OLD WATKINS NATIONAL BANK

Lawrence, Kansas

PRESERVATION

Tech Notes

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

WINDOWS

NUMBER 5

Interior Metal Storm Windows

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The Old Watkins National Bank (now known as the Watkins Community Museum) is an impressive example of Richardsonian Romanesque architecture in Kansas. Built in 1887, the building is individually listed on the National Register of Historic Places and is owned by the Douglas County Historical Society.

The windows are a prominent feature of the building. The 102 windows, a majority of which are 5' wide by 10' high, are in twelve sizes and five styles. Many have arched tops. The monumental double-hung windows help to convey the grand qualities of the original design both on the exterior and in the spacious interior *(see figure 1)*. Made of curly and burly pine, the windows are exquisitely trimmed on the interior, and the distinctive natural wood grain is especially pronounced in the jamb panels and interior shutters. Unlike the more usual shutters which fold against the jamb, these shutters slide vertically within multiple jamb tracks.

Design Problem

As with most building owners, the historical society was concerned about energy usage and thermal comfort as well as the need to have closely regulated environmental control to protect museum collections. As part of an overall rehabilitation program, an energy audit was initially performed by the local utility company. Although the historic wood windows were well-constructed and not seriously deteriorated, they were identified as a major contributor to energy usage because of their number and large sizes. Single glazing, lack of weather stripping and cracks around the window frames all added to winter heat loss, summer heat gain and appreciable air infiltration. As a result of the energy audit, the project architect, James Williams, AIA, investigated several storm window systems.

Use of exterior storm windows was initially explored both for energy conservation purposes and as a way to extend the useful life of the original windows *(see figure 2)*. Unfortunately, the prices quoted for exterior storm windows by local contractors were around $65,000, nearly double the budgeted amount. In addition to the high cost of exterior storm windows, one further problem with an exterior storm application arose when it was discovered that the decorative terra cotta capitals adjacent to the upper level window openings returned against the original frames. As a result, the proposed exterior storm windows could not be easily installed in these locations without cutting back or covering portions of the terra cotta *(see figure 3)*.

The numerous problems with exterior storm windows encountered in this project led to consideration of an interior storm system. Here too, there were specific requirements:

Physical damage and visual changes to historic windows should be minimized when installing storm windows.

1. The impressive interior woodwork around the windows could not be damaged.

2. The new window unit could not alter the appearance of the windows as viewed from the outside and the basic character of the window needed to be preserved on the inside as well.

3. The storm window needed to have venting capability in case condensation occurred between the storm unit and the original sash to protect against damage to the original sill.

4. The windows needed to be less expensive than the exterior storm windows.

5. The interior shutter system still used in various rooms for sun control needed to remain operable.

6. The energy conservation objectives would have to be met.

Design Solution

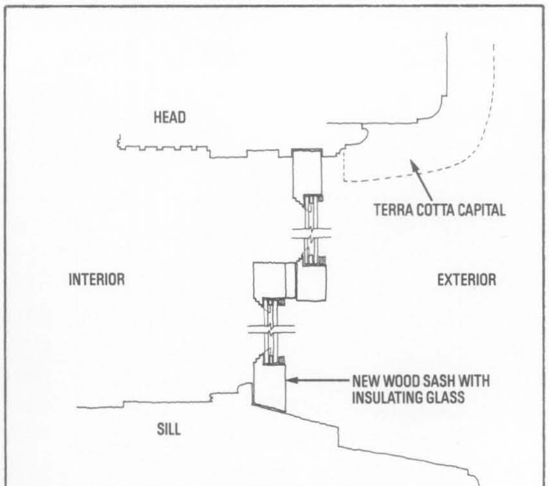
In searching for an interior storm window that met both the functional requirements and the concerns about visual qualities, the architect chose a commercially available metal storm window system. The storm window was designed to fit within the existing wooden jamb, thus resulting in minimal damage to historic material *(see figure 4).*

The interior windows were nearly $20,000 cheaper to install than the bids received for exterior storm windows. Of particular significance, the storm sash were not readily visible from the outside, and on the inside the thin bronze-finished frames blended in well with the decorative finish and fine detailing of the original windows.

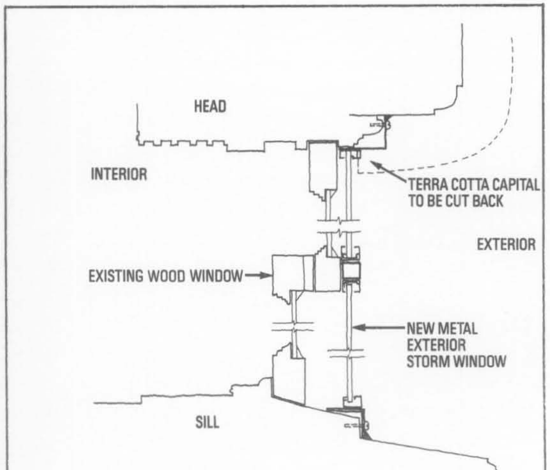
Selecting an interior storm window *per se* had certain inherent advantages in this case over exterior applications: (1) no obtrusive structural muntins were necessary because wind pressure was not a major factor; (2) fabrication of the storm windows on the first floor was significantly less expensive since the original windows were squared-off at the head on the interior unlike the arch shape found on the exterior; and (3) installation costs would be appreciably lower since problems created by cutting back the decorative terra cotta

Figure 1. The monumental windows are elegantly detailed on the interior and contribute to the grandeur of the spacious banking rooms. The original interior shutters are still being used for comfort and light control. Photo: Charles E. Fisher

Figure 2. As part of the planning, the architect prepared sketches of 4 possible window treatments to improve the energy performance of the windows.



Sketch 1 is of a replacement wood window with insulating glass. This proposal was dropped because of cost and the fact that the historic windows were significant and still in good condition.



Sketch 2 reveals the problem of applying an exterior storm window. The terra cotta detailing that returned against the window would have to be cut back to permit proper installation.

capitals on the exterior of the second floor openings were avoided.

Storm Window Detail

The thin aluminum storm window frame ($\frac{7}{8}$" wide, $1\frac{1}{2}$" deep) was attached to a small new subframe by two pins that allowed the windows to pivot open for cleaning and venting in case entrapped condensation was ever a problem *(see figure 5).*

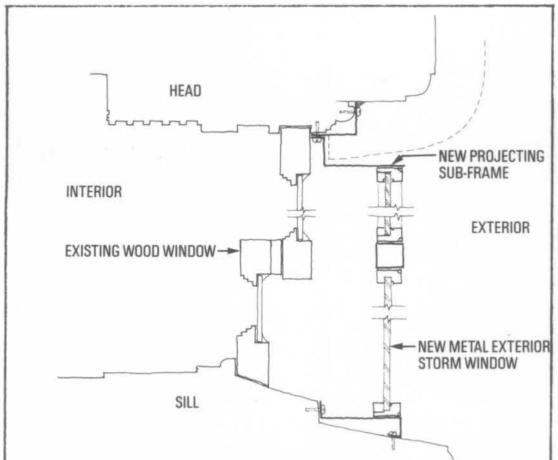
The subframe consisted of a $\frac{1}{8}$" thick metal angle screwed to the wood jamb, serving as support and as a stop for the storm sash. On the large windows, the metal angle was paired to form a horizontal muntin, in line with the historic meeting rail, to accommodate an upper and lower storm panel, both of which pivoted *(see figure 6).* The frames were mounted in a location that provided a sufficiently wide dead air space for energy conservation purposes, yet still allowed the interior shutters to remain operable *(see figure 7).*

Mounted on pivot pins, the storm window relied on the pile weather stripping which ran continuously along the edge of the frame to serve as the seal between the metal subframe and the metal storm *(see figure 4).* Neoprene weather stripping was also added to the surface of the subframe to serve as a compression seal with the storm frame. Clear silicone caulk between the wood jamb and the subframe completed the seal.

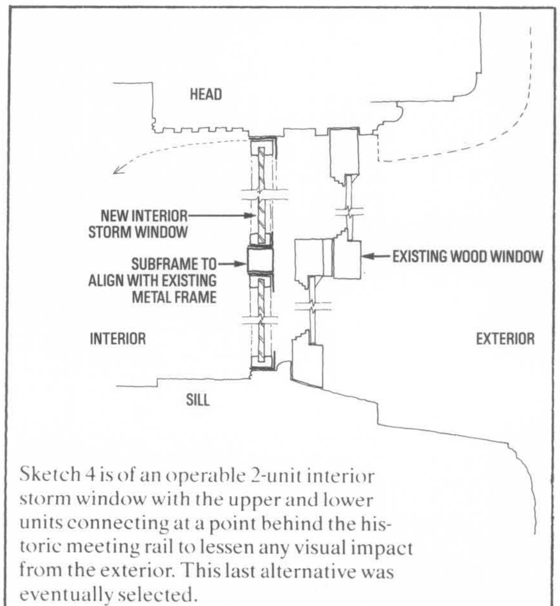
Assembly and Installation

The frames were custom-fitted to each opening and prefabricated by a local glass dealer. For ease of installation, the glazing was not done at this time. At the site, the sash frames were positioned in the existing jambs with the aid of a rolling scaffold. A space of nearly $1\frac{3}{4}$" was provided between the existing glass, which is in a very thick wood frame, and the back of the storm glass; this space serves as a dead air pocket for energy conservation.

To mount the frames, holes were drilled and hardware attached for the lock and pivot mechanisms; the storm frames were then attached and the loose end of the hold-open arms were screwed



Sketch 3 shows an alternate technique for installation which relied on a large projecting subframe. Though damage to the terra cotta is avoided, the exterior storm window would have a very thick frame and would significantly change the reveal of the windows.



Sketch 4 is of an operable 2-unit interior storm window with the upper and lower units connecting at a point behind the historic meeting rail to lessen any visual impact from the exterior. This last alternative was eventually selected.

Figure 3. Exterior storm windows were initially considered but presented several problems. The terra cotta capitals on the pilasters returned against the windows, making normal installation difficult without damaging the terra cotta. Many of the windows also had round heads which would require additional custom work—these same windows on the interior had square tops. Photo: Charles E. Fisher

to the metal subframe. Once the glass was installed, the work was essentially completed.

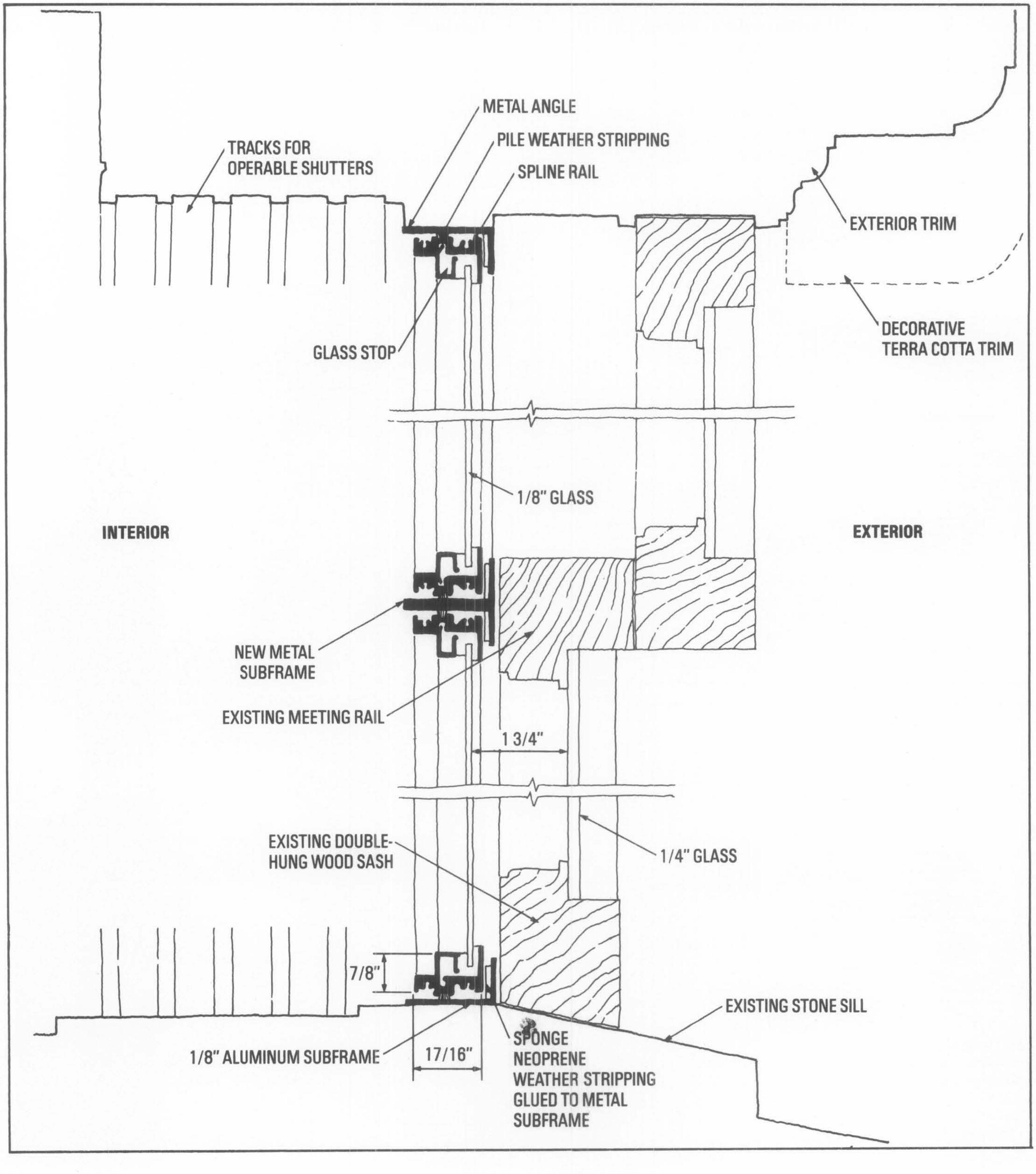
Project Evaluation

The storm window system chosen for the building fulfilled the criteria established at the beginning of the project.

Figure 4. Section showing the new interior metal storm window set behind the historic wood sash. Drawing: Martha L. Werenfels

Interior storm windows were installed on 92 of the windows in 1981 at a cost of $45,068 ($12.07 per square foot of opening), and an initial cost savings of nearly $20,000 was realized over exterior storm applications. A portion of the cost saving was attributed to the fact that, as interior storm windows, they were installed by the contractor during his slow winter months. The payback period for the storm windows will be accurately determined only by in-place performance. However, it would appear that the storm windows are reducing the energy consumption by more than 40% — a figure that exceeded the theoretical calculations. Long-term maintenance of the storm windows is expected to be low because of the quality of construction and because the windows will not be opened on a daily basis.

Other benefits have resulted from



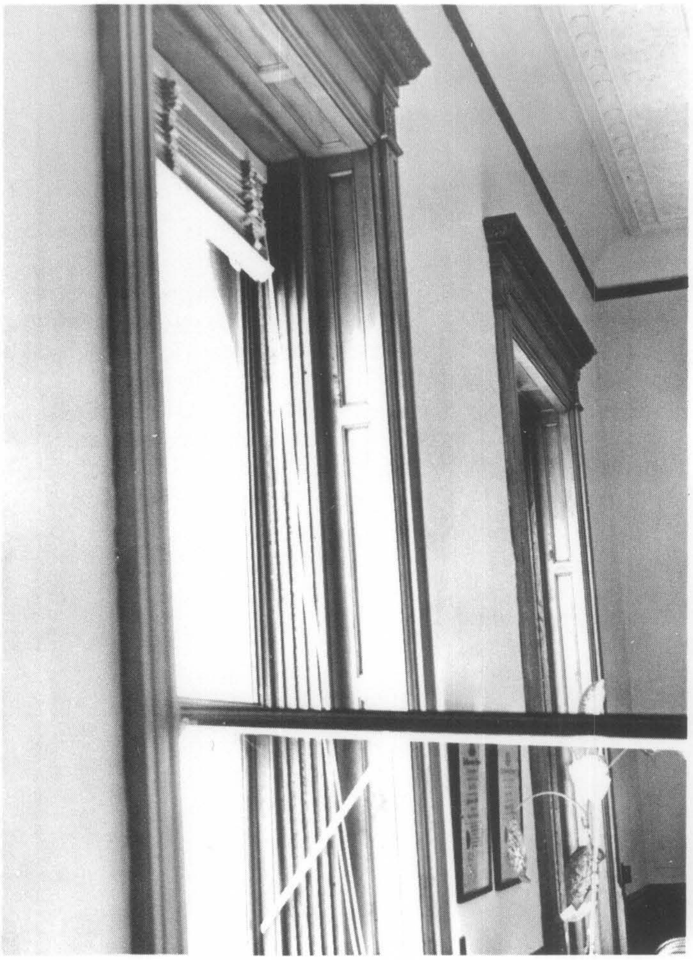


Figure 5. The interior storm window was designed to fit within the existing wooden jamb. The large size of the windows necessitated the use of operable storm panels, intersecting at the historic meeting rail. Here the lower storm panel is in an opened position for cleaning. Photo: Charles E. Fisher

Figure 6. The windows were too large for only a single storm panel, necessitating the use of a structural subframe at the mid-section of the window. Both the upper and lower storm panels are operable and come together opposite the historic meeting rail. This element of the storm window is sufficiently thin that is not readily discernible from the outside. Photo: Charles E. Fisher

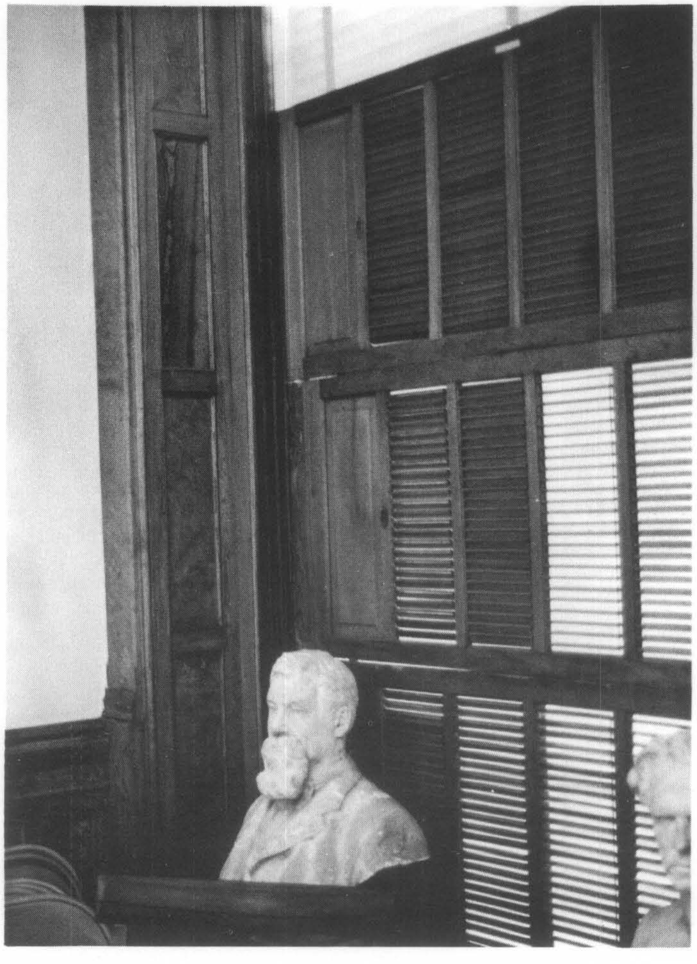


Figure 7. Continued use of the unique shutter system required that the frame of the interior storm window be narrow. The storm windows are set between the shutters and the historic sash. Photo: Charles E. Fisher

Figure 8. The decorative jamb panel on the left and the interior shutter tracks were unaffected by the installation of the interior storm window shown on the right. Photo: Charles E. Fisher

this project that cannot be directly measured in dollars. Former hot and cold spots in the building have been greatly reduced. Patron comfort has been noticeably improved both thermally and from reduced street noise level.

In summary, the interior storm window solution not only provided the owner with initial cost savings in installation, but it also reduced fuel consumption, met all functional requirements, and carefully addressed historic preservation concerns *(see figure 8)*. The thin frame storm window, set within the existing jamb and mounted so as to pivot, was a sensitive solution which is also being used on other projects involving rehabilitations of historically important commercial buildings.

PROJECT DATA

Building:

Elizabeth M. Watkins Community Museum (formerly the Old Watkins National Bank)
1047 Massachusetts Street
Lawrence, Kansas

Project Date: Winter 1981

Project Staff:

James Williams, AIA
Project Architect
123 West Eighth
Lawrence, Kansas

Kennedy Glass, Inc., Contractor
P.O. Box 681
Lawrence, Kansas

Steve Jansen
Director, Watkins Community Museum
Lawrence, Kansas

Special Supplies:

Interior Storm Windows—
Kawneer Company, Inc.
1105 N. Front Street
Miles, Michigan

Project Costs:

Total costs, including installation for the 92 storm windows was $45,068, equaling $12.07 per square foot. Small storm windows were up to four times as expensive per square foot as the largest ones. Units were not installed on 6 attic and 4 basement windows.

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. Information on the window work at the museum was contributed by Steve Jansen, Director of the Elizabeth Watkins Community Museum, Jim Williams, AIA, and particularly Terry W. Marmet, Historic Preservation Division, Kansas State Historic Society, who helped with portions of the text. Special thanks go to the following people who contributed to the production of the TECH NOTE: John H. Myers, Center for Architectural Conservation, and Preservation Assistance Division staff, particularly Michael J. Auer, Martha A. Gutrick, Mae Simon, and Martha L. Werenfels.

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.

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