PRESERVATION
Tech Notes
NATIONAL PARK SERVICE
U.S. DEPARTMENT OF THE INTERIOR
WASHINGTON, D.C.

WINDOWS
NUMBER 1

Planning Approaches to Window Preservation

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MARQUETTE BUILDING
Chicago, Illinois

The Marquette Building, constructed in 1895, is one of Chicago's finest commercial buildings. Individually listed in the National Register of Historic Places, the building incorporated the then-recent structural innovation of the steel frame with a design that brought much acclaim to the architectural firm of Holabird and Roche. Though the site was slated for redevelopment in the 1970's and the occupancy rate fell to ten percent, a decision was made in 1978 to renovate the building for prime office and retail space in Chicago's Loop.

The modified Chicago-style windows, which fill the bays between the structural piers, are one of the most prominent features of the building's facade. The large glazed area in each bay consists of two narrow double-hung sash flanking either a large central fixed light or a pair of fixed lights. Careful evaluation of the window repair and replacement options showed that preserving the historic windows was the most cost-effective treatment. The project demonstrated that proper planning can control rehabilitation costs—as well as lead to the preservation of historic windows.

Rehabilitation Planning

The Marquette Building is a 16 story building with 290,000 square feet of net rentable floor space and fronts on Dearborn and Adams Streets. While the building has nearly 350 double-hung windows principally on the upper three floors and throughout the northern facade fac-

Protecting and maintaining historic windows can be best accomplished through careful planning.

ing on an alley, the 182 Chicago style windows are of greatest interest here because of their style, prominence, and large size. Although the windows vary in size, most measure about 12' wide by 8' high *(see figure 1)*.

Constructed out of good quality mahogany, the windows were still in sound physical condition despite over ninety years of exposure to Chicago's winter weather and years of neglect due to deferred maintenance *(see figure 2)*. While some of the sills needed repair, the windows primarily needed to be repainted and to have some interior trim replaced. Recaulking around the frames was necessary, but otherwise there was very little air infiltration. The windows had already proven to be very durable and, except for periodic painting, long-term maintenance was expected to be minor. The project architect, Walker C. Johnson, AIA, of Holabird and Root, estimated the life of the windows to be in excess of another ninety years. Even with this information, the architect and owner still had other factors to consider in examining alternatives for the repair or replacement of the windows.

Related HVAC Study One added consideration for the proposed window work was an outgrowth of the energy analysis done for the building. The new heating and cooling system (HVAC) chosen as a result of the study consisted of a variable volume air system for cooling and a hot water radiation system using perimeter finned tube units.

Based on current operating expenditures and projected energy costs supplied by the local power company, it was determined that by having the windows closed all the time, savings could be achieved as a result of purchasing smaller capacity HVAC units and having lowered operational costs.

Window Evaluation Criteria In conjunction with the HVAC analysis, three window alternatives were considered:

- repairing the existing windows and fixing them closed;
- modifying the existing windows by installing insulated glazing for improved thermal performance; or
- replacing the existing windows with high-quality, aluminum units with insulating glass that matched the appearance of the original.

Criteria for evaluating the three alternatives related to aesthetics, window performance and economics:

(1) The historic character of the large office windows had to be preserved;

(2) Only high quality materials and workmanship would be used in any work on the windows, consistent with the goal of creating prime office space;

(3) As a result of the decision previously reached concerning the new HVAC system for the building, the windows had to be fixed closed;

Figure 1. The Marquette Building has both Chicago-style windows, as shown above on the second floor, and a modified Chicago-style window consisting of two fixed lights in the center section. Photo: Charles E. Fisher

(4) While specific requirements were not established at the outset for the energy efficiency of the windows, a project goal was to have the overall building meet the energy utilization and building performance standards established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE); and

(5) Any changes to the windows in order to improve energy performance needed to be cost-effective.

With these criteria established, the three window treatments were then examined in detail.

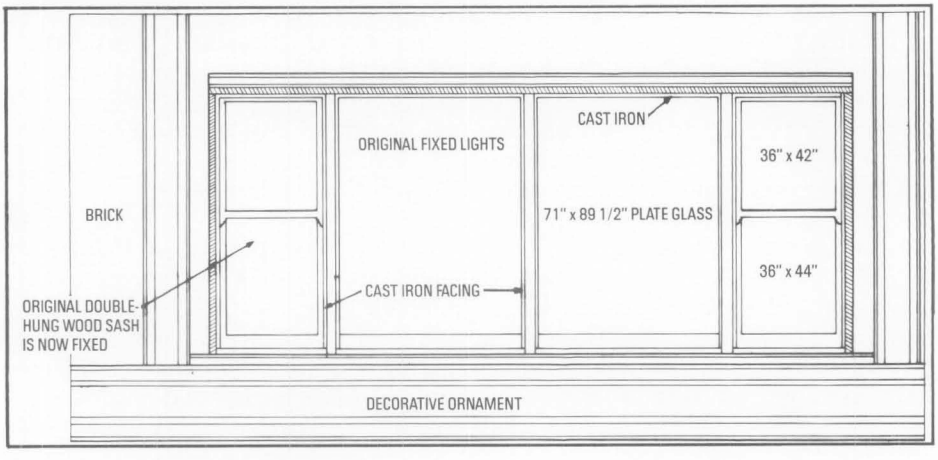


Figure 2. The window sash were well-constructed of mahogany and the frames were faced on the outside with cast iron trim. Drawing: Martha L. Werenfels

First Alternative — Window Repair Repair work needed on the large windows consisted of: (1) repairing ten units where the vertical mullion dividing the two large fixed panes had been changed to accommodate interior partition alterations; (2) installing a fiberglass wrap on approximately 5% of the wood sills where deterioration was a problem; (3) installing approximately 1000 linear feet of new casing trim on the interior to match original trim that was damaged or that had been removed as a result of later partition alterations; (4) repainting the exterior and interior woodwork; and (5) reconditioning the chains, pulleys, sash weights, and hardware in case the windows ever needed to be opened. The estimated cost of this work was $65,000, including the repair and reinstallation of fixed frames and glass in 28 windows where a material hoist and trash chutes were located during the rehabilitation.

Second Alternative — Modifying Existing Sash A new estimate was made of the cost-effectiveness of installing insulated glazing in both the existing fixed panes and the double-hung sash throughout the building. The insulating glass would be installed by cutting back the interior stops. Such a window system would lighten the load on the mechanical system by reducing seasonal heat losses and gains. This window work would achieve further savings by reducing energy consumption and permitting installation of a smaller HVAC system. Construction costs, however, were estimated to be $860,000.

Third Alternative — Aluminum Replacements Only good quality, high performance replacement windows were considered because the architect sought to avoid some of the recurring problems associated with hangers, connectors, and weather stripping. The estimated cost of aluminum replacement windows that matched the appearance, size and configuration of the existing windows was nearly $1,600,000. This estimate included the cost of removing the existing windows and installing metal substitutes that had a thermal break and insulating glass.

Planning Results

The windows in the Marquette Building at first glance would seem prime targets for alteration or replacement in order to improve their energy performance. Installing matching replacement units with thermal glass or adding interior storm glazing both could have been undertaken without significant alteration to the visual appearance of the windows, yet the historic windows would have been lost.

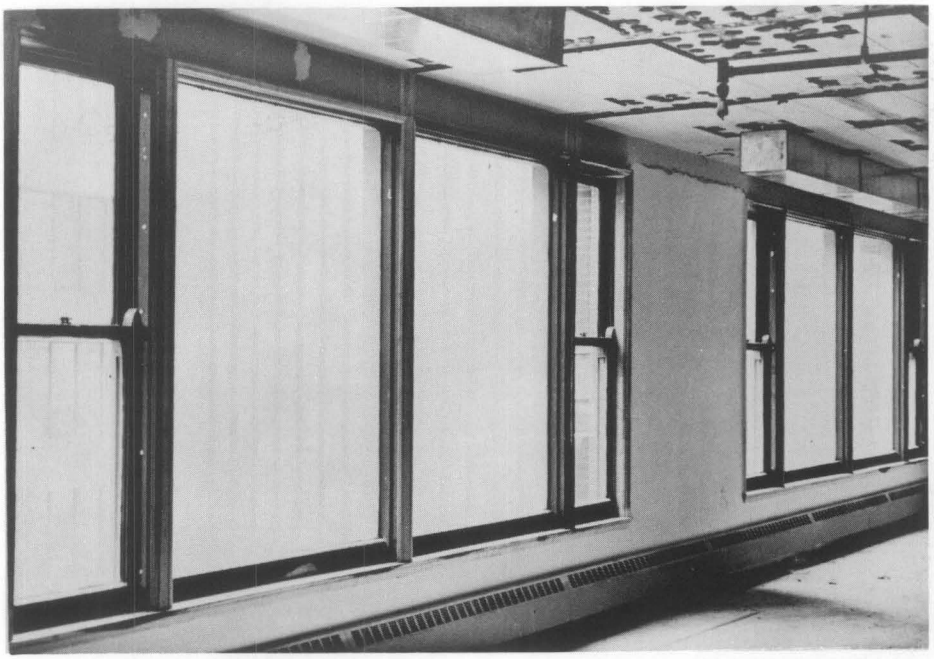


Figure 3. Approximately 1000 linear feet of matching window casing trim had to be installed. In many cases, damage had occurred where later partitions had intersected the windows. Lighter color wood shown in the photograph is the new trim prior to painting. Photo: Charles E. Fisher

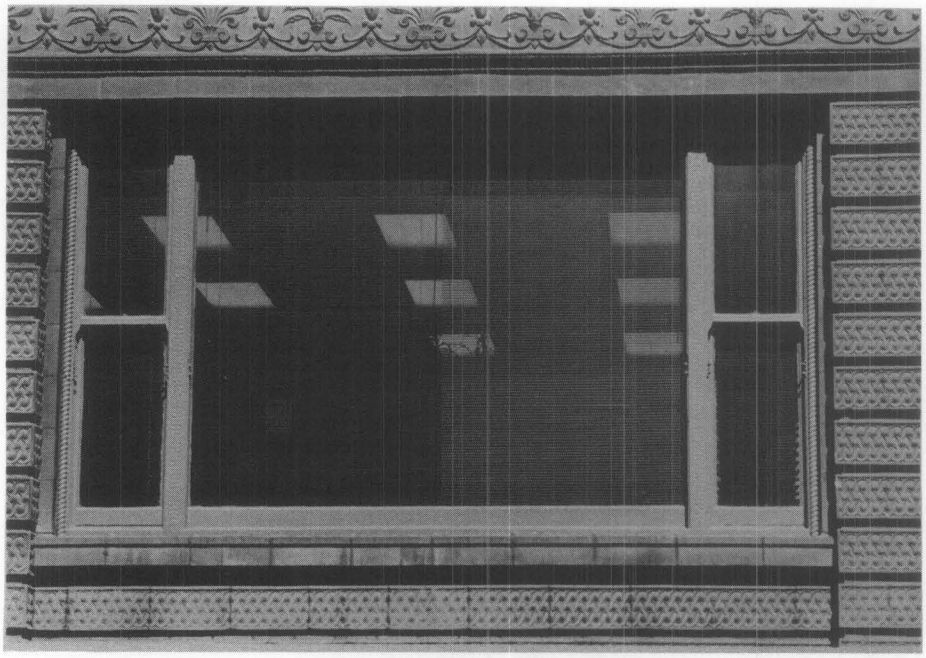
After an in-depth study of the repair, modifications, and replacement alternatives in which such factors as energy costs, construction costs, and finance charges were considered, the architect determined that the most cost-effective solution was to repair the existing windows.

Figure 4. The only modification made to the windows was the addition of a screw through the decorative end of the sash stile to fix closed the operable portions. This decision grew out of the recommendations by the mechanical engineers. Photo: Charles E. Fisher

Double glazing, achieved either through adding insulated glazing or as a result of new replacement units, would have improved the energy efficiency of the windows and the building, yet would have been expensive and, in this case, unnecessary. Assuming the worst conditions for infiltration, insulating glass would have resulted at best in energy savings of 10% in heating costs and 15% reduction in cooling costs. Building management decided to save the money since there was no pay back. Furthermore, even without additional glazing being added to the windows, the overall building exceeds the energy utilization and building performance standards of ASHRAE. In the future, if conditions change, the addition of insulating glass could be accomplished with little problem.

Repair work on the windows was conducted at the site, working one floor at a time. Wood stops were removed, and the windows taken out of those frames needing repair. The hardware was cleaned and repaired, or replaced where missing. Only about 7% of the windows and trim required any major work. Most of the required work was due to the use during rehabilitation of two fixed windows per floor for trash removal and the material hoist or where later partitions intersecting the windows had damaged the wooden trim *(see figure 3)*. The wood stops were then reattached using screws in order to facilitate future window work that might arise.

To prevent tenants from opening the windows, a screw was secured through the decorative extension on the stiles of both upper and lower sash *(see figure*



4). The work was done on schedule and within the original cost estimates.

Figure 5. Careful planning and evaluation led to the conclusion that the most cost-effective approach was merely to repair the windows rather than undertake measures to upgrade their performance. Photo: Charles E. Fisher

Project Evaluation

In many rehabilitation projects involving historic buildings, the original windows are mistakenly identified as obsolete and, as a result, are needlessly replaced. Too often the replacements do not satisfactorily suit the intent of the original design and thus severely alter the historic character of the structure. Where this occurs, substantial Federal tax incentives for historic preservation may be jeopardized.

This and other rehabilitation projects have shown the value of careful and objective evaluation of existing window conditions *(see figure 5).* Sound planning can result in window decisions that take into account good preservation decisions and the realities of the marketplace.

PROJECT DATA

Building:

Marquette Building
140 South Dearborn Street
Chicago, Illinois

Owner:

Bankers Life and Casualty Company
Chicago, Illinois

Project Date: 1979-1982

Project Staff:

Walker C. Johnson, AIA
Project Architect
Holabird & Root
Architects, Engineers and Planners
Chicago, Illinois

Holabird and Root Mechanical Engineers

Project Costs:

Total rehabilitation cost was $17,000,000 and the window repair cost, exclusive of the storefronts, was $65,000.

This PRESERVATION TECH NOTE was prepared by the National Park Service in cooperation with the Center for Architectural Conservation, Georgia Institute of Technology. Charles E. Fisher, Preservation Assistance Division, National Park Service, serves as Technical Coordinator for the TECH NOTES. Special thanks go to Walker C. Johnson, AIA, for his time and generous assistance in providing information concerning the window work at the Marquette Building. Thanks also go to the following people who contributed to the production of this TECH NOTE: John H. Myers and Laura A. Muckenfuss, Center for Architectural Conservation, and Preservation Assistance Division staff, particularly Kay D. Weeks, Michael J. Auer, Martha L. Werenfels, Martha A. Gutrick, and Mae Simon. Cover, Marquette Building Photo: Courtesy, Commission on Chicago Historical and Architectural Landmarks.

This and many of the TECH NOTES on windows are included in "The Window Handbook: Successful Strategies for Rehabilitating Windows in Historic Buildings" (available late 1984), a joint publication of the Preservation Assistance Division, National Park Service and the Center for Architectural Conservation, Georgia Institute of Technology. For information write to The Center for Architectural Conservation, P.O. Box 93402, Atlanta, Georgia 30377.

PRESERVATION TECH NOTES are designed to provide practical information on innovative techniques and practices for successfully maintaining and preserving cultural resources. All techniques and practices described herein conform to established National Park Service policies, procedures and standards. This TECH NOTE was prepared pursuant to Federal tax laws which direct the Secretary of the Interior to certify rehabilitations of historic buildings that are consistent with their historic character; the advice and guidance provided in this TECH NOTE will assist property owners in complying with Federal tax requirements.

Comments on the usefulness of this information are welcomed and should be addressed to TECH NOTES, Preservation Assistance Division, National Park Service, Washington, D.C. 20240.

ISSN: 0741-9023 PTN-1 January 1984