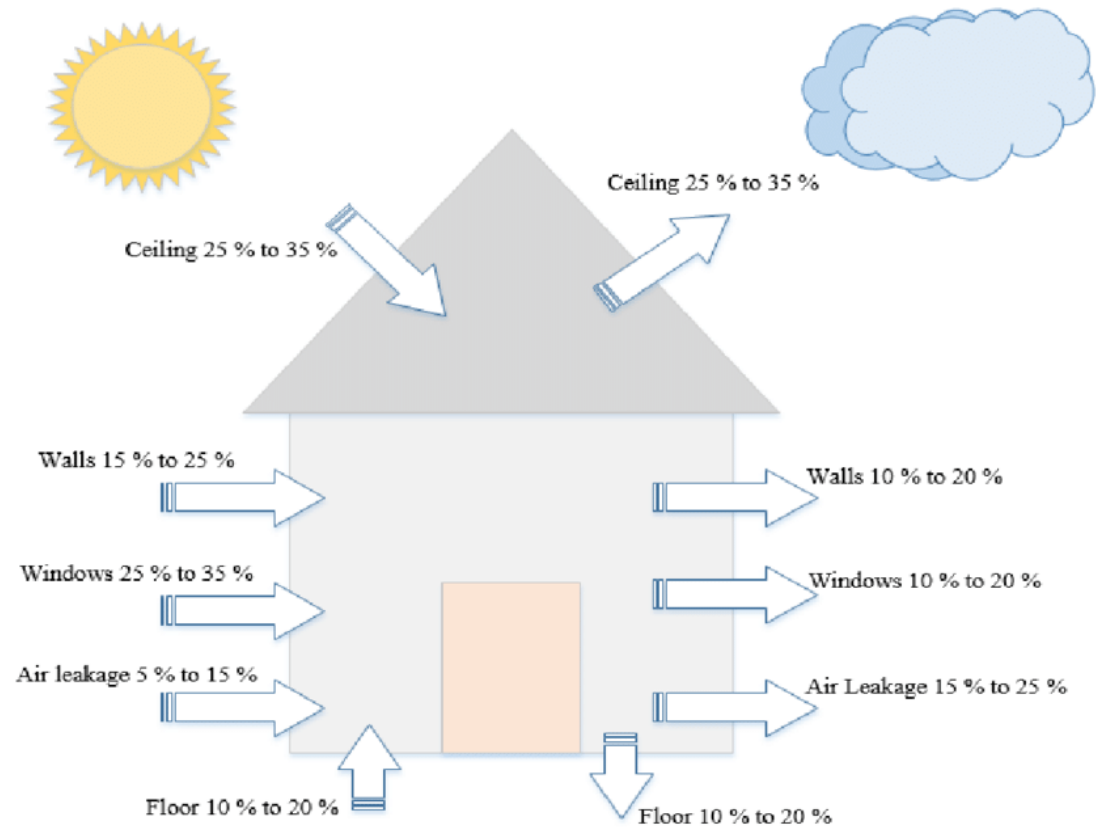


“Every historic window can be repaired and made to be as or more energy efficient than a replacement window.”

~ Scott Sidler

HISTORIC WINDOWS

Energy Efficiency

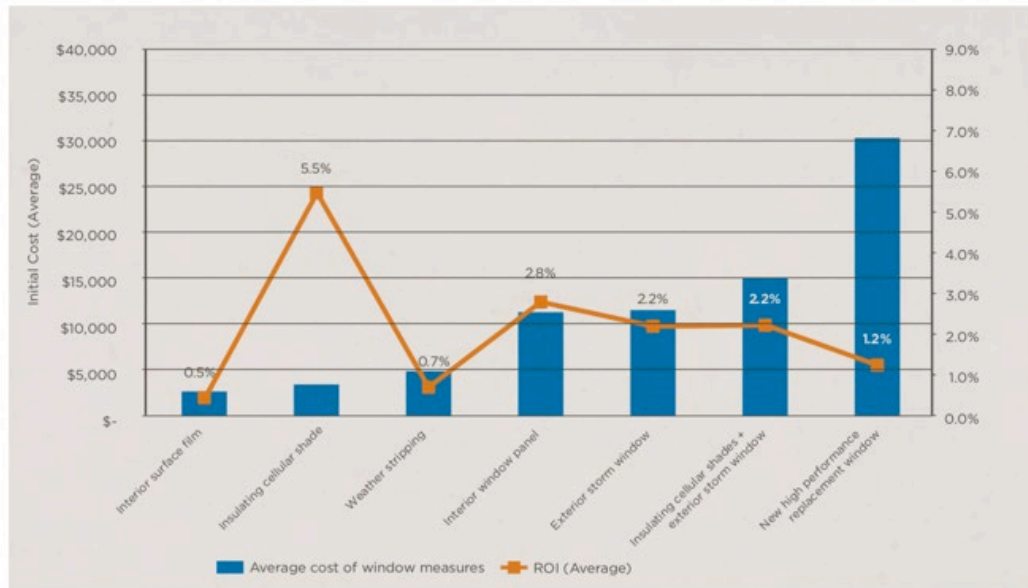


Windows make up a relatively small part of heat loss/heat gain in a typical single family residence.

HISTORIC WINDOWS

Energy Efficiency

Figure 10: Average Annual Return on Investment – Portland

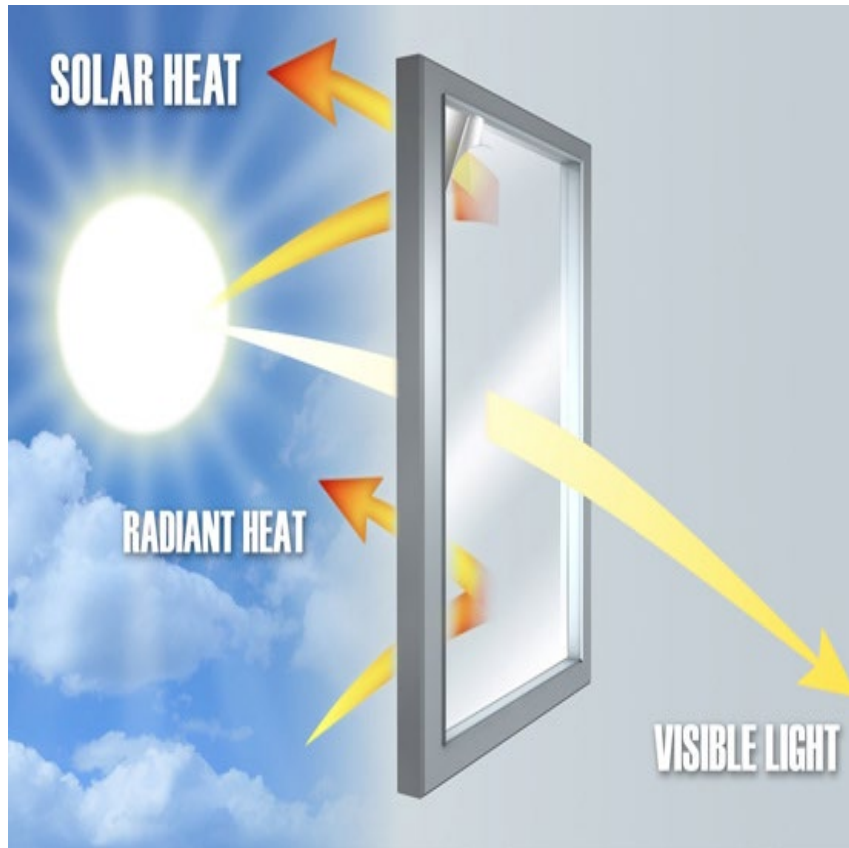


- Retrofit measures can achieve performance results comparable to new replacement windows.
- Almost every retrofit option offers a better return on investment than replacement windows.

Saving Windows, Saving Money: Evaluating the energy performance of window retrofit and replacement.
Preservation Green Lab. 2012.

HISTORIC WINDOWS

Improving Efficiency



In cooling climates, like Hawai‘i, we are primarily concerned with keeping sunlight out and cool air inside.

The measure of a window’s ability to perform in this manner is called:

Solar Heat Gain Coefficient (SHGC)
(aka “shading coefficient”).

Note: Existing and historic residences are exempt from code-mandated SHGC values.

HISTORIC WINDOWS

Improving Efficiency: Basic Maintenance

Simple repairs can improve energy efficiency:

- Weatherstripping
- Caulking
- Operability
- Re-glazing



HISTORIC WINDOWS

Improving Efficiency: Window Film

Retrofitting with Window Film:

- Energy Saving and Climate Control
- UV-blocking for fade Protection
- Glare reduction
- Safety and Security

Generally, in historic buildings, we install **neutral gray films**, without obvious color or highly-mirrored surfaces.



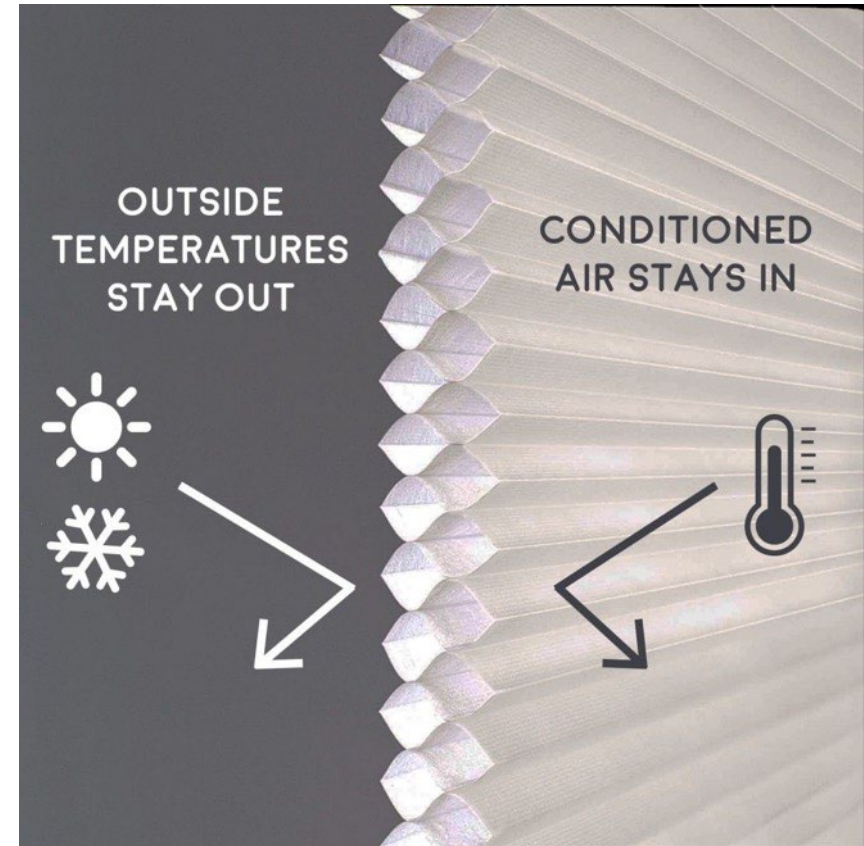
HISTORIC WINDOWS

Improving Efficiency: Window Shades

Insulating Cellular Shades:

Cellular or honeycomb shades have horizontal columns of air trapped between two or more connected layers of blind

- Increases R-value (measure of insulation). Single honeycomb shades have an insulation value around R-2, while double-layer honeycomb shades can reach R-5.
- Readily available at local home improvement stores
- Inexpensive



HISTORIC WINDOWS

Improving Efficiency: Window Awnings

Exterior awnings:

- Along with drapes, curtains, shutters, and blinds they provided natural climate control in an age before air conditioning and tinted glass.
- Easily installed and reversible.
- Relatively inexpensive

National Park Service, Preservation Brief 44: *The Use of Awnings on Historic Buildings, Repair, Replacement and New Design.*



HISTORIC WINDOWS

Improving Efficiency: Landscape

U.S. Department of Energy's
Landscaping for Energy Efficient Homes

Hot-Humid Region:

- Maximize summer **shade** with trees that still allow penetration of low-angle winter sun.
- Channel summer **breezes** toward the home.

Landscaping for Shade

Shading is the most cost-effective way to reduce solar heat gain in your home and **cut air conditioning costs**. To effectively shade your home, you need to know the size, shape and location of the shadow that your shading device casts.



FACT: In tree-shaded neighborhoods, the summer daytime air temperature can be up to **6 degrees cooler** than in treeless areas.

Discussion
