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A Note to Contributors: TRADITIONAL BUILDING solicits reviews of historical products from building and preservation professionals. A query letter to the editor is suggested. Photos of outstanding examples of non-traditional building materials are encouraged. All materials must be submitted in black and white. TRADITIONAL BUILDING is not responsible for non-receipt of new products, or for technical inaccuracies.

TRADITIONAL BUILDING ISSN: 0007-4870 is published quarterly by Specialists, Inc., 170 Fifth Ave., New York, NY 10010. Second class postage paid at Toledo, OH and additional mailing offices. Subscriptions: 1 year, $30.00; 2 years, $55.00. Foreign subscriptions: 1 year, $37.50; 2 years, $63.75. Subscribers to professional organizations, coalitions, and preservation groups: 1 year, $20.00; 2 years, $35.00. Subscriptions and others request orders via: ebenfalls@ineo.com

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Manchester, New Hampshire

Circle No. 27
The Prophet Of Historic Windows

The National Park Service's Chuck Fisher has caused dramatic changes in the kind of windows that are being placed in America's old buildings. Here's how he made it happen.

by Clem Labine

The 1970s were the low point for historic windows. The energy crisis had accelerated window replacement in older buildings. And the typical replacement was a solid, bronze-anodized aluminum window with totally square moldings. When wood replacements were used, they bore little resemblance to the original steel industry. The steel window industry was geared to new construction, totally ignoring the historic preservation market.

During those dark ages that Charles Fisher of the National Park Service's Preservation Assistance Div. devised an ambitious plan to improve the quality of window work in historic buildings. His position in the National Park Service's Washington office involved with the Federal historic preservation tax incentive program enabled him to develop a program that would ultimately involve manufacturers, architects, contractors, building owners, and historic preservation review staffs across the country.

Aluminum Window Dilemma

Most of the insensitive aluminum window work of the late 1970s had been justified in terms of costs and manufacturer inability to supply better products for the preservation market. Chuck Fisher set out to establish high-level contacts with leaders in the window industry. He talked to these contacts each day.

By pointing out the considerable market potential, especially in light of the then new Federal tax incentives, he got the more forward-thinking companies intrigued by the preservation market.

Chuck's momentum turned up from these high-level contacts was quite revealing. For example, the cost of custom work, such as arched-top heads and custom paint colors, was much lower than commonly believed. But better and earlier planning by the architect was essential to benefit from the semi-custom capabilities of the companies.

In addition to custom colors and special tops, critical issues in the early 1980s included muntin grids and custom-contour panning. Rejecting the flat muntin grid commonly in use, Chuck Fisher developed guidelines for the National Park Service that labeled as "inappropriate" fake muntins for smaller buildings and elaborate windows. (The guidelines considered the possible use of fake muntins in high-rise buildings and large institutional complexes — provided a more appropriate applied muntin system was adopted by manufacturers.)

The new generation of applied muntins consisted of a trapezoidal-shaped muntin applied to the exterior and integral to the frame, with a depth eventually reaching 5/8" as the optimum for good shadow lines.

Panning Over Wood

Another area of concern was the common practice of using flat panning over the existing window frame — totally obliterating the historic moldings. Once Chuck discovered through his contacts that the cost of custom contour panning to match the historic appearance was relatively low, the National Park Service became a leader in requiring such a feature in Tax Act projects.

Chuck Fisher's work also extended to national manufacturers of wood windows. He discovered early on that most companies had unrealized custom manufacturing potential. Meetings with plant officials and top management helped influence some positive design changes.

Recognizing that insulating glass dictated wide muntin spacing with multiple lite, he encouraged development of true divided lite sash with an attached single-lite storm panel for the room side that rode with the operable sash. Such a design was used in the 1920s — and a few small shops had been offering it in New England. With prodding, one of the leading manufacturers began offering true divided-lite sash with applied interior storm panel.

Getting The Word Out

Much of the true custom work for the historic preservation field comes from smaller window companies. Recognizing that the capabilities of most of these companies are not widely known, Chuck launched a National Park Service project in 1985 to develop a national directory of companies offering window work suitable for historic buildings. The National Park Service, the National Trust for Historic Preservation, and many other organizations have contributed to the project.

The year 1986 was a major turning point in Chuck's effort to promote quality window work. Up to that time, Chuck had preached the gospel of sensitivw window work in workshops and articles. To accelerate the pace of getting information out, he laid plans for the 1986 National Park Service Conference and Exposition in Boston in December of 1986. With the co-sponsorship of 10 major organizations, this national conference attracted over 600 architects and other professionals.

Taking The Show On The Road

Currently, Chuck Fisher is working on an update of The Window Directory that will include an expanded section on storm windows and a new section on window repair companies — two areas that he feels are critically important.

Along with the Mid-Atlantic Regional Office of the National Park Service, the Historic Preservation Education Foundation, and a volunteer committee of professionals working on window preservation, Chuck is involved with a superb traveling exhibit of historic windows. "Windows Through Time" opened in New York this summer, and next goes on display in October at Independence National Historical Park in Philadelphia.

Fisher also continues to advise architects, preservation officials, and the window industry on complex window problems involving historic properties. Encouraging the use of half screens on the room side, window repair, fire shutters, and better detailing of replacement windows remain high on his priority list.

Chuck is quite modest about his role in the Historic Window Revolution. He points out that the work has been greatly aided by people in the window industry, representatives of historic preservation agencies and commissions, and many individuals working on projects across the country. All true. But if it hadn't been for Chuck Fisher's energy and persistence for the past 12 years, all we'd see today would be endless rows of dreary aluminum windows with flat fake muntins.

THE WINDOW GOSPEL

"Deteriorated historic windows should be repaired rather than replaced wherever possible. In the event replacement is necessary, the new windows should match the historic ones in design, color, size, configuration, reflective qualities, shadow lines, detail, and material. Only when it is not feasible to match the historic fabric should substitute window material be considered . . . and only when it is shown through such means as field mock-ups that it is possible to match closely both the detail and the overall appearance of the historic windows."

— From The Window Handbook, Edited by Charles E. Fisher

SPECIAL WINDOWS ISSUE

SEPTEMBER/OCTOBER 1989 • 3
The Window Wizards

In the course of their work on historic buildings throughout the Northeast, architects at Robert E. Meadows' firm have solved just about every type of window problem there is.

by Clem Labine

They don't specialize in windows, of course. Robert E. Meadows, P.C., Architect is a broad-based firm that handles historic preservation projects of every description, from restoring the cast-iron work of Brooklyn's Prospect Park to designing a neo-classical terrarium for the Bronx Botanic Garden. And in between, there have been dozens of projects that include Gracie Mansion, South Street Seaport, Old Westbury Gardens, Sailors Snug Harbor, The National Arts Club, the Richmond Town Restoration, and the American Museum of Natural History.

Even though they handle a wide range of design and preservation assignments, the firm's architects find that windows occupy a big part of their professional life. "We do a lot of work requiring approval from Landmark Commissions or the National Park Service," says Bob Meadows, the firm's principal architect. "And these administrative bodies are paying increasing attention to windows."

As a result, the firm has developed extensive in-house expertise for handling just about every type of window problem. One indication of the central role that windows play in the company's activities: A visitor to the firm's offices in Manhattan's South Street Seaport district finds the conference room stacked high with sample windows dropped off by hopeful vendors.

Being an expert in historic windows, of course, involves a lot more than just choosing between competing suppliers of replacement windows. It's often more desirable to repair existing windows than to replace them. "When the decision is to repair," says the firm's Dean Koga, "the problem then becomes one of training and supervising workers. We're doing a window repair job now where we've had to teach carpenters how to do epoxy consolidation. The first few weeks were a bit rocky, but the project is going smoothly now," Dean says with some relief.

And even when replacement windows are called for, there are pitfalls. Larry Jones, another of the firm's architects, says: "Some of these manufacturers are stretching their technology too thin when it comes to making big double-hung windows." He tells of being called in recently to inspect a two-year-old installation. "There were big 5-ft.-tall double-hung windows operated with spring balances. The nylon strings started breaking after two years, and each time a string broke the spring fitted into the room like a rocket, half took a picture of one of the errant springs sticking into the sheetrock ceiling!"

The Voice Of Experience

"We make every effort to retain old windows," says Bob Meadows. "Not only does that ensure that historic character is kept, but it's often more economical and less messy to repair the old windows. And you usually end up with a better product because the wood and hardware in old windows is often superior to what you buy today," declares Meadows.

"The joinery makes the window," Bob states emphatically. "And the joinery in old windows is stronger than in new windows that are designed for mass production. One of our basic specs for a replacement wood window is: Joinery shall exactly match the unit to be replicated."

Meadows' firm has developed several contractors with whom they work on window repair projects. Techniques used range from simple scrape/paint/paint to epoxy consolidation and dutchman repairs requiring skillful splicing in of new wood.

"Often, we need to add thin strips of wood to the sides of old sash to

Larry Jones (left) and Robert Meadows (middle) are in the process of inspecting some wood sash that is being restored by George Lucry (right) of Lake Construction Corp. The 19th-century sash, from Sailors Snug Harbor on Staten Island, was in surprising-ly good shape despite decades of neglect.

re-establish a tight fit in the frame... unless we are adding weatherstripping," says Dean. "But when you're cutting slots for weather strips, you have to be careful not to cut the tenons. I've seen sash, weakened in this fashion, break apart when someone gave a good tug to open it."

The Meadows firm uses aluminum windows as replacements in certain applications — but feels that the advantages of aluminum windows have been overstated. "The anodized colors will last for a reasonably long period," says Bob Meadows. "But it's another story if you have to use a painted finish to get historic color-matching. I've seen paint peel off aluminum windows after 5 years."

Vinyl cladings on wood windows pose similar problems. "I've seen distinct color changes in vinyl that's weathered for three or four years," says Larry. "Just about any wood shape can be duplicated in aluminum," adds Dean, "but a high-quality custom aluminum window is often more expensive than a high-quality custom wood window."

The Meadows firm's "repair rather than replace" philosophy extends to steel windows. They are just starting a job on a building with steel windows that are in bad shape. Preliminary investigation has indicated that they can repair the old windows for about half the cost of new replacements. The Meadows architects are in the process of having the contractor restore a sample steel window that will establish quality and cost benchmarks before plunging into a full-scale repair program.

BEFORE: This 1840s building in Montgomery, N.Y., had been vacant for 10 years. The rehabilitation designed by Robert Meadows involved placing 5 shops and 3 apartments into the old building.

AFTER: New wood windows, storefronts, and millwork were custom-produced to Meadows' drawings by Millwork Specialties of Brooklyn, N.Y., preserving the traditional character of the building.
These repaired 4-over-1 units are part of a 180-window restoration project supervised by Robert E. Meadows, P.C. Architect, in a large apartment building. Sash was removed from the occupied apartments in the morning of Day 1 and an acrylic panel fastened in place. Sash was taken away, rehabilitated, and reinstalled the next day.

Sash was taken to the shop for quick repairs. Glass was removed, and all loose paint and putty carefully stripped with scrapers. After repairs, the sash was re-glazed with the original 3/4-in glass. Next day, when the sash was put back into the window frames, integral brass weatherstripping was also installed.

Loose joints were taken apart, glued with epoxy, and reprimed. Rotted or damaged wood was restored with epoxy consolidant and filler. When an individual rail was beyond repair, a new "dutchman" was spliced in. If more than 35% of a sash was beyond repair, a whole new sash was manufactured. — Photos on this page: Kathleen Rose, Robert E. Meadows, P.C. Architect

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Circle No. 224
Revival Of The Wood Window

Wood windows, because of their superior aesthetic, performance, and repair characteristics, are making a big comeback in both rehabilitation and traditionally styled new construction. The key to a happy purchase: Tightly written specs that make sure you get what you want.

Two decades ago, the wood window seemed to be going the way of the brontosaurus. Countless ads touting aluminum and vinyl windows declared how superior these new materials were to wood. Nonetheless, the wood window is making a remarkable comeback, and among the window manufacturers leading the charge is Marvin, the company whose wood replacing efforts are called for, there are several problems to be addressed.

On old buildings — especially Tax Act projects — the issue of historic compatibility becomes paramount. Replacement windows have been one of the primary areas of dispute between the National Park Service and developers and architects.

On old buildings, replacement windows must accurately replicate the appearance of existing historic windows. All too frequently, the profiles of muntins, sash, frames, and moldings in replacement windows differ from those in the originals. For example, the muntins in a new double-glazed window may be much wider and flatter than the original muntins. Even though the new window may duplicate the number of existing panes, the characteristic of the historic window is lost due to the change in profile and relief.

Another problem with many replacement windows is the use of panning — metal molding installed over the original surrounding wood molding, or which replaces the existing molding altogether. When panning does not match the existing molding, a further loss of historic character occurs.

Because of the vital importance of windows to facade appearance, for Tax Act jobs the Park Service usually requires detailed shop drawings that show all details of the original window and proposed replacements (see illustration).

Stock Vs. Custom

For retrofits, wood windows must nearly always be made to order because of the problems of trimming and detailing a stock window to an old opening. However, often the entire window unit doesn’t need replacing, just the sash. Some companies, such as Marvin Windows, provide sash-only replacements. You just remove the loose existing sash and slip in a new jamb liner and sash.

Wood windows clad in vinyl or aluminum are usually prohibitively expensive to custom-manufacture because of the heavy tooling costs for dies and extrusions. So the question becomes whether a stock clad window will possess the right “look and feel” for a retrofit job — as well as fitting the existing opening. A related issue is the integrity of the cladding. If the cladding becomes damaged during installation or afterwards, any water that penetrates into the wood core becomes trapped, and the window can quickly rot. Major manufacturers, such as Pella, have carefully worked out the details of their cladding systems. But beware of clad unit from a back-alley shop.

Removable muntins aren’t satisfactory for most rehabilitation jobs, but may meet client needs on new construction. For this reason, we’ve included the availability of this feature in the supplier listings in the accompanying SourceList.

For More On Replacement Wood Windows

A thorough review of the aesthetic, historical, and technical factors in specifying replacement wood windows will be found in the The Window Handbook and The Window Workbook. See review and ordering information on p. 15. — CL

Who’s Included On The SourceList

There are hundreds of millwork shops that will make wood windows. The 51 suppliers we’ve included on the SourceList are the ones who, in the opinion of the editors, provide the best combination of quality and historic sensitivity, along with an interest in serving the special needs of architects and contractors on historic projects.

The company specializes in “made-to-order” units. “We go to the parts pile and make what you want and put your name on it,” says Frank Marvin, president of the company and grandson of its founder. Stock designs include casements, double-hung tilts, hoppers, awnings, bows, bays, and various non-operable shapes such as circles, ovals, and polygons.

The advantage of using U.S. Woodworking, according to manager Warren Weilbacher, is that “we can make windows in any shape or any size in any material — the other guys use only pine or mahogany.” Almost all of the company’s recent projects have involved restoration, including massive double-hung windows for New York’s City Hall and 27 x 16 ft. clerestory windows for Ellis Island. Windows and doors are their specialty; they also make molding and millwork. For more information on U.S. Woodworking, see the pullout SourceList in this section. — EMK

U.S. WOODWORKING:
The More Challenging The Better

In the 1940s, the Marvin Lumber and Cedar Company gave birth to a window division. These days, Marvin Lumber is a small, local, 85-year-old lumberyard, while its offspring, Marvin Windows, is the country’s third largest wood window manufacturer.

MARVIN WINDOWS:
Semi-Custom Units

The company specializes in “made-to-order” units. “We go to the parts pile and make what you want and put your name on it,” says Frank Marvin, president of the company and grandson of its founder. Stock designs include casements, double-hung tilts, hoppers, awnings, bows, bays, and various non-operable shapes such as circles, ovals, and polygons.

Aluminum-clad and unclad replacement sash are also available. True divided lites are an option on all units. Marvin was the first national manufacturer to standardize production of curved glass windows; curved glass single-hung are currently available in 9 standard sizes.

For more on Marvin Windows, see the SourceList in this section. — EMK
When it comes to replacement windows, close doesn't count.

You need a window that doesn't fit like you need a nose in the wall. But if you have a balanced opening, that's exactly what you get with most replacement windows. Instead of messing with fit-
lots and extenders, why not specify the brand of window that's made to order so it fits exactly
right, right from the start. Every Marvin window is carefully constructed by hand to your specifica-
tions, regardless of shape, size or style. Standard or custom. For more information about Marvin
replacement windows or to return the sample below or call toll free 1-800-346-5228 in MN,
1-800-652-1627 in Canada, 1-800-652-1610 in all other states.

Send to: Marvin Windows, Wacoast, MN 55762.

The Joinery Makes The Window...

Specification Checklist For Premium-Quality Historic Wood Windows

Here's a checklist to consider when specifying replace-
ment double-hung wood windows in old buildings—
along with some typical language that can be modified
to suit your particular job. (Of particular importance are
the items listed under "Submissions.") In addition, all
standard performance specifications should be included.

WOOD: [ ] Grade 1, ponderosa, sugar or northern white pine, mahogany,
tack, or other fine-grained lumber that has been kiln-dried to 6 to 12%
moisture content at time of fabrication.

SIZES, THICKNESSES, & PROFILES: [ ] Work shall be fabricated to
designs, dimensions, and details shown on the approved shop drawings,
and shall replicate configurations and profiles on existing windows except
where specifically indicated otherwise. (Note: Inexpensive stock sash can run
as thin as 1-3/8 in. High-quality sash is usually as thick as 2 in.)

JOINERY: [ ] All joinery shall match that of existing sash in all respects.
[ ] Or — Sash stiles & rails shall have beveled miter & tenon joints, glued
and pinned with teak, aluminum, or stainless steel pins.
[ ] Muntins shall have coped miter & tenon joints.
[ ] Molding or coped trim shall be molded edges.
[ ] All wood jambs and sills shall be connected with dadoed joints.

OPERATING SYSTEM: [ ] Units require two balanced, vertically sliding
sash, with two pair of concealed sash weights, pulleys, a pair of lift handles
in lower rail, and a lock on meeting rails of lower and upper sash.
[ ] Original sash weights shall be reused wherever possible. When
new weights are required, they shall match the originals in weight. Replacement
weights can be cast iron, or square mild steel bar stock, as specified.

WEATHERSTRIPPING: [ ] Brass, interlocking weather strips designed for
permanent resilient sealing under bumper or wiper action. Provide
weatherstripping at perimeter of each sash. Weatherstripping shall be com-
pletely concealed when sash is closed.

HARDWARE: [ ] Specify whether existing hardware is to be restored and reused, or
if new hardware is required.
[ ] Provide solid brass company standard hardware (US3 finish). (Specify
supplier, if desired.)

FINISH: [ ] All wood shall be immersed in water repellent for at least 15 sec.
after milling or assembly. Allow repellent to dry thoroughly, according to
manufacturer's recommendations. Water repellent shall be paintable, non-
toxic, and certified compatible with specified final finish.
[ ] Provide fabricator's standard white shop prime coat on exposed surfaces
only of wood components. Primer shall be alkyd primer undercoat comply-
ing with Federal Specification TT-P-25 and identified as manufacturer's best
grade product. Supply Benjamin Moore or Pittsburgh Paints.

GLASS: [ ] Specify glazing units, such as: Hand-Made "restoration" cylinder
glass, 3/32 in. thick. — Or — Supply double-glazed units that meet Sigma Quality
Test CRA and carry at least a 10-year warranty to be free of condensed moisture.)
[ ] Glazing will be back-bedded in glazing compound and fastened with
glazing points every 6 in. Install glazing compound and tool to provide a

substantial wash away from glass.

GLAZING COMPOUND: Use oil-based glazing compound, non-staining
and non-bleeding, complying with Federal Specification TT-C-410 for face
glazing compound. Use DAP #3 Glazing Compound or equivalent.
If insulated glass is being used: Use silicone sealant that vendor certifies is
compatible with the unit seal on insulated glass units.

GLAZING POINTS: [ ] Glazing points shall be galvanized steel, installed
every 6 in.

FASTENERS: [ ] Comply with NWMA requirements for fabrication, and
with manufacturer's recommendations and standard industry practices for
historical type and size of installation fasteners.
[ ] Fasteners, unless originally exposed, shall be concealed. Where surface
fastening is required and approved by the Architect, it shall be by means of
countersunk screws or bolts, with screw or bolt head concealed with wood
plugs. Finishing nails, where required, shall be soft cut and puttyed.
[ ] Window Fabrication Adhesives: Use non-staining casing or cold resin
adhesive.
[ ] Window Fabrication and Installation Fasteners: Use zinc-coated or non-
errous nails and screws.
[ ] Interior Wood Stops: Secure with exposed brass tapered wood screws
with tapered washers made for such installations.
[ ] Hardware and Accessory Installation: Use brass screws

WINDOW CASING & MOLDINGS: (Specify whether existing moldings are to
be removed and reused, or if identical new moldings are to be milled and installed.
Field test might be required to determine if existing moldings and casings be reused
without damage in removal and reinstallation.)

FIELD MEASUREMENTS: [ ] Contractor is responsible for field measuring
all dimensions for the required window work.

SUBMITTALS:
[ ] Site Visit: Vendor shall submit letter certifying he has visited the site and
is thoroughly familiar with all field conditions.
[ ] Installers: Submit letter certifying contractor will use adequate numbers of
skilled workers who are thoroughly trained and experienced in replacing
windows in historic buildings. Contractor shall certify that workers are
familiar with the materials, methods, tools and equipment
needed to install historic windows.
[ ] Sample Window: Vendor shall submit sample window showing prior
successful production of units similar to those required. Such samples shall
show fabrication techniques, workmanship, hardware, and accessories
similar to those required.
[ ] Weatherstripping: Submit 12" long samples of all weatherstripping re-
quired.
[ ] Moldings: Submit 12" pieces of each molding type required for each
window and casing with specified finish.
[ ] Shop Drawings: Submit shop drawings showing both horizontal and
vertical sections of both the original window (when appropriate) and the
replacement window. The sections will be carefully detailed so that all parts
of the window are shown and all materials are specified. Drawings shall
include dimensioned wall elevations, and full-size section details of every
typical composite member and joinery, including all glazing and
weatherstripping details. — CL

KEDDEE: Custom Restorations

After 30 years as a chemical engineer, David Fingnegan left the white-collar
world ten years ago to become The Keddee Company, a one-man
millwork manufacturer.

He prefers restoration projects, especially challenging ones, involving
unusual muntins, customizing major
manufacturers' products, or carving just about anything. "I do things
right," he says emphatically. "Archi-
tects should spend six months with someone like me, to learn the fine
points of millwork.

His work appears on some
of Rhode Island's finest historic struc-
tures, ranging from the 18th-century
commercial Irons & Russell Building
in downtown Providence to the 18th-
century Smith-Apbleby House in
Smithfield. His company's name, by
the way, derives from the names of his
family: son Kevin, wife Eugenia, his
dated and daughters Eileen and Erin.

For more information on The Ked-
dee Company, see the pullout SourceList in this section. — EMK

Circle No. 226

Marvin Windows
## Traditional Building's Wood and Clad Windows Source List II

### Company

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<tbody>
<tr>
<td>Englehard Millwork Corporation</td>
<td>Small shop specializing in duplicating historic millwork, especially circle and round-top windows using true divided-light construction, insulated glass on request.</td>
<td>None</td>
<td>As specified</td>
<td>As specified</td>
<td>None</td>
<td>50%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Gibbons Sash &amp; Door Box 76, Rt. 1, Dept. TB</td>
<td>Small shop specializing in wood windows to specification. Mainly new construction. All joints dowelled to permit odd angles. Various glazing types offered.</td>
<td>Free Circle No. 225</td>
<td>As specified</td>
<td>As specified</td>
<td>Polycarbonate</td>
<td>80%</td>
<td>Expensive</td>
<td></td>
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<tr>
<td>Harbrook Architectural Wood 146 Vley Rd., Dept. TB</td>
<td>Consultation, design, &amp; installation of wood windows for restorations, rehabs, &amp; new construction in the Northeast. Provides wide range of special architectural shapes, window types, &amp; store fronts. Experienced with landmark design boards.</td>
<td>Free Circle No. 240</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>100%</td>
<td>Expensive</td>
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<tr>
<td>Herrick &amp; White 3 Flat Street, Dept. TB</td>
<td>Woodwork shop that can make windows in unusual sizes and shapes, mainly for commercial new construction and restoration projects on the East Coast. All glazing types available, with true divided light preferred.</td>
<td>None</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>100%</td>
<td>Moderate to expensive</td>
<td></td>
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<tr>
<td>Historic Window Box 138, Jct. 123 &amp; 123A, Dept. TB</td>
<td>Mid-size window restoration specialists. Will reproduce existing units. Can also salvage old sash: from commercial to museum quality work, depending upon price. Antique restoration, or modern glazing in single, double, or triple strength.</td>
<td>Free</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>5%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Ideal Company Box 2540, Dept. TB</td>
<td>85-year-old mid-size millwork manufacturer with line of stock wood and clad windows, casement, awning, tilt double-hung, round top, true divided light. Various glazing types available including triple and low-E.</td>
<td>Free</td>
<td>Pine</td>
<td>Aluminum, white, bronze</td>
<td>Vinyl</td>
<td>10%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>J.B. Sash &amp; Door 280 2nd St., Dept. TB</td>
<td>Mid-size company specializing in wood and clad tilt replacement sash for double-hung windows. Double glazing with removable muntins standard; low-E available.</td>
<td>Free</td>
<td>Sugar and ponderosa pine</td>
<td>Vinyl, white</td>
<td>Vinyl</td>
<td>None</td>
<td>5%</td>
<td>Moderate</td>
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<tr>
<td>The Keddie Company 794 Hartford Pike, Dept. TB</td>
<td>One-man restoration specialist. Will carve or mill wood as needed; can customize major manufacturers' products and salvage old sash. All glazing types available.</td>
<td>Free</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>100%</td>
<td>Moderate</td>
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<tr>
<td>Lincoln Wood Products 701 N. State St., Dept. TB</td>
<td>Large stock wood &amp; clad window manufacturer. Double-hung, casement, slider units, &amp; replacement sash. Some true divided light, also removable &amp; sealed in muntins. Double glazing standard: single strength, low E, &amp; argon-filled available.</td>
<td>Free</td>
<td>Western pine</td>
<td>Aluminum, white, bronze, beige, grey</td>
<td>Vinyl</td>
<td>5%</td>
<td>Moderate</td>
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<tr>
<td>Lindsley Sash 1995 Commerce Dr., Dept. TB</td>
<td>Small company specializing in wood and clad replacement double-hung sash. All units swing out for cleaning. Double glazing standard: single strength also available.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>Aluminum, white, brown</td>
<td>Vinyl</td>
<td>20%</td>
<td>Moderate</td>
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<tr>
<td>Littitz Planing Mill 302 E. Front St., Dept. TB</td>
<td>77-year-old planing mill with thousands of cutters for creating antique muntin profiles. All glazing, including recycled, and all wood types available.</td>
<td>Free</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>100%</td>
<td>Expensive</td>
<td></td>
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<tr>
<td>Marvin Windows Dept. TB</td>
<td>Third largest manufacturer of custom and stock wood &amp; clad windows and tilt replacement sash. Odd stock designs include non-operable pentalgonal and Gothic-head windows, half round, with spider-web muntin patterns, round-top double-hung, single or double glazing with low E or other high-performance panes. Also curved windows.</td>
<td>Free Circle No. 226</td>
<td>Ponderosa pine</td>
<td>Aluminum, white, brown, bronze, grey</td>
<td>Vinyl</td>
<td>50%</td>
<td>Moderate to expensive</td>
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<tr>
<td>Maurer &amp; Shepherd Joiners 122 Naubon Ave., Dept. TB</td>
<td>Small woodwork shop that reproduces 17th- and 18th-century windows for old and old-style homes. Recycled glass or specialty. Can recreate any muntin or trim profile.</td>
<td>Free Circle No. 36</td>
<td>Oak or eastern white pine</td>
<td>None</td>
<td>Unsealed oil or turpentine</td>
<td>100%</td>
<td>Expensive</td>
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<tr>
<td>Messing Planing Mill</td>
<td>Small 77-year-old shop that makes windows, doors, and other woodwork, mainly for residential restoration projects. All glazing types available in single or double strength.</td>
<td>None</td>
<td>Sugar pine</td>
<td></td>
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<td>None</td>
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<tr>
<td>Midwest Wood Products</td>
<td>Small wood window manufacturer. They have stock components for double hung, storm, and screen windows that can be assembled in custom sizes. Double glazing standard. Antiqued, reproduction, single, and triple glazing available.</td>
<td>Free</td>
<td>Northern white, sugar, or ponderosa pine</td>
<td>As specified</td>
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<td>As specified</td>
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<tr>
<td>Millwork Specialities</td>
<td>Ten-person millwork shop that makes wood windows mainly for restoration projects. Stock line includes casements and double-hung. Various glazing types available, four divided lite only, also storm and screens with wooden frames.</td>
<td>None</td>
<td>As specified</td>
<td>Vinyl</td>
<td></td>
<td>As specified</td>
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<tr>
<td>MW Manufacturers</td>
<td>Major manufacturer of stock wood and clad windows. Double-hung, casement, awning, fixed, round top, and non-operable odd shapes. Any new glazing type available.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>Vinyl or TPE</td>
<td></td>
<td>Vinyl or TPE</td>
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<tr>
<td>New Morning Windows</td>
<td>Mid-size manufacturer of non-operative wood and clad windows of unusual shapes and sizes. Units and cladding colors designed to complement products of major manufacturers. Any new glazing type available.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>Aluminum: 12 colors</td>
<td>None</td>
<td>None</td>
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<tr>
<td>Norco Windows</td>
<td>Major manufacturer of wood and clad windows. Mainly for new construction. Stock units, or with false divided lites, include awning, half double-hung, round top casement. Any new glazing except triple offered; double standard.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>Vinyl, brown, and aluminum brown, beige</td>
<td>Polystyrene</td>
<td>Primer</td>
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<tr>
<td>Northwest Window Works</td>
<td>Mid-sized wood window manufacturer. Mainly West Coast residential and specialty commercial projects. Arches and divided lites with insulated glass and 1/4&quot; muntins. Specialty: Low-E, heat mirror, and insulated leaded glass available.</td>
<td>Send $2 for catalog</td>
<td></td>
<td>Q-ion, foam</td>
<td></td>
<td>Q-ion foam</td>
<td></td>
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<tr>
<td>Pella</td>
<td>Second largest manufacturer of wood and clad windows. Stock units include casement, awning, double-hung. Double glazing standard; sealed-in blinds available.</td>
<td>Free</td>
<td>Western pine</td>
<td>Aluminum: any color</td>
<td>Vinyl</td>
<td>Vinyl</td>
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<tr>
<td>Petersen Planing Mill Company</td>
<td>Mid-size millwork shop that makes windows. Large and small sizes, elliptical shapes a specialty. Some restoration experience. Any glazing type offered.</td>
<td>None</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
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<tr>
<td>Point-Five Windows</td>
<td>Mid-size wood window restoration specialists. Muntin profiles copied from mantles on historic buildings around the country. Replacement only also available; single or double glazing with modern float glass or hand-blown cylinder glass.</td>
<td>Free</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
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<tr>
<td>Pozzi Wood Windows</td>
<td>Major manufacturer of wood windows, subsidiary of Indus Millwork Systems. Over 4,000 window products plus custom shapes and sizes. Various glazing types available.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>Vinyl</td>
<td></td>
<td>Primer</td>
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<tr>
<td>Rickerton Woodworking</td>
<td>Family-owned mid-size millwork shop, founded 1902. Mainly high-end new construction, large commercial and residential projects; some restoration. All glazing types available.</td>
<td>Free</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
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**Source List**

**CSi# 08610**
### TRADITIONAL BUILDING'S Wood And Clad Windows SourceList  ■ IV ■

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<tbody>
<tr>
<td>Ruffin &amp; Payne</td>
<td>A family-owned lumberyard that makes wood windows based on local Colonial architecture. Can also customize the products of other manufacturers, tilt and non-tilt. Single glazing standard on Colonial windows.</td>
<td>None</td>
<td>Western pine</td>
<td>Vinyl</td>
<td>None</td>
<td>x</td>
<td>100%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Seltzer Millwork Corporation</td>
<td>Mid-size millwork manufacturer, large round tops a specialty. Many residential new construction. Any new glazing available.</td>
<td>Free</td>
<td>As specified</td>
<td>Vinyl</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>None</td>
<td>100%</td>
<td>Moderate</td>
<td></td>
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</tr>
<tr>
<td>Staples Millwork</td>
<td>Mid-size custom millwork shop specializing in the replication and restoration of wood windows. Reproduction glass and hardware available.</td>
<td>Free</td>
<td>Circle No. 208</td>
<td>As specified</td>
<td>As specified</td>
<td>x</td>
<td>x</td>
<td>None</td>
<td>100%</td>
<td>Moderate</td>
<td></td>
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</tr>
<tr>
<td>Tischler and Sohn</td>
<td>Top-of-the-line German-based window manufacturer. Primarily new construction, large homes or commercial projects. Any new glazing available. Optional coating has 20 years. To allow wood to breathe.</td>
<td>Free</td>
<td>Mahogany</td>
<td>Aluminum any color</td>
<td>Neoprene</td>
<td>x</td>
<td>x</td>
<td>As specified</td>
<td>100%</td>
<td>Expensive</td>
<td></td>
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</tr>
<tr>
<td>United States Woodworking</td>
<td>35 person millwork shop, specializing in windows and doors. Mainly restoration of commercial buildings and larger homes. Any glazing except antique glass.</td>
<td>Free</td>
<td>Circle No. 120</td>
<td>As specified</td>
<td>Vinyl or zinc</td>
<td>x</td>
<td>x</td>
<td>Primer</td>
<td>100%</td>
<td>Expensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walbrook Mill &amp; Lumber Company</td>
<td>2636 W. North Ave., Dept. TB</td>
<td>Free</td>
<td>White pine</td>
<td>As specified</td>
<td>As specified</td>
<td>x</td>
<td>x</td>
<td>As specified</td>
<td>100%</td>
<td>Moderate</td>
<td></td>
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</tr>
<tr>
<td>Webb Manufacturing</td>
<td>Large manufacturer of stock non-replicable wood windows: round, oval, half round, quarter round, octagon. Single or double glazing.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>None</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Primer</td>
<td>10%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>West-Pine Wood Windows</td>
<td>Mid-size wood window manufacturer specializing in true divided Colonial-style units with low-E glass. Primarily residential. Various glazing options available, as well as stain only replacements.</td>
<td>Free</td>
<td>Circle No. 222</td>
<td>Ponderosa pine</td>
<td>Vinyl</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>25%</td>
<td>Moderate</td>
<td></td>
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</tr>
<tr>
<td>Window Millwork Shop</td>
<td>Small shop that provides windows for both new construction and restoration work. Has worked on large commercial projects in Boston area. Recycled and reproduction glazing available.</td>
<td>None</td>
<td>As specified</td>
<td>As specified</td>
<td>As specified</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>100%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Windsor Window Company</td>
<td>Large stock wood &amp; clad window manufacturer. Line includes casement, awning, and double-hung, many for residential new construction. Double glazing standard; other options available.</td>
<td>Free</td>
<td>Ponderosa pine</td>
<td>Aluminum white bronze</td>
<td>Q-lon</td>
<td>x</td>
<td>x</td>
<td>Primer</td>
<td>3%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Wood Window Workshop</td>
<td>Small company specializing in restoring old sash; can also remodel components or entire unit. Sub-sidiary of building supply company, so some stock products available. Mainly New York state since work done on site.</td>
<td>Free</td>
<td>As specified</td>
<td>Aluminum white bronze</td>
<td>As specified</td>
<td>x</td>
<td>x</td>
<td>As specified</td>
<td>80%</td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Woodstone Company</td>
<td>Small wood/window manufacturer for high-end new construction and large restoration projects: period reproductions, including double glazing with thin muntins, a specialty. Peggyed mortise-and-tenon construction. All new glazing types.</td>
<td>Send $3 for brochure. Most hardwoods and softwoods</td>
<td>As specified</td>
<td>Preservation</td>
<td>100%</td>
<td>Moderate to expensive</td>
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<tr>
<td>J. Zeluck</td>
<td>Mid-size wood window and door manufacturers for high-end new construction and large restoration projects, top of the line product. All types of new glazing offered.</td>
<td>Free</td>
<td>Mahogany</td>
<td>Bronze or neoprene</td>
<td>None</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>100%</td>
<td>Expensive</td>
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History in the Remaking

When restoring any building for historic certification, the windows will often determine final approval. Camden Window & Millwork has maintained a 100% success record in reaching that approval.

Camden Window & Millwork specializes in detailed restoration and custom duplication of all wood windows. With rigid field testing for air, water and sound infiltration, we're able to balance energy and preservation requirements with design elements to create the maximum visual impact.

Restoration is cost-effective, many times, less than the market price for "new" installed windows.

From the sashes of the main building on Ellis Island to the arched windows of Carnegie Hall, we remake history with precision craftsmanship.

Camden Window & Millwork
When History Must Be Repeated.

1551 John Tipton Boulevard
Pennsauken, NJ 08110
1-800-345-2338
(NJ) 609-662-4646

The window with two cases depicted in "The Woodstone Company" brochure

Midwest Wood Products is a user-friendly establishment. Their brochure includes not only side and front views of their double-hung windows, storms, and screens but also a glossary of window terminology and an illustrated diagram of window parts. Midwest will work on small orders of a few windows or replacement sash, and they'll also tackle large replication projects like storefronts (a handsome turn-of-the-century example is depicted in the brochure).

A basic price list comes with the brochure. Costs range from $30.32 for an unglazed double-hung unit with room for two 16 x 16 in. panes to $144.95 for a glazed window with two 4 x 48 in. panes. Add $3.50 per sq. ft. of glass for insulated glazing and $2.25 per lite for true divided lites.

For more on Midwest Wood Products, see the SourceList. — EMK

GIBBONS: Dowelled-Joint Specialists

Gibbons Sash & Door uses only dowelled joints on its windows. "The mortise and tenon is designed for 90 degree angles," says owner John Gibbons. "But we get asked to do all kinds of odd angles, that other people won't do. A dowel is much more flexible than a mortise and tenon; it can go into any joint."

Recent projects range from a post-and-beam window wall for a storefront to an elliptical-head window that wraps around the corner of a house. Their work is divided equally between new construction and restoration; Gibbons says that both are challenging. "Either we have to duplicate everything exactly as it was on an old building, or we work with architects who specify every detail — the muntins, the sills. We'll make all the custom profiles they want."

For more about Gibbons Sash, see the SourceList in this section. — EMK

WOODSTONE... TEN YEARS OF PROFESSIONAL WOODWORKING SERVICES

... not only does WOODSTONE manufacture only the finest custom solid wood windows, doors and architectural millwork...

... available in virtually any size, shape or wood species imaginable...

WOODSTONE OFFERS SERVICE!

TRADITION & TECHNOLOGY including:

* Mortise & tenon joinery, even in our most intricate sash bar & muntin patterns.
* CAD CAM design service to match any other manufacturers’ dimension standards.
* Glass from Beveled to Bull’s Eye, Low E to Insulated and Tempered to Tinted...
* True made-to-order manufacturing with large & small project capacity.
* 24-hour FAX service for prompt detail description and job costing.
* On-the-road consultation & site visits... before and after the sale.
* Guaranteed pricing.
* Product Warranty.
* Accurate project completion schedules.
* ASTM performance certification.
* Insulating glass available in virtually any shape.
* An established landmark historical reproduction track record.
* "A thin 1" overall bar & muntin width with true divided lite insulating glass.

For an illustrated brochure, please send $3.00. Visa & Mastercard welcome.

WELCOME TO WOODSTONE®

WOODSTONE®
WOODEN WINDOWS & DOORS

RELIABLE	TRADITIONAL	REQUEST YOUR FREE BROCHURE TODAY

SEPTEMBER/OCTOBER 1989
**POINT-FIVE WINDOWS: Leak-Proof Sash**

Point-Five Windows derives its name from the maximum cubic feet of air per minute per foot of seal that its windows will leak. "And they usually test even better than that," says its owner, Dave Lundahl.

The company’s products include replacement sash and complete windows, both designed specifically for old buildings. The cast-bronze hardware is based on turn-of-the-century designs.

The windows are typically glazed with hand-blown cylinder glass, which all but disappeared from the scene when rolled glass was developed in the 1880s. Weatherstripping is intended to be, as Lundahl puts it, "conspicuously absent," unless the sash is open.

Eight standard profiles are available, all of which are copied from muntins on important buildings that Point-Five has worked on: the Federal Courthouse in Providence, the New York Life Building in Kansas City, the Asher Levy Bathhouse in New York City. The muntins come in custom widths in increments of 1/16 in., beginning at 13/16 in. for double glazing and 9/16 in. for single glazing. Custom profiles can be provided for a $950 set-up charge.

For more information on Point-Five Windows, see the pullout SourceList in this section. — EMK

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**WOODSTONE: Custom Windows Via CAD/CAM**

The Woodstone Company can take a customer’s sketch and turn it into window specs via a CAD/CAM system. We can figure out virtually an infinite number of dimensional possibilities," says co-owner Jay Eshelman. Among the company’s specialties are one-inch-wide muntins on true divided-lite insulated-glass units and a high-tech weight-and-pulley counterbalance system. The windows are guaranteed for ten years. About 20 people work for the company, and they are comfortable with any wood species from teak to pine.

For more information on the Woodstone Company, see the pullout SourceList. — EMK

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**ARCHITECTURAL COMPONENTS: 18th-Century Sash**

Architectural Components makes windows typical of early Connecticut River Valley architecture. The 18th-century units have 1-in.-thick muntins, a holdover from those found on Jacobean buildings, and the 19th-century units have 5/8-in.-thick muntins, which reflect the delicacy of Georgian and Federal architecture.

The upper sash is fixed and the lower is operable. Single glazing is standard, usually with antique or reproduction panes. Prices range from $46 for an unglazed 15/16-in.-thick 18th-century unit with four 6 x 8 in. panes to $466 for a 1-1/8-in.-thick 19th-century unit with 12-over-12, 9 x 12 in. panes and a 2-1/4-in.-wide sill.

The company also takes on custom orders. ‘I imagine there’s something out there I wouldn’t want to do, but I haven’t come across it yet,’ owner Chuck Bellinger says.

For more on Architectural Components, see the SourceList. — EMK

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The first manual, "The Window Handbook," contains 125 pages of brief, well-illustrated case studies called Preservation Tech Notes. The Tech Notes describe both innovative and traditional procedures for repairing and/or replacing historic windows. The Tech Notes give lots of specific detail...including costs and product information...so you can adapt the same procedure to other projects. The Tech Notes are divided into six categories: (1) General Guidance; (2) Planning & Evaluation; (3) Repair & Weatherization; (4) Double-Glazing Historic Windows; (5) Replacement Sash & Frames; (6) Screens, Awnings, & Accessories.

The second manual, "The Window Workbook," contains 368 pages on the preservation and rehabilitation of windows in older buildings. The contents are based on papers given at the National Window Conference sponsored by the National Park Service. It's a great guide for architects, developers, contractors, and building managers. Among the topics addressed are: energy conservation, historic technology, maintenance, custom fabrication, repair techniques, and government regulations. There's also a 30-page directory of companies that do all special types of window work.

Purchased separately, "The Window Handbook" costs $30, and "The Window Workbook" costs $48.25. Together, the set of two costs only $70, postpaid. Order from: Historic Preservation Education Foundation, P.O. Box 27080, Central Station, Washington, D.C. 20038. - CL*
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But on many projects, such as the Marquette Building (see page 20), careful analysis has shown that it can cost less to repair than to replace. There are a couple of articles in The Windows Handbook that detail major repair projects on deteriorated wood windows (see page 15).

However, if you determine that repair is the desirable path for a specific job, you still have the problem of finding a contractor who's willing to tackle repairs. Some architects have good luck training regular carpenters to tackle window restoration. As long as the workers have had experience on preservation projects, the odds are good that they'll adapt successfully to this new task.

There are also some contractors who specialize in window repair. Below we've listed a few of the companies we've run across who have a good track record in wood window restoration.

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wood window repair

A Computer "Expert"

It takes an expert to decide whether it's more economical to repair or replace wood windows. Soon, you can have your own personal window expert on your desktop.

by Constance W. Ramirez and John H. Myers

Work now being done by the U.S. Dept. of the Army through the Center for Architectural Conservation at Georgia Tech may make life simpler for anyone who needs to evaluate the condition of windows and make sound "repair or replace" decisions. The project is called "Window Expert System" and, in essence, it stores the knowledge of experts in a computer program that then directs non-experts through the evaluation process. The non-expert arrives at a technically and philosophically sound decision just as an "expert" would.

The Window Expert System starts with a computer program "shell" developed by specialists in expert systems. The shell is then loaded with technical information on window types, sizes, materials, the Secretary of Interior's Standards, from Preservation Briefs and Tech Notes -- and names, addresses, and capabilities of window manufacturers. It is then programmed to go through the same steps as a human expert to evaluate a window and come up with a correct decision on significance and condition, recommend action, and list suppliers of products and services appropriate for the recommended action.

The 3 Parts Of Being Expert

The program guides the user step-by-step through a series of questions in three major sections:

1. The first stage collects basic data on the building. (Intelligent window decisions can only be made in context of the building's importance.)
   - The second step evaluates the relative significance of each window type in the building. Usually, some windows are more important architecturally than others in the same building. The program asks a series of questions like the one in Fig. 1, and ultimately assigns a significance level to each window type.
   - The third step in a window-by-window assessment of physical condition, within each identified type. A series of questions like the one in Fig. 2 helps the user describe conditions.
   - The program then uses the information on significance and condition to make repair/replace recommendations for each window. The system can use information stored in commonly used database programs like dBase, and it can store the results in a database as well. For example, the Window Expert System will read from a database of window manufacturers' capabilities and inform the user where appropriate products are available.

Solutions For Other Problems

This new approach to analyzing historic preservation issues holds great promise for many other preservation problems where there are large inventories of historic buildings. For the Army, which maintains about 10,000 pre-1940 build-

ings and over 100,000 archeological sites, expert systems offer the opportunity to ensure uniform inspection and analysis criteria necessary for budget and manpower decisions. For this reason, the Army has been leading the field in applying computer programs to historic resource management.

The Window Expert System is the first such program targeted to building maintenance, and is a forerunner of powerful and inexpensive aids for solving technical problems. The Window program will allow property owners and managers to work more effectively with architects and engineers to achieve solutions that protect the significant features of historic buildings. It joins other Army programs such as the Cultural Resources Information System and Geographical Resources Analysis Support System that aid the development of historic preservation plans.

The Window Expert System is still in the developmental phase, but ultimately the Army and the Center see the program as one to be shared with other users ranging from federal agencies to historic house museums.

To get additional information about the Window Expert System, contact: Richard Hayes, Facilities System Div., U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, 2092 Newmark Drive, Champaign, IL 61821. Or: John H. Myers, Center for Architectural Conservation, College of Architecture, Georgia Tech, Atlanta, GA 30332 (404) 894-3390.

John H. Myers is Director of the Center for Architectural Conservation and author of Preservation Brief No. 9, "The Repair of Historic Wooden Windows." Constance Werner Ramirez, Ph.D., is Historic Preservation Officer for the Dept. of the Army and develops policies for management of archeological sites and historic buildings on military land.

Window Repair: $65,000. New Windows: $1,600,000.

When Holabird & Root, Chicago, undertook the $17-million rehabilitation of the Marquette Building for the owner, Bankers Life & Casualty Co., it was clear the windows were a major part of the job. Project Architect Walker C. Johnson, AIA, analyzed three options: (1) High-quality aluminum replacement windows. Cost: $1,600,000. (2) Modifying existing sash to accept insulating glass. Cost: $860,000. (3) Repair existing sash. Cost: $65,000. Careful analysis showed that just replacing the old windows would still allow the building to meet ASHRAE energy performance standards -- and that the energy saving of the two more costly options would not yield an adequate payback. It was a case of good preservation practice and good economics going hand in hand.

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When you've got to improve the energy performance of windows in historic buildings, some sort of double glazing is usually called for. Options include: (1) installing a traditional exterior storm window; (2) installing an interior storm window; (3) routing out the historic sash to insert a double-glazed thermal unit; or, (4) replacing the deteriorated sash with a new double-glazed one that preserves the historic character.

Storm windows — interior or exterior — are on the most economical double-glazing strategy. Whether the storm goes inside or out is usually decided by the combination of aesthetic, technical, and perhaps legal factors — if the property is in a historic district or is subject to Tax Act review.

Outside storm windows are often the best strategy when dealing with simple 1-over-1 windows. Well-designed exterior storms have a minimum impact on appearance — and have been approved by the National Park Service for use on Tax Act projects.

Outside storms have serious drawbacks, however: multiple-lash sash because the exterior storm panel masks the muntin profiles of the prime window. For windows with distinctive glazing bar patterns, interior storms are often the way to go. There have been dramatic developments in the past few years in the field of interior storm windows available. For example, the new magnetically attached interior storms are especially useful in traditional casement windows; they grab right to the steel frame.

Many of the high-quality exterior and interior storm windows don't have self-storing panels, which is why they look better than the ubiquitous triple-tracks. But the property owner may have to figure out where to store the glazing panels during the summer.

For more details on improving the thermal efficiency of historic windows, consult the Window Handbook (see review on p. 15). Below you'll find a list of some of the leading suppliers of storm windows for historic buildings.

ALLIED WINDOW, INC. The company makes four lines of aluminum storm windows: one for exterior mounting, and three types for interior mounting. Allied specializes in custom designs and custom colors, priding itself on making "invisible" storm windows. The company has supplied storm windows for many historic and Tax Act projects.

For exterior installation on commercial, industrial, and residential buildings with double-hung windows, Allied has its Historic One Lite (HOL) line. The HOL lines are available with: (1) A single removable panel; (2) One fixed and one removable panel; (3) Two removable panels. Units are custom-engineered to the installation, and can be made with arched, round, and segmental heads. Even circular shapes can be provided; all panels are inside removable.

For interior installations, Allied has its Magnetic One Lite (MOL), Allied One Lite (AOL), and Slide-A-Way (SAW) lines. The MOL line is designed primarily for double glazing of fixed windows. It attaches magnetically to steel tape or steel angle affixed to the window frame. Because of its aluminum frame, it can utilize glass panels — and undivided glass panels as large as 66 in. x 92 in. have been successfully installed.

The AOL line has been approved for interior installation on Tax Act projects. There are a couple of ways to attach it to the inside of a window frame. Panels snap out easily from the aluminum frame with mechanical clips. Units are custom-engineered to the installation, and can be made with arched, round, and segmental heads. Special shapes follow line of existing windows. Screen panels and special glazing are offered. Allied Windows, 1754 W. Mckinley Ave, Dept. TB, Cincinnati, OH 45214 (800) 445-5411. Circle No. 69

DEFENDER, INC. The company makes interior storm windows that feature in-jamb or face-mounted vinyl frames — in several colors — with acrylic glazing panels. Five-inch and interior storm systems are offered to fit just about any shape and style of window. The acrylic glazing panel can be installed or removed without special tools. Defender, Inc., Dept. TB, Box 3582, Bridgeport, CT 06605 (800) 257-0882.

KASSON & KELLER — Company provides aluminum secondary windows, both exterior and interior-mounted, for commercial buildings. The Manhattan single-hung commercial secondary window can be manufactured as large as 72 in. wide by 120 in. high. Head-mounted balances allow the bottom insert to be raised or lowered on large units. Tilt-in glass and screen inserts allow easy removal for cleaning and repair. The units are engineered to meet wind and structural loads that occur in high-rise buildings. Kasson & Keller, School Lane, Dept. TB, Fonda, NY 12068 (518) 853-3421.

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MAGNETITE CORP. Offers interior storm windows with heavy-duty aluminum edging and a continuous flexible strip magnet. Several framing systems allow installation on any existing window size limited only by glazing dimensions. Self-storing models are available. All units come custom made, so unusual shapes are possible. Uses acrylic or glass panels in thicknesses up to 25 in. Specialty glass, such as solar reflective glass, "S-1", is available. Magnetite Corp., 8356 Tom Drive, Dept. TB, Baton Rouge, LA 70815 (800) 624-8465.

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NATIONAL ENERGY CORP. Supplies the Spring-Tite interior storm window, which is designed to slip easily inside an existing window jamb and be held in place by friction pressure supplied by internal spring mechanism. No magnets, Veloct, or other mounting hardware is required. The frame is extruded PVC, the corner key is injection-molded nylon with aluminum pop rivets. The springs are made from tempered stainless steel. Glazing can be acrylic or double-strength glass. The frames come in white, tan, or dark brown; neoprene gaskets around the perimeter makes a tight weather seal. National Energy Corp., 105 Franklin St., Dept. TB, Westerly, RI 02891 (401) 348-1030. Circle No. 332

PANELAIR — Sells a simple inside storm window consisting of a sheet of clear glass in a vinyl gasket within a U-frame aluminum channel. Also available with acrylic glazing, double-strength glass, and UF-3 for ultra-violet protection. A circular bulk-type gasket provides an air-tight seal. Frames available in white or brown, which can also be painted to match existing woodwork. Held securely in place by spring-loaded clips for easy access and removal. Panelair, 203 Spark St., Dept. TB, Brockton, MA 02402 (508) 586-8900. Circle No. 232

PLASKOLITE — Company supplies custom-made Winsulator inside storm windows for residential, commercial, and industrial locations. Storm unit is attached magnetically to a steel banding affixed to the window frame. Magnetic strip is connected to the extruded vinyl frame via a flexible bellows that accommodates out-of-square surfaces. Glazing is acrylic; vinyl frame comes in white, brown, or tan. Plaskolite, Inc., P.O. Box 1497, Dept. TB, Columbus, OH 43216 (614) 298-3356.

CIRCLE No. 237

THERMO-PRESS CORP. — Company provides an inside storm window in which a continuous 1/2-in, hook Velcro strip is stapled to the window trim or to a strip attached inside the window jamb. An extruded PVC channel is slotted into the existing jamb. Velcro strip is pushed against the mating Velcro strip; weather tight seal is provided by an inner vinyl gasket extruded to the PVC frame. Acrylic glazing unit is permanently bonded to the PVC frame. The PVC frames are available in many custom colors, including wood stains.

Thermo-Press windows can be divided into two sections, like a double hung window. The top panel can self-store into the top panel, allowing easy access to the prime window. For more information, see the advertisement. Thermo-Press Corp., 5406 Distributor Drive, Dept. TB, Richmond, VA 23225 (804) 371-2664. Circle No. 226

ULTRASTORM CORP. — Offers an interior storm window that slips inside the window jamb and is held by friction generated in the interior Spring-Tite mechanism. The frame is extruded PVC with acrylic glazing. It accommodates window frames that are as much as 11/4 in. out of square. Compression clips are used to compress the spring-loaded frame, then the unit is molded into the window jamb. Clips and clips are removed. Frame then springs into place. Ultra-Storm Corp., P.O. Box 119, Dept. TB, Lincoln, MA 01773 (508) 358-5554.

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- Steel windows are an important design element and their original look should be preserved;
- Old steel windows can be repaired and thermally upgraded.

Detailed techniques for repairing and thermally upgrading historic steel windows are contained in The Window Handbook (see review, p. 15).

If replacement is called for, several companies still produce steel windows. In some cases it may be desirable to make the replacement units from aluminum. The Window Handbook gives a detailed review of a commercial rehab in Lowell, Mass., in which the original steel windows were replicated in aluminum by Custom Windows Co. of Denver (see below).

A & S WINDOW ASSOCIATES — Manufactures steel windows in four weights: Intermediate, Commercial, Standard Intermediate, and Heavy Intermediate. For preservation work, they can match the pre-war 14 in. x 20 in. or 12 in. x 18 in. pivoting ventilator windows. Windows are available with weather-stripping applied to integral grooves in the sections. Windows can be prepared for inside or outside glazing, putty or bead, single or insulated glass. Styles available include casement, projected, horizontal and vertical pivoted, terrace doors, and security windows. Vertical pivoted windows, when oversized, can be manufactured with tubular ventilator sections. A & S Window Associates, 88-19 76th Ave., Dept. TB, Glendale, NY 11385 (718) 275-7900. Circle No. 234

BLISS-CASSHER — Makes traditional metal windows in both steel and aluminum. On restoration jobs, the company's steel windows incorporate old-style muntins with cove detail and narrow sight lines. Old lite sizes are easily fabricated. Their windows have been used on Tax Act projects. Available in two weights: commercial and architectural. Makes both project and pivoted ventilators, as well as security windows and casements. Offers custom work and curved heads. Bliss-Cashier Metal Products, 617 West Morittus St., Dept. TB, East Syracuse, NY 13057 (315) 437-3396. Circle No. 235

CORNAPI CO. — Medium-size window contractor that will repair or replace steel and aluminum windows, although their specialty is wood windows. Mainly handles larger jobs. Cor- napi Company, 2307 Oakland Ave., Dept. TB, Glenville, PA 19038 (215) 887-0556. Circle No. 236

CUSTOM WINDOWS — Company produces custom aluminum and steel windows and has extensive experience in replicating, in aluminum, old wood and steel windows for preservation and Tax Act projects. (A detailed review of one of their steel window replacement projects is contained in The Window Handbook.) Their 8300 Historical Renovation series maintains the appearance of historical windows, while providing thermal barrier construction and true divided-light fenestration. Steel windows can be made in casement, projected, and stationary styles. The firm also produces aluminum window systems for commercial, institutional, and industrial buildings — stock and custom. Custom Window Co., 27700 S. Vallecito, Dept. TB, Englewood, CO 80110 (303) 761-2099. Circle No. 238

ENVIRON, INC. — Custom design and fabrication of aluminum and vinyl replacement windows for the commercial, institutional, housing, and historical markets. Extensive experience in getting approvals for Tax Act projects. Can also replicate steel windows in aluminum. Has own installation crews to ensure high-quality workmanship when windows are installed. Environ, Inc., P.O. Box 20808, Dept. TB, Greensboro, NC 27420 (919) 272-3592. Circle No. 241

HOPE'S ARCHITECTURAL PRODUCTS — Company produces steel windows for new construction or restoration. All windows are custom fabricated to specific project requirements. Hope's 'Jamestown' Series and 'Landmark' Series are available in fixed or operable styles. All ventilators come with weather-stripping applied to an integral dovetail groove. 'Jamestown' Series windows accept up to 1-in. insulated glass ('Landmark' Series up to 5/8 in.) and snap-in glazing beads. Steel casement doors, 3/4-hr. fire-rated windows, and replacement hardware also offered. All products furnished with factory-applied finishes of urethane, Kynar, or polyester powder. Hope's Architectural Products, 84 Hopkins Ave., Dept. TB, Jamestown, NY 14701 (716) 665-5124. Circle No. 236


TORRANCE STEEL WINDOW — Specializes in steel casement windows and doors in two grades: Standard Intermediate and Residential/Architectural — in both stock and custom sizes. Also produces 3/4-hr. fire-rated windows. The Standard Intermediate line is 1-1/4 in. thick, and includes fixed, projected, and casement designs. For insulating glass, 1/2 in. could be glazed with putty, and the balance provided with a steel bead. The Residential/Architectural line is 1 in. thick, and features residential steel casements. Units can also be used in light commercial construction. Also: Industrial security windows, commercial projected windows, and steel window hardware. Torrance Steel Window Co., 1819 Abalone Ave., Dept. TB, Torrance, CA 90501 (213) 328-9181. Circle No. 237

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SEPTEMBER/OCTOBER 1989 ■ 25
**NEW ANTIQUE GLASS**

If you’ve heard the term “Antique Glass,” you may not know that what is being described is blown glass. At least that’s the case with Blenko Glass, suggests owner Richard Blenko. Blenko Glass is known for its use of patterned, custom, insulated, stained, and pulley hardware. It is also one of the few sources for sash weights that began during a restoration in Brooklyn Heights, N.Y. Architectural Iron found it needed several thousand weights so it started manufacturing the parts in house.

There are stock 1-1/2 lb. weights for $2.40 apiece and 2 lb. weights for $3.20 apiece. Custom weights are accommodated.

Architectural Iron Company, Box 126, Dept. TB, Milton, Pa. 18337 (717) 296-7722. CSH 0870 - JL. Circle No. 219

**Glass Blowing - A Team Effort**

Susan Russell and Michael Kraatz, glass blowers (both were trained at the Rhode Island School of Design), operate a glass blowing studio in Canaan, New Hampshire. Among other specialties are authentic bull’s-eye glass panels utilizing the traditional method. The bull’s-eye lights are used primarily for transoms, doors, and sidelights. Although they price their products for individual projects, some sample sizes and prices are as follows:

- $68 for 27" x 8" for $31, 31" x 10 for $50, 10" x 10" for $63, and 10" x 12" for $98.

Kraatz Russell Glass, Gratiot Mill Hill, Rt. 1, Box 320C, Dept. TB, Canaan, NH 03741 (603) 523-4289. CSH 08810 - JL. Circle No. 254

**Exotic Window Hardware**

Stry-Buc Industries has a catalog filled with hundreds of new and obsolete door and window hardware items that they distribute to manufacturers. Says Cindy Ervin, Sales Manager, “We inventory 10,000 items and have access to an additional 40,000.”

Among the stock items are: window balances, mounting hardware, cam handles, weatherstrip between any window replacement hardware, roller assemblies, vent arms, and more. Most of the pieces are cast bronze (white and red), although they also distribute some solid brass hardware.

Stry-Buc buys obsolete molds to custom make hardware in their machine shop. They have found a British product that produces decorative locking handles for case- ment windows, which are now hard to find. The handles have a ‘tape balance’ to be used instead of weights and pulleys; it is inexpensive, yet has been used on some historical renovations.

Stry-Buc Industries, 546 Church Lane, Yeaden, PA 19080 (215) 352-0650 in PA (215) 620-3320. CSH 08800 - JL.

**SASH PULLEYS RISE AGAIN**

One annoyance when rehabilitating older windows is finding pulleys for the sash weights. The problem was so vexing for U.S. Woodworking that they are now manufacturing their own pulleys.

Housing, flange, and pulley wheel are made from Zytel glass-reinforced nylon resin. Pulley wheel rotates on a brass axle. The entire unit is rustproof, avoiding problems that arise when steel pulleys corrode and start to bind. The pulley is sized for most institutional and commercial windows: Flange is 1-1/4" wide by 5-7/8" deep; pulley is 2-1/2" dia. The Zytel pulleys are $7 apiece; discounts for quantity orders.


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**SPECIAL WINDOWS ISSUE**

**EOPY REPAIR OF WOOD WINDOWS**

- **CONSERVATION SERVICES, 8 Lakeside Troll, Dept. TB, Kinnelon, NJ 07405 (201) 836-6412.** Their epoxies are more flexible than wood so they don’t shear. The consolidant has a low viscosity for deep penetration into the wood. 1/2 gal. of consolidant, $55 and 7/8 gal. (4 liters), $68. Circle No. 175

- **DELL CORPORATION, P.O. Box 1462, Dept. TB, Rockville, MD 20850 (301) 279-2612.** A general contracting firm that distributes the Beto Epoxy System. Their low-viscosity (flows like water) consolidant (1200 parts A - B mixture comes in a 1-lter unit and is $21.65. The filler (FM-250C) comes as a powder that mixes with the consolidant to make 10 oz. or 22 oz. a bag. They also sell Bello Rotters (a wire brush) which is two-part paste epoxy mixed in a 1:1 ratio; 2.2 lbs. is $18.60. Circle No. 218

- **GOUGECHE BROTHERS INC., 100 Patterson Ave., Dept. TB, Boy City, MI 48705 (517) 684-7286.** Manufacturer of West System epoxy; largest supplier to epoxies marine construction and repair market. The focus of their recipe strength and water resistance. One qt. of 105 Resin and 44 pt. of 205 Hardener are mixed in a 51 ratio, $16.85 and $7.45 respectively. 406-5000 (fillers) can be mixed with the mixed resin and hardener to form an adhesive paste, $4.50 for 1 oz. Low-density 140 Microlight (dry filler mixed with resin and hardener to form an easily spreadable putty) filter, $5.95 for 2.5 oz. They also sell gloves, brushes, application tools, and pre-calibrated dispensers for easy site use, $7.00/pc. Circle No. 246 — JL.
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208. Leaded Glass — Leaded glass is a popular choice for window treatments. It is a great way to add color and privacy to any room.

209. Building Materials — Building materials are used in the construction of buildings. They include wood, metal, and concrete.

**Division 7 — Moisture Resistance**

210. Restoration Systems — Restoration Systems are designed to restore the moisture resistance of buildings. They provide a barrier against moisture and prevent damage to the building materials.

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212. Stainless Steel — Stainless steel is a popular choice for building materials. It is resistant to corrosion and is used in many applications.

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225. Lead — Lead is a popular choice for window treatments. It is a great way to add color and privacy to any room.

226. Zinc — Zinc is a popular choice for window treatments. It is a great way to add color and privacy to any room.

**Division 11 — Professional Services**

227. Architect — An architect is a professional who designs and plans buildings. They work with clients to create design plans that meet their needs.

228. Engineer — An engineer is a professional who designs and plans buildings. They work with clients to create design plans that meet their needs.

229. Contractor — A contractor is a professional who builds and renovates buildings. They work with clients to create design plans that meet their needs.

**Division 12 — FURNISHINGS**

230. Furniture — Furniture is a popular choice for window treatments. It is a great way to add color and privacy to any room.

231. Linens — Linens are a popular choice for window treatments. They are used to add color and privacy to any room.

232. Accessories — Accessories are a popular choice for window treatments. They are used to add color and privacy to any room.

**Division 13 — Lighting**

233. Lighting — Lighting is a popular choice for window treatments. It is a great way to add color and privacy to any room.

234. Fixtures — Fixtures are a popular choice for window treatments. They are used to add color and privacy to any room.

235. Chandeliers — Chandeliers are a popular choice for window treatments. They are used to add color and privacy to any room.

**Division 14 — Specialties**

236. Chef — A chef is a professional who prepares and serves food. They work in restaurants, hotels, and other establishments that serve food.

237. Caterer — A caterer is a professional who prepares and serves food. They work in restaurants, hotels, and other establishments that serve food.

238. Baker — A baker is a professional who prepares and serves food. They work in restaurants, hotels, and other establishments that serve food.

239. Pastry Chef — A pastry chef is a professional who prepares and serves food. They work in restaurants, hotels, and other establishments that serve food.

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Many people helped with counsel and advice in the preparation of this Special Issue. In particular, we'd like to express thanks to: Charles E. Fisher, Preservation Assistance Div., National Park Service; Walker Johnson, AIA, Holabird & Root; Robert Meadows, Larry Jones, and Dean K. Koga of Robert E. Meadows, P.C., Architect; Richard Pelletier of Historic Window Co., and Warren Weibach and Robert W. Kress of United States Woodworking. — Clem Labine

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