

Historic Wood Windows

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City of Columbia
Preservation Office
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State Historic Preservation
Conference

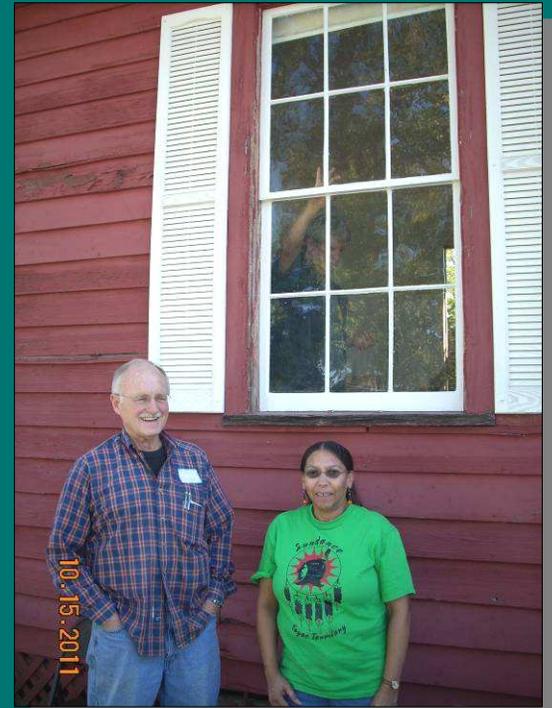


Thank You

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- This project was also partially funded by the City of Columbia.
- Contact the Environmental Protection Agency for rules, regulations and tips regarding lead safety.
- Work conducted on the Little Red Schoolhouse was carried out by the City of Columbia's Preservation Office, David Hoggard of Double-Hung, LLC and volunteers.

TOPICS

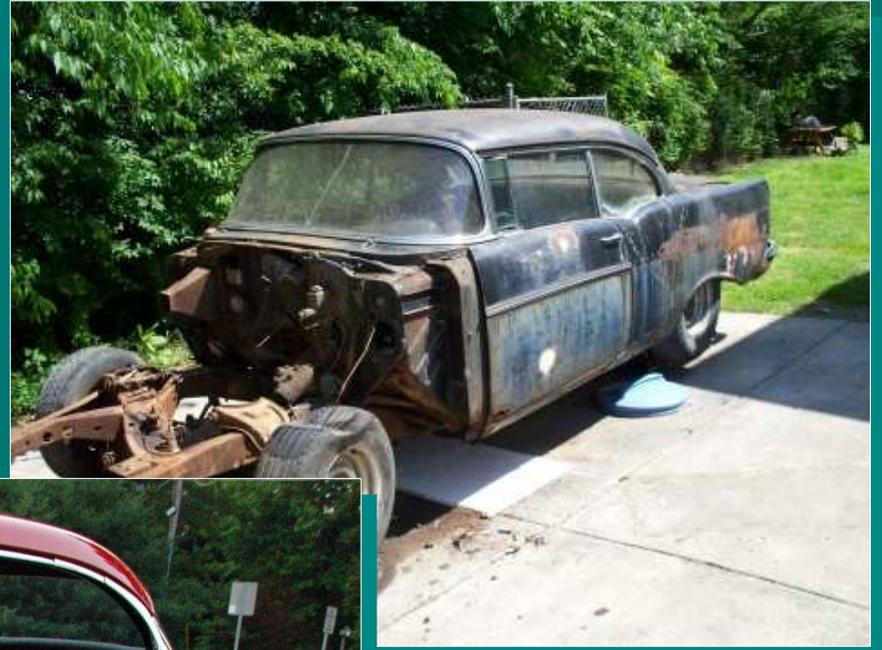
- Windows and Design
- Functions and Characteristics of Windows
- Repair and Renovation
- Replacement Window Myths
- Energy Efficiency Tips
- Workshop Tips



Age + Maintenance = Value



'57 CHEVROLET! SWEET, SMOOTH AND SASSY!



\$94,900 SOLD

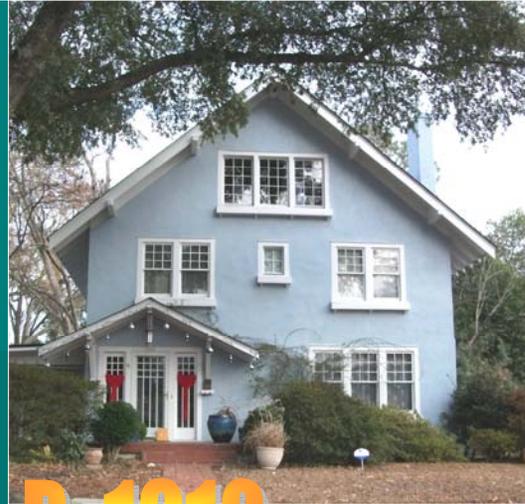


ARCHITECTURE and Aesthetic Value

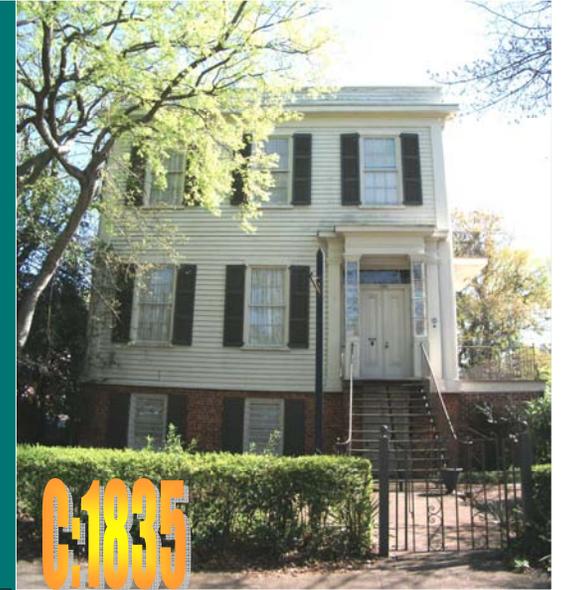




A: 1917



B: 1910



C: 1835

Do they look like what you thought?

D: 1818



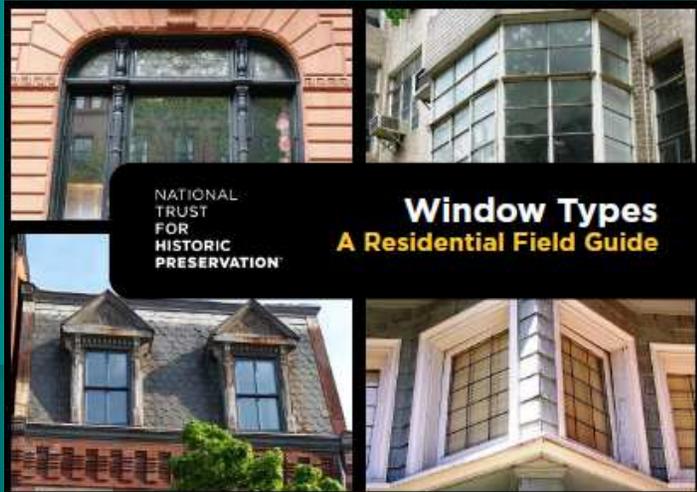
E: 1912

"The history of architectural material... has been the endless struggle for light... in other words, the history of windows."
- quote attributed to French architect Le Corbusier

F: 1949







Single, Double and Triple-Hung Sash



NATIONAL TRUST FOR HISTORIC PRESERVATION

Window Types — Residential Field Guide



Window Types — Residential Field Guide

About the Guide

Bay and Bow



Oriel



Casement



Patterned



Gothic



Queen Anne



Leaded and Stained Glass



Single, Double and Triple-Hung Sash



Additional Window Types



Modern

DURABILITY & CRAFTSMANSHIP

1891

Window Sashes,
GLAZED or unglazed. All the regular sizes constantly on hand; odd sizes made to order at short notice. The above are sold at factory prices.
 Dec 19 2 JAMES BROWN.

Wall Paper & Paper Shades.
A HANDSOME stock of the above just received. Also, Borders and Fire Screens. For sale low at the old stand.
 Dec 19 2 JAMES BROWN.

Oils, Varnishes and Paints,
IN great variety, always on hand. A small stock of Artists' Materials in store and for sale low.
 Dec 19 JAMES BROWN. 2

GLASS, WINDOW GLASS!
IN store, a large stock of the above, assorted sizes, from 6x8 to 36x60. All shapes and sizes cut without extra charge.
 Dec 19 2 JAMES BROWN. 336 23 3100

PERCIVAL MANFG. CO.,
 478, 480, 482, 484 & 486 Meeting Street, Near Line, Charleston, S. C.

BEST WORK.



LOWEST PRICES.

—MANUFACTURERS OF ALL KINDS OF—

SASH, DOORS, BLINDS, FRAMES,

1866

Doors, Sashes, Blinds, &c.

P. P. TOALE,
MANUFACTURER AND DEALER, No. 20
 Hayne street and Horbeck's Wharf,
 Charleston, S. C. This is the largest and
 most complete factory of the kind in the
 Southern States, and all articles in this line
 can be furnished by Mr. P. P. Toale at prices
 which defy competition.
 A pamphlet with full and detailed list
 of all sizes of Doors, Sashes and Blinds, and
 the prices of each, will be sent free and post
 paid, on application to
 July 11 1872 P. P. TOALE.

1872

“To ascertain the dimensions of window frames, add four-and-one-half inches to the width of the glass for their width, and six-and-one-half inches to the height of the glass for their height. These give the dimensions, in the clear, of ordinary framed for twelve-light windows; the height being taken at the inside edge of the sill in a brick wall...” R.G. Hatfield, The American House Carpenter, 1844

DURABILITY & CRAFTSMANSHIP

Glass and wood came in different grades, the lesser the grade, the more blisters or lines were in the glass and the more knots were in the wood.

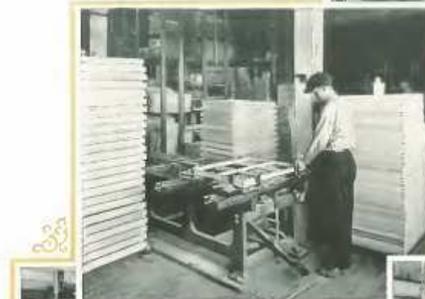
Virgin timber could have as many as 30 growth rings per inch, versus the 3 to 5 growth rings per inch of modern timber. (J. Stahl, This Old House)

A survey of muntin cross sections from windows of the last three centuries shows the great variety of these tiny members. In general, muntins are thinner for sash with more lights and also on mass-produced sash later than the end of the 19th century. They also varied by era, style, region, and production method. Although you can purchase router and shaper bits designed to cut muntins, it is unlikely you'll find an exact match for yours. Putting the finishing touches on the moulding may require some hand rasp and sanding work. Or have your cutters custom ground to match. Muntin profiles courtesy of the Preservation Assistance Division, National Park Service.

A MUNTIN SURVEY		
	1740s	1760s
1823	1845	1850s
1870s	1879	1890s
1897	1901	1915
1932	1927	1930s



THE process of cutting the glass for the sash and having the hole for the lead is accurately done on the machine directly above. The completely machined sash stock is trimmered. To give the customer the advantages of quantity production, even on small orders, large quantities of machined sash material are always carried in stock. Assembling sash material into windows of the required size and design, as shown at the right, is followed by placing sash window into a clamp to hold it securely, while steel chisels are driven and set on the machine directly below. This is called "pinning."



FINALLY, the window is ready for your painter without further labor on the job. A special machine, shown below at the left, smooths the check rail and both sides of the sash in the same operation. Curtis windows are furnished either glazed or unglazed. When glazed at the Curtis factory, zinc "points" are driven into sashes and rails to hold the glass and then putty is applied. Both operations are shown directly below. The special groove, described on page 16, provides additional anchorage for the putty. There are some of the operations which enter into the construction of a Curtis window before it comes to you.



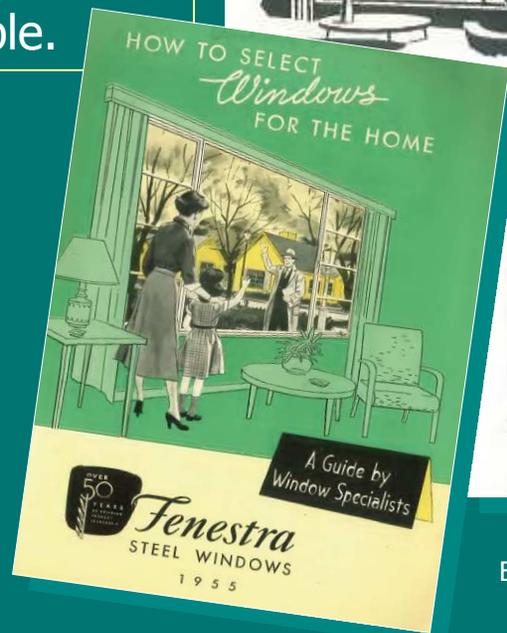
Above: Curtis Window pamphlet, 1927 (archive.org)

Left: Wood Window Repair Handbook, Landmark Consulting

Purposes and Functions of Windows

Windows worked with a whole system of building and site characteristics to cool a house.

The technology of double-hung wood windows did not change for over 200 years, and it makes them almost infinitely repairable.



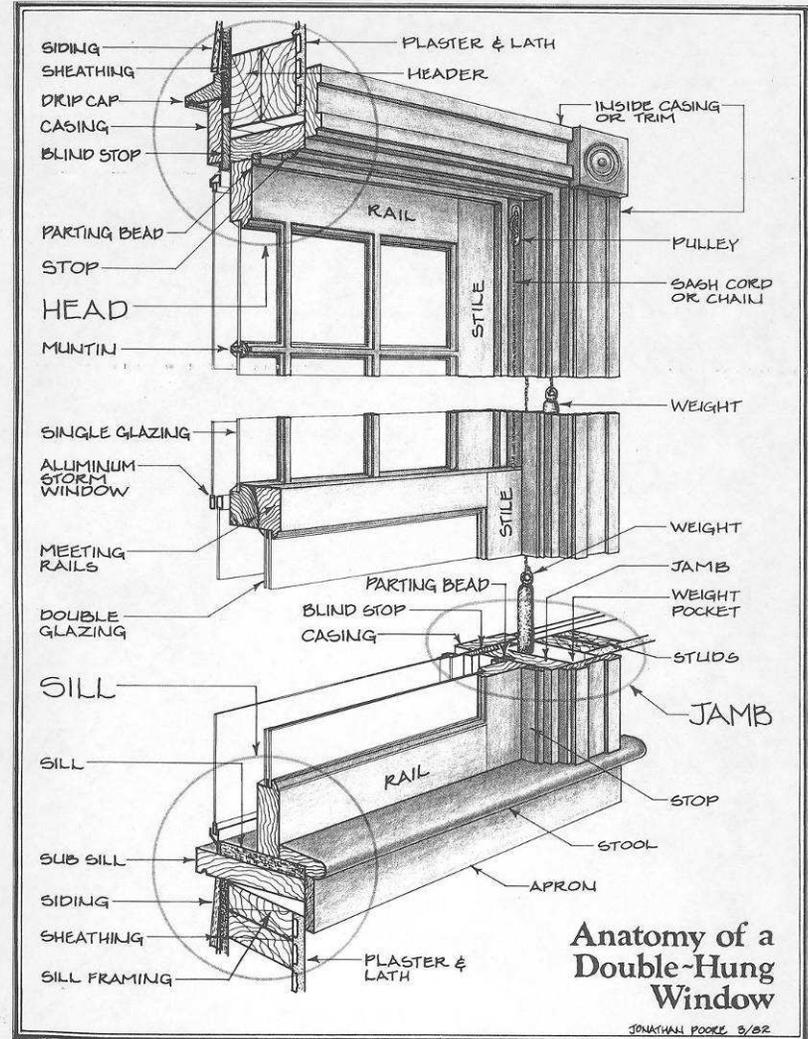
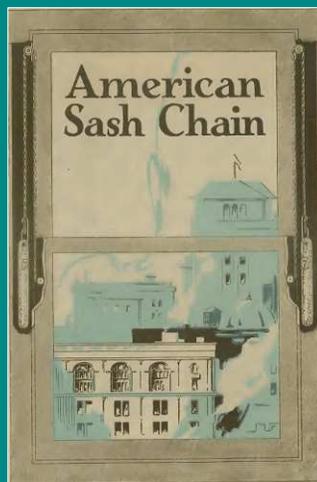
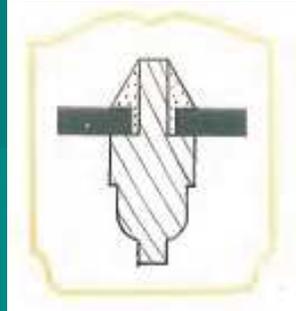
Brochure from archive.org

How Do Historic Windows Work?



The wood and glass in old windows and doors is generally very sturdy, repairable, and can last for generations if properly protected.

The parting beads, check rails and stops are meant to secure the sashes tightly in the jamb, these were often custom installed on site to ensure a good fit.



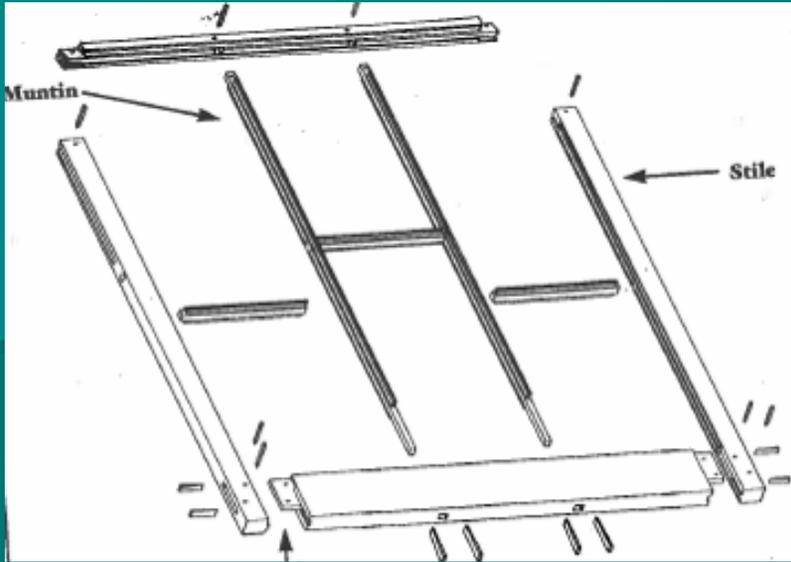
The Old-House Journal

Why Don't Mine Work?

■ Common Problems With Historic Wood Windows and Doors:

Symptom	Problem	Solution
Can't open window	Painted shut	Score painted joint with razor or other tool
Window won't stay open	Ropes cut	Replace with new rope, or add new hardware
Putty is crumbling or missing	Putty is past its lifespan	Remove old putty and add new putty
Broken glass	Broken glass	Remove putty and glazier points, replace glass
Loose corner joints in sash	Shrinking of wood, loss of wood dowel holding joint	Tighten joint with wedge or new wood dowel and glue
Peeling paint, soft wood	Moisture and/or rot has attacked the window through rain or condensation	Remove paint, consolidate wood, epoxy missing components or add wood
Rattling, drafty windows	Sash is loose in jamb	Add spring bronze weatherstripping or build up jamb as needed

Repair and Renovation



Michael J. Devonshire, *Repairing Old and Historic Windows*, NY Landmarks Conservancy

Windows should be considered significant to a building if they:

- 1) are original,
- 2) reflect the original design intent for the building,
- 3) reflect period or regional styles or building practices,
- 4) reflect changes to the building resulting from major periods or events, or
- 5) are examples of exceptional craftsmanship or design.

(From the National Park Service, Preservation Brief 9: The Repair of Historic Wooden Windows)

- ┌ Step 1: Assess condition of windows for significance, appearance (below surface), operability and soundness
- ┌ Step 2: Set a goal for restoration, simple repair, rehabilitation or preservation
- ┌ Step 3: Follow lead safety procedures. Test materials and follow guidelines of the Environmental Protection Agency.
- ┌ Step 4: Either remove windows or work on windows in place.

TIP: Use the Secretary of the Interior's Standards for Rehabilitation

DIY Wood Window Restoration



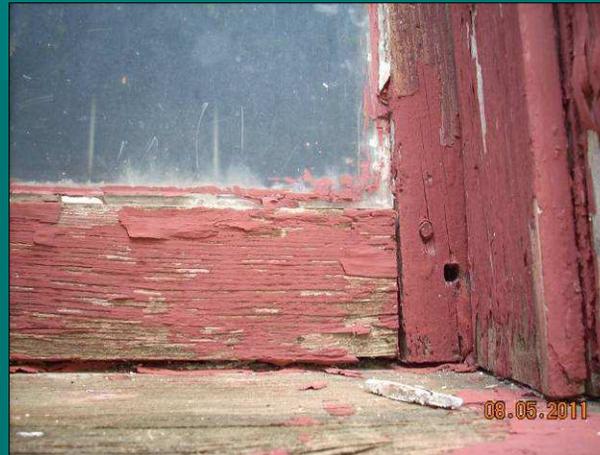
Some images from Don Browsers, Old House Mechanic, 2009 Window Repair presentation

At left: Image from David Hoggard, DoubleHung Restoration, LLC

Restoration Steps:

1. Break paint seals.
2. Remove stop on one side of the window, remove bottom sash and remove rope, if attached. Label sashes as you remove.
3. Remove parting bead to remove the top sash, remove rope if attached.
4. Remove old paint, if necessary, and putty (steam, scrape, chemical, heat)
5. Brush on boiled linseed oil (caution: combustible) into muntins and other exposed wood. Oil is a water repellent, but may attract mildew.
6. Repair any rotted wood, loose corners, missing muntins and replace glass. Muntins must be put together first, as they fit into the frame as a unit.
7. Apply a wood preservative, if necessary.
8. Replace putty.
9. Paint only those areas that are exposed. Use painter's tape! Wax bare wood if necessary.
10. Install new ropes.
11. Add weatherstripping.
12. Reinstall sashes.

Quick Repairs, Full Restoration, Replacement?



The Unfixable Window



Epoxy: \$30, including sill
Wood: Free
Glass: \$25
Time: @12 hours



Advanced Window Conservation

- For advanced repairs you may consider wood consolidation and epoxy, Dutchman wood repairs, or replacing muntins, stiles, or rails.
- Used Abatron wood repair system. Other products are from West Systems, Sculpwood from System 3, and Flex-Tech epoxy from Advanced Repair Technology.
- Absolutely beyond repair? Are you sure? Replacement wood sashes with true divided lights and putty available from Victor-Bilt, a window company started in 1944 and based in Greenville, S.C.
- Some images at right provided by David Hoggard of DoubleHung Restoration, LLC.



MATERIALS

- Glass (finding it, cutting it, wavy)
- Using professional quality products vs. big box store
- Putty (Sarco M, AquaGlaze, Dap 33, latex and oil, paint)
- Where to find wood pieces
- Change the technology?



Need spare parts and glass? Consider salvaged windows and doors: City demolitions, His House and Restore, or use parts from the rear windows.

Talk to Building Officials about demolitions in the city, or find out who the demolition contractors are.



Some images from David Hoggard of Double-Hung, LLC.



I have to replace my windows
because...

Window Replacement Myths

- ❑ Calculator from vinyl window company website suggests that my energy loss through existing windows is 30% of my energy bill. (Window World)
- ❑ Calculator suggests that I will now have no energy loss through my new windows!

Energy Saving Estimator

Simply tell us your average monthly energy costs, and we'll tell you how much you could be saving each year with Energy Efficient Replacement Windows:

\$

Savings

Over 1 Year:	\$ 720.00
Over 2 Year:	\$ 1440.00
Over 3 Year:	\$ 2160.00
Over 4 Year:	\$ 2880.00
Over 5 Year:	\$ 3600.00

Calculation based on 30% energy savings. Your results may vary based on location and construction variables.

Average monthly energy bill = \$200

If windows account for 10% of energy loss:

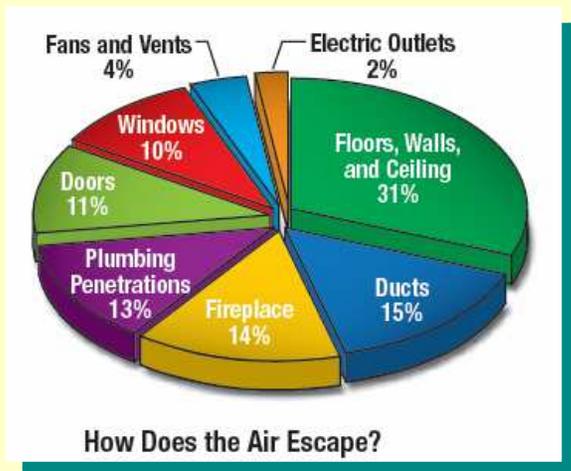
10% of bill = \$20 per month

If new windows double the efficiency of your windows, accounting now for only 5% of energy loss, you've saved \$10 per month

If the windows cost \$3,000, it will take 300 months, or 25 years to recoup your cost.

Most vinyl windows last less than 25 years as the PVC used to make them degrades in sunlight.

"In a warning to marketers, the Federal Trade Commission today settled charges with five companies that claimed energy-efficient replacement windows could save consumers 'up to' 35 to 55 percent in heating and cooling bills. The FTC found that 'most customers could never achieve these kinds of results.' Overall, he estimated that the average true savings on energy bills as a result of new windows is more like 5 to 20 percent. 'We're not claiming these are bad windows,' he said. 'They just overstated the energy savings.'" (February 2012, J. Greene)



U.S. Dept. of Energy

Window Replacement

Myths

- GREEN!
- Match historic appearances
- No Maintenance
- Appropriate for any building
- Cheaper than repair
- Wholesale replacement is best
- Just replacing the sash-not the window!
- "Old windows won't ever work right"

Reality

- Adds millions of pounds of waste to our landfills
- Vinyl windows are generally not recycled
- Muntins (vinyl and wood) are too wide and often too flat
- Wood windows are often fast growing Ponderosa Pine, which is susceptible to rot and insects
- Cannot be maintained because once parts start to fail or break you often have to replace the entire unit.
- Limited colors, white and white
- Repairs can be much cheaper
- Usually not all windows in a building have the same level of disrepair
- Installation, installation, installation



GREEN PRACTICES
Our commitment to sustainability is not just talk, we walk the walk in both the products we create and how we operate.

OUR PRODUCTS

- ✓ High performance and thermal efficiency
- ✓ Designed for durability
- ✓ FSC® certified products or SFI® certified products available
- ✓ Recycled content in glass, aluminum and other components
- ✓ Engineered to create minimal wood scrap
- ✓ Reduced on-site waste
- ✓ Major components reusable or recyclable

OUR OPERATIONS

- ✓ Scrap wood used to heat plant; wind power
- ✓ Employ carbon absorption to recycle solvents
- ✓ Systems implemented in plants reduce lighting and conserve water
- ✓ Shipping and trucks managed for minimal environmental impact

A GREEN TODAY AND A GREENER TOMORROW
For up-to-date information on our continued commitment to green building, green manufacturing, and environmental initiatives, visit our website at marvin.com/green.

MARVIN.COM/GREEN

Changes in Window Frame Color
Vinyl frames or vinyl cladding maybe affected by solar radiation or chemicals that can cause color change.

- Chemicals can cause PVC discoloration. All fuels, solvents, bleaches or corrosive chemicals must be avoided.
- In dry climates with high levels of solar energy, a color change can be expected with PVC, like most any finish.
- A color change has no effect on the strength or structural integrity of the PVC.
- Over time and with exposure to normal humidity, this yellowing most often returns to a white color.

A 2004 Fine Homebuilding Magazine article disclosed that about 30% of windows being replaced are less than 30 years old, "which is shocking compared to windows constructed 100 years ago that continue to perform with just a little maintenance." FHB, 2011, Aaron Lubeck

Left: Taylor Windows website; Sustainability Initiative Brochure from Marvin Windows and Doors.

NATIONAL TRUST FOR HISTORIC PRESERVATION

Repair or Replace Old Windows

A Visual Look at the Impacts



Adrian Scott Fine/NTFP

15



Adrian Scott Fine/NTFP

8



19th century Italianate style house
Replacement windows do not match size, type or material

Historic Landmarks Foundation of Indiana

Energy Efficiency and Old Windows



- Windows are big holes in the walls. Air will go around them, heat can transfer through them.
- Add layers to windows to create an air space: use blinds, shades, drapes, shutters, or energy-efficient storm windows. Allow for weep holes with storm windows! Do not laminate old glass!
- Consider awnings for appropriate buildings.
- Add Low-E film to existing storm windows.
- Add weatherstripping along sashes to stop air. Try spring bronze or even inexpensive V-crimped vinyl. (1940 advertisement below)
- Caulk around window trim. (Latex caulk!)
- Caulk in the window weight pocket, if possible.
- Add a filler to the bottom of a pulley.
- Make sure putty around the panes is intact, or replace.
- Add hardware to ensure that the meeting rails fit tightly together.

For One Window:

Bronze Weatherstrip kit	\$11
Window Putty (with leftover)	\$17
Caulk for interior and exterior	\$3
Cellular Shade	\$30
TOTAL is less than	\$61

Maintaining and upgrading your historic windows with the above items can make your windows as energy efficient as new vinyl replacements.

An advertisement for weatherstripping products. It features a yellow banner with the text "Think of Cutting Fuel Costs 25% Yearly" in a cursive font. Below the banner, there is a photograph of a window with weatherstripping installed. To the right of the photograph, there is a small illustration of a document or certificate. Below the illustration, the text reads: "New Principles of BUILT-IN WEATHER-STRIPPING make SILENTITE 'TOPS' in WEATHER-TIGHTNESS and FUEL ECONOMY".

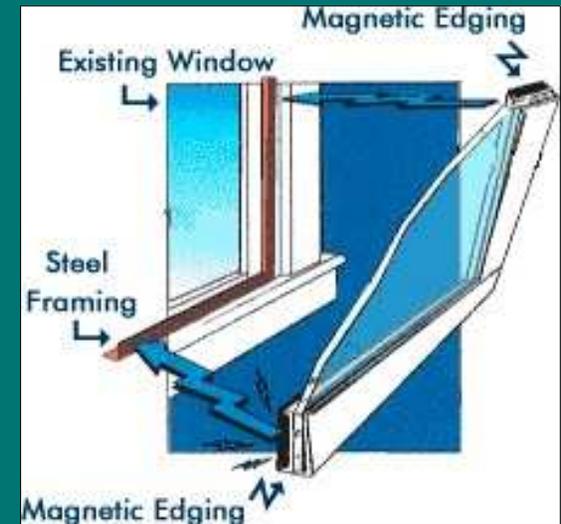
Think of Cutting Fuel Costs 25% Yearly

New Principles of
BUILT-IN WEATHER-STRIPPING make
SILENTITE "TOPS" in WEATHER-TIGHTNESS and FUEL ECONOMY

Window Energy Efficiency

Table ES-1. Measurements of U-factors and R-values

Description	Number of test runs	Total test hours counted in calcs	Standard Deviation of hourly U-value	Weighted Average (U)	Weighted Average (R-value)
Old double hung from window 5	4	102	0.000872	0.78	1.29
Single glazed original alum storm	2	39	0.000872	0.97	1.03
New Storm w/o insulated frame	2	32	0.00132	0.27	3.65
New Storm w insulated frame	1	16	0.00077	0.24	4.11
New Storm single glazed	2	40	0.001045	0.76	1.31
Old DH from 5 + new storm w/o Ins	2	39	0.000908	0.21	4.87
Old DH from 5 + new Storm w/ Ins	1	42	0.001054	0.19	5.18
Retrofitted double hung from wind 5	1	24	0.000862	0.48	2.07
Ret DH from 5 + new storm w/o ins	2	39	0.000958	0.19	5.32
Ret DH from 5 + new storm w/ ins	3	91	0.000958	0.17	5.83
Ret DH from 5 + sg wood storm w/o ins	3	116	0.000926	0.33	3.00
New Vinyl Window	3	110	0.000926	0.36	2.75



THE EFFECTS OF ENERGY EFFICIENCY TREATMENTS ON HISTORIC WINDOWS, The Center for ReSource Conservation

This testing is based on a 108-yr old home in a cold climate. R-value is thermal resistance, the higher the number the better. U-Value is the measure of heat flow, a lower number is better.

Hint: Check the National Fenestration Rating Council for U-values, most vinyl windows are in the .30 range for double glazed, new triple-paned can reach the .20 range.



The Net-Zero Historic House

Mission Zero House

Old West Side Historic District, Ann Arbor, Michigan



the Atlantic "Sustainable perfection."



One of USA Today's Seven Best Green Homes of 2010

America's **oldest** Net Zero Energy residence

Michigan's **first** Net Zero Energy house

America's **first** Net Zero home rehabilitation in a historic



What is Net-Zero Energy

A Net-Zero Energy Home (also called Zero Energy Home) is a home that produces as much or more energy than the occupants consume. This is accomplished by first reducing energy demand, typically by 60% - 70%, then meeting that demand by adding on-site renewable energy.

We Consume in One Year

10,000 kWh

Our SunPower Solar Will Produce

10,581 kWh

Net Zero*

= 0

Reduce

- Light with CFLs and LEDs
- Use Motion Sensors on lights
- Seal the envelope
- Insulate well
- Restore the old windows
- Add Low-E Storm windows
- Kill the vampire power
- Use Less Water

Reduce

- Geothermal Heating & cooling
- Energy Recovery Ventilator
- Induction Range
- Energy Star Appliances
- Monitor Your Energy Use

Reuse

- Materials and Restoration

Produce

- Solar panels on roof

Get Our Free Newsletter
Enter Your Email Here

Window restoration \$6,000

(restored 110 year old windows) Wood Window Repair Company

Storm Windows w/ Low-E Glass by Trapp \$1600 (including 30% Fed tax credit) Robertson's Storm and Screen in Ann Arbor

Wood Window Preservation Points

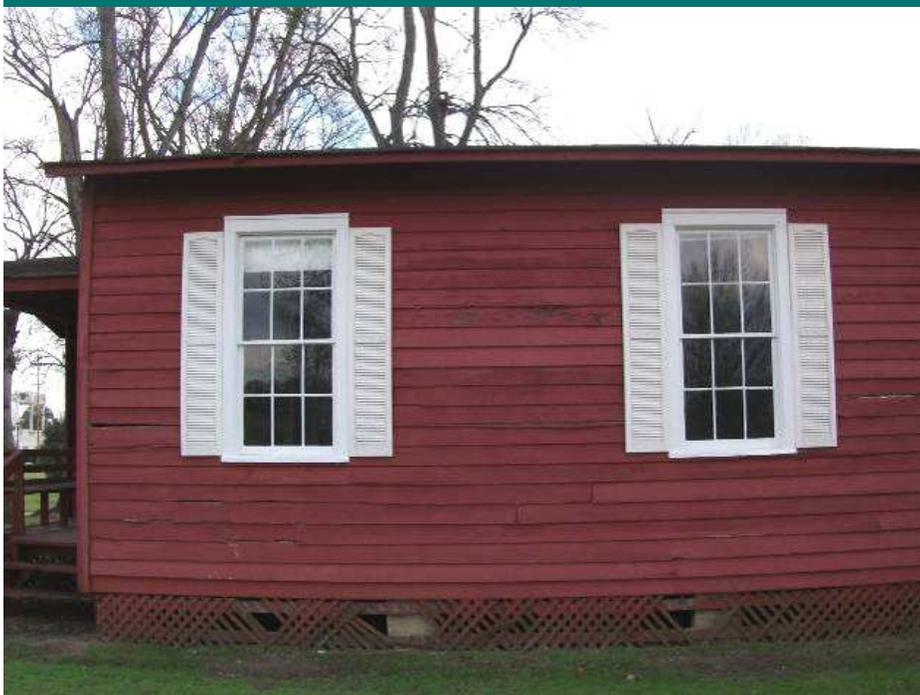
- Contribute to architectural style
- Created to work easily and to last a long time
- Lack of maintenance will affect performance and lifespan
- Restoration takes TIME, but lasts for DECADES
- Vinyl window marketers need to be on “Myth Busters”
- Old windows can be made energy efficient
- It is sustainable and “green” to restore and reuse historic windows
- There is a finite amount of historic windows and more are being lost every day
- Education is key!

TIP: Painters and glaziers often do putty replacement!

Workshops!

- Grant funding if possible, or find partners in sustainability, salvage, community development, government, non-profits
- Invite contractors and homeowners
- Vary the length of program and need for materials
- Find a speaker or use an educated staff member
- Find a building or use salvaged windows, (*plan an exit strategy*)
- Plan for drying time (several days)
- Utilize free videos and handouts, with permission
- HANDS ON!!!
- Housekeeping: legal and model waivers, restrooms, water, hand washing station, goggles, gloves, masks and first aid kit
- Media! Advertise and then praise the success
- Gain confidence in your profession





Want to Learn More?

- Youtube videos online: Simple Steps to Working Windows (Kalamazoo), Kansas SHPO
- NPS Preservation Brief 9
- Upcoming National Window Preservation Standards from a collaborative is due out this month, initiative of the Preservation Trades Network
- The Alliance Review from the National Alliance of Preservation Commissions Jan.-Feb. 2012 "The Windows Issue"
- Old House Journal
- The Repair of Wood Windows, SPAB
- "Save Our Historic Windows" John Leeke
- Repairing Old and Historic Windows, New York Landmarks Conservancy

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