PRESERVATION
Tech Notes
U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

HISTORIC INTERIOR SPACES

NUMBER 3

Preserving Historic Corridor Doors and Glazing in High-Rise Buildings

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Introduction

Historic office building corridors are often rich in distinctive features and materials. Glass door panels with gold leaf lettering, glass transoms and sidelights, woodwork and wainscoting all provide a physical connection to the way business was conducted in the late 19th century. Moreover, they display a level of detail, and quality of material and craftsmanship that are rare in new construction. Some of the same characteristics that make historic corridors significant and unique, however, may present a challenge to their sensitive rehabilitation.

A primary difficulty lies in bringing historic features and materials "up to code." Because successive building regulations are rarely applied retroactively, a historic structure may be decades – or even a century – out of step with current life safety standards. When such a building undergoes a major rehabilitation or change in occupancy classification, the owner is usually required to bring the structure into compliance with modern codes written primarily for new construction. Among other provisions, current building codes often require that assemblies and materials provide a specified level of fire resistance. Historic doors, transoms and sidelights are common corridor features that are unlikely to meet such resistance ratings *(see figure 1)*.

Building code enforcement has traditionally favored replacing existing materials and assemblies with new construction of known fire rating. In recent years, however, regulatory and technical solutions have better reconciled historic features with life safety and building code requirements. Rehabilitation provi-

When rehabilitating larger buildings, significant corridors should be preserved where possible. Code required changes should be made in such a manner as to preserve important features and finishes.

sions and equivalency and performance-based standards permit building officials increased flexibility in determining how existing historic construction can meet current requirements. Meanwhile, manufacturers and designers have responded with new materials and assemblies that are more fire resistant. This *Preservation Tech Note* discusses some of the techniques applied when historic office corridor features are modified to meet modern safety standards. The conversion of two early skyscrapers in Chicago for new functions illustrate ways of complying with fire regulations while retaining original materials and assemblies.

Building Codes and Historic Office Corridors

Efforts to accommodate the unique nature of historic features while upholding the safety of occupants and the building itself are increasingly reflected both in newly written rehabilitation codes and how older codes are administered. Traditionally codes have been prescriptive, in that they identify all of the steps necessary to achieve compliance. For example, the code may require that stairways used for egress have a two-hour fire separation and that sprinklers be located at specified intervals.

Standard code requirements, however, do not take into account the individual characteristics of a building and are not easily applied to existing structures. To address these issues, most codes allow authorities to consider alternative approaches often based upon the concept of "equivalency." If existing features are code deficient, architects and building officials may be able to retain them by establishing safety measures that provide an equivalent level of protection to that stated in the code. Fire detection and automatic sprinkler systems, for example, may be expanded beyond minimum code requirements in order to permit the retention of historic features that are not code compliant. This provision is set forth in the National Fire Protection Association's model code for historic structures (NFPA 914) which states, "Nothing in this code shall be intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance or effectiveness," provided documentation of the equivalency is submitted and accepted by the code authority.

Fire protection options available to those working with historic buildings will expand even further as many states and municipalities incorporate performance-based components into their fire code. Performance-based codes establish life safety goals that fire protection engineers then use to develop a protection plan that is unique to a particular structure. Computer modeling and other forms of analysis allow the engineer to consider every aspect of a building's design, construction and use. Originally developed to give architects additional freedom in designing uncommon building types, performance-based systems are also well suited to assessing and retaining historic features.

Figure 1. Historic corridor features such as doors, transoms and sidelights often do not meet current fire resistance regulations. Photo: Fisher Building, Frank Merrill Photography.

All fire codes share one primary objective – to ensure the safe evacuation of a burning building. Because the corridors in high-rise buildings typically function as primary escape routes, fire protection solutions are designed to prevent smoke and flames from spreading through and across the space. Valuable escape and emergency service response time is gained by restricting the rate at which fire and smoke spread. Most prescriptive building codes stipulate a one-hour fire rating for corridors. The wall assemblies separating offices or residences from areas used for public egress must be able to resist heat and maintain their structural integrity for at least one hour during a fire. Door openings that perforate such a wall assembly must have a 20-minute rating. Additional provisions may limit the amount of glazed surface area and the types and characteristics of wall and door glazing.

Although historic masonry walls with two faces of plaster and solid wood doors may meet these basic requirements, most doors, door panels, sidelights and transoms will probably be considered nonconforming elements that require some form of alteration. Such code deficiencies were often corrected in the past by replacing historic doors with solid doors and filling in or removing glazed areas along corridor walls. However, an increasing body of research and precedent indicates that the fire resistance of historic corridor features can be improved with relatively simple modifications that have little impact upon the features.

One successful technique developed to upgrade the fire resistance of historic doors and glazed areas is to add sheets of non-combustible material behind the door or glass. The panels, usually gypsum board, calcium silicate board or sheet steel, supplement the inadequate level of protection provided by the original glass or wood panels, thereby achieving the desired rating. If the sidelights or transoms are particularly large, new partitions can be constructed behind the original walls (within the room or office units), again using non-combustible material. Smoke-resistance can be increased by applying intumescent materials such as paint, paste or sealing strips to the space between the edge of the door and the frame. These products expand to several times their original thickness when heated, forming a seal that prevents the passage of smoke and flames. Intumescent stains, clear varnishes and paints can also be used to raise the flamespread resistance of corridor trim and wainscoting.

When major assemblies such as doors and whole wall sections are preserved, a range of other features can also be retained. For example, if historic doors are kept, it is likely that surviving hardware and trim can also be preserved and integrated into the new function. If historic wall assemblies can be modified to meet code, the original dimensions, door locations, trim, flooring and spatial organization of the entire corridor can be retained.

Two separate structures built in Chicago during the last decade of the

19th century were recently rehabilitated using these approaches to save historic corridor features and meet building and fire code requirements. The Reliance and Fisher buildings, both originally designed by the noted architectural firm, Daniel H. Burnham and Company, are important early high-rise office structures and seminal examples of the Chicago School of Architecture. Although the buildings' office spaces were altered over the past century to suit the changing desires of tenants, large portions of the historic corridors survived to the late 1990s when the structures were converted for new uses. The following sections discuss how the corridor features of both buildings were modified for increased fire protection.

RELIANCE BUILDING (Hotel Burnham) Chicago, Illinois

Construction of the fifteen-story Reliance Building was completed in 1895. With a steel structural frame, narrow bands of decorative terra cotta and large bay windows, the Reliance Building offered a narrow, light (and light filled) high-rise alternative to the prevailing dense masonry office building model. The interior corridors were functional and elegant, comparable to "Class A" office space for their time. Mahogany doors with glass upper panels and lower panels of wood provided entry to individual offices. Four-foot high white Carrara marble wainscoting ran the length of the corridor, while a number of glass sidelight and transom configurations allowed light brought in by the exterior windows to suffuse the hall and open stairway. Mahogany trim outlined all of the glazed areas, doors and wainscoting. Beginning in 1997, the Reliance Building was rehabilitated for use as a 122-room hotel.

Problem

Floors eight through twelve retained their original features and layouts. Because of their historical significance and because the owners intended to focus upon that significance in marketing the hotel, rehabilitation plans were heavily influenced by a desire to preserve original materials and the distinctive character of the surviving space.

Until the building underwent a major rehabilitation and its use classification shifted from office to residential, original corridor materials and features remained despite their non-conformance to updated building codes. Once converted to a residential high-rise, however, the rehabilitated corridors had to provide one hour of fire resistance, with a twenty minute rating for guest room doors. Glass sidelights and transoms and both wood and glass door panels throughout the historic floors did not meet this requirement.

Solution

To retain the transoms and sidelights while complying with code requirements, the architects designed a non-combustible assembly that was integrated into the existing wall on the hotel room side *(see figure 2)*. The 3-1/8" thick wall consisted of two gypsum boards separated by steel studs and sealed to the existing ceiling and doorframe. Back painting the glass white obscured the new wall assembly from the corridor.

The mahogany office doors were 2-1/2" thick with upper 1/8" thick glass and lower 1/4" thick wood infill panels. Both glass and wood panels were code deficient. To increase their fire resistance, two 3/8" gypsum boards were secured flush to the inside face of the glass and a single 5/8" sheet was used on the lower wood panel *(see figure 3)*. New wood molding stained to match the original was placed around the border to secure and mask the edge of the added material. Mirrors were installed on upper panels facing the hotel rooms while lower panels were painted brown

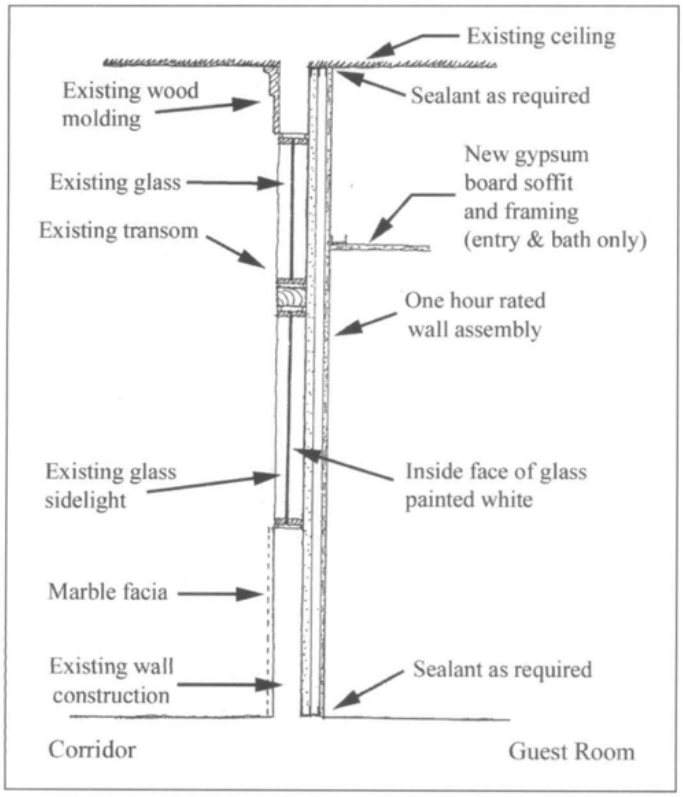

Figure 2. Typical Reliance Building corridor section showing additional wall assembly built behind historic glass sidelight and transom. Drawing: Antunovich Associates.

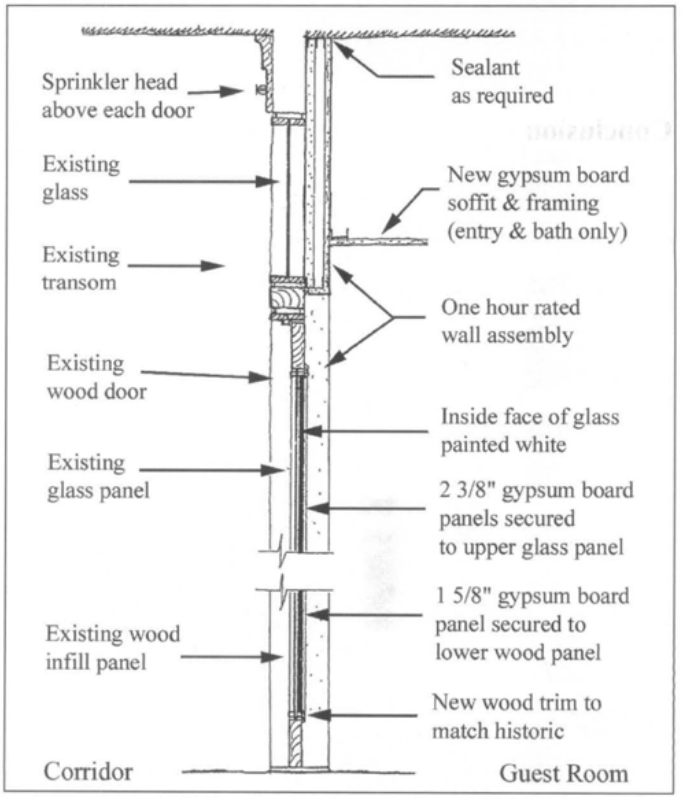

Figure 3. Typical Reliance Building door/transom section showing additional wall assembly and door panels. Drawing: Antunovich Associates.

Figure 4. View of a Reliance Building office door from inside guest room. Upper and lower door panels have gypsum board secured to back with new molding. A mirror was affixed to the upper panel while the lower panel was painted to match original material. Photo: Chad Randl.

Figure 5. Completed Reliance Building corridor showing historic door panel, sidelight and transom. Photo: Chad Randl.

(see figure 4). Like the sidelights and transoms, the original glass was back painted with a white latex paint to conceal the infill panels from the corridor. Intumescent paint was applied between the door and frame to provide an effective smoke barrier and compensate for small irregularities in the fit of the historic doors. The mail slots were sealed and filled with a fire-rated putty. Further fire protection was provided by the installation of a sprinkler head on the corridor-side wall above each door. These heads were in addition to those specified by the building code.

All surviving glass (plain, fluted and florentine) was retained in the door panels, sidelights and transoms *(see figure 5)*. New plain glass was used in locations where the original was cracked or otherwise required replacement. Room numbers were lettered on the glass with gold leaf. Finally, the direction of the door swing was reversed so that they opened inward and automatic closers were added in keeping with standard exiting code requirements.

Approval for these solutions had been obtained by submitting designs for upgraded doors and glazed areas to both the Chicago Committee on Building Standards and Tests and the Bureau of Fire Prevention. Following a process of negotiation and reviewing mock-ups installed in the building, these agencies determined that the proposed assemblies matched the level of protection specified in the code.

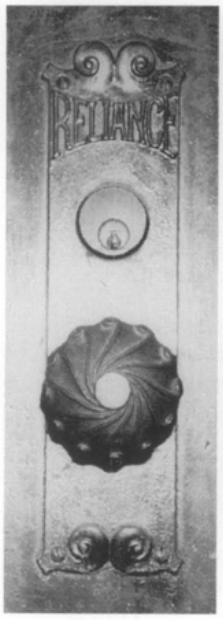

Figure 6. Original hardware including doorknobs, escutchen plates and hinges were retained. Photos: McClier.

Retaining the doors and corridor glazing led to the preservation of a host of other features, including the mahogany trim found throughout the corridors and unique door hardware *(see figure 6)*. Historic magnetite hinges, mail slots, doorknobs and escutcheon plates (inscribed "Reliance") were also retained. This meant forgoing the keycards that are typical for new hotels in favor of traditional locks and keys. Installing a keycard system would have required replacing the historic escutcheon plates and knobs or significantly altering the door stile. Instead, a new mortise lock set appropriate to the door rating was installed with the original knob and escutcheon plate fitted over top.

FISHER BUILDING
Chicago, Illinois

The main eighteen-floor section of the Fisher Building was finished in 1896 with a taller addition constructed ten years later. Like the Reliance Building, bay windows and terra cotta spandrels emphasized the height and lightness of the Fisher Building. The highly finished interior corridors were also similar to those in the Reliance. Carrara marble wainscoting extended almost the full height of the walls, with a series of three-light transoms above each door. Large sidelights flanked the doorways at some corridor ends. The mahogany doors were of two basic varieties. Most had a glass upper panel and wood infill panel below, while others had a single glazed panel filling almost the entire door area. Both types featured custom hardware including escutcheons with a Fisher Building monogram and decorative hinges. Mahogany trim delineated the edges of all doors, glazed areas and wainscoting. The conversion of the Fisher Building to 184 apartment units began in 1998 as the Reliance project was concluding.

Problem

The Fisher Building office corridors survived to the period of the rehabilitation with a high degree of integrity. Because its function remained unchanged for over one hundred years and because it never underwent a major rehabilitation project, the building had not been required to comply with subsequent changes to the city's building code. However, when the office space was converted into apartments, all the code provisions specified for residential high-rise buildings became applicable. The doors, transoms and large sidelights were not fire resistant enough to achieve the required ratings. As with the Reliance Building, the Fisher Building owner intended to emphasize its historical and architectural significance in marketing the building to tenants. Preserving the public corridor space, therefore, was particularly important.

Solution

Although rehabilitation plans for the Fisher Building were similar to work completed on the Reliance Building, Chicago building authorities reviewed each project individually. Obtaining approval for the Fisher

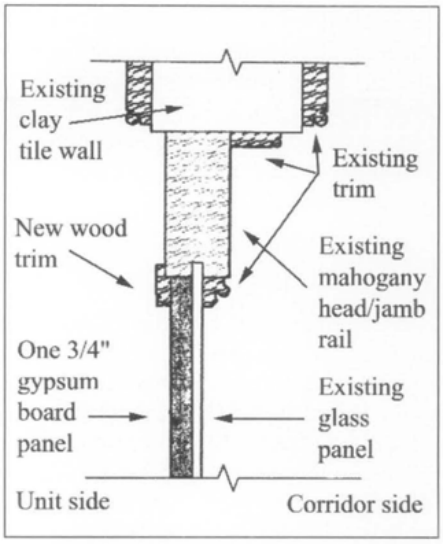

Figure 7. Section of Fisher Building door modified to improve glass panel fire rating. Drawing: Garet Stefanowski, Pappageorge/Haymes.

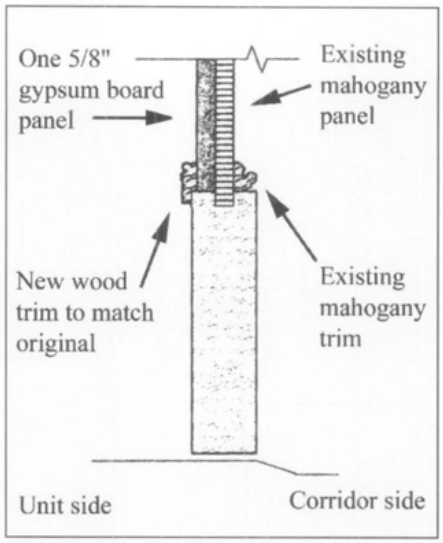

Figure 8. Section of lower wood panel with gypsum board reinforcement. Drawing: Garet Stefanowski, Pappageorge/Haymes.

Building's unrated doors and glazed areas also required comprehensive documentation and negotiation with the Bureau of Fire Prevention and the Committee on Building Standards and Tests.

The Fisher Building corridors had considerably less glazed areas than the Reliance corridors. Glass was limited primarily to transoms and door panels. To increase the fire resistance of the transoms a non-combustible wall assembly, similar to that used in the Reliance, was constructed on the apartment-side of the wall. Extending from the inside door head trim to the ceiling, it consisted of two gypsum board panels– a 3/4" panel placed directly against the glazing (after back painting the glass with a white paint) and a second 5/8" panel.

Door modifications paralleled those made in the Reliance Building. The interior stops were removed from the glazed areas of the doors, the original glass was cleaned and back painted, and a 3/4" sheet of gypsum board was secured against the glass *(see figure 7)*. A 5/8" sheet of gypsum board was used behind the lower wood panel *(see figure 8)*. Molding with profiles that were similar to those on the original door was attached at the joint between the gypsum and the original doorframe. Intumescent material was also applied to the edges of the door and doorframe *(see figure 9)*.

Openings into some offices were missing original doors and a few doors were missing glass. To fill in the gaps, architects attempted to match door types and glass types (a mix of fluted, diamond patterned, chipped patterned and plain) on each floor – or floor section – using materials shifted from other areas of the building or from a stockpile found in the basement. Where replacement glass was required, new plain glass was used. Room numbers and the names of early office tenants were lettered on the glass to distinguish apartment units.

Following the Reliance Building model, all door hardware, including hinges, knobs, escutcheons and mail slots (where present) were preserved and incorporated into the rehabilitated doors *(see figure 10)*. New deadbolt locks and peepholes were added to the door stiles above the original knobs. Automatic closers were added to all doors.

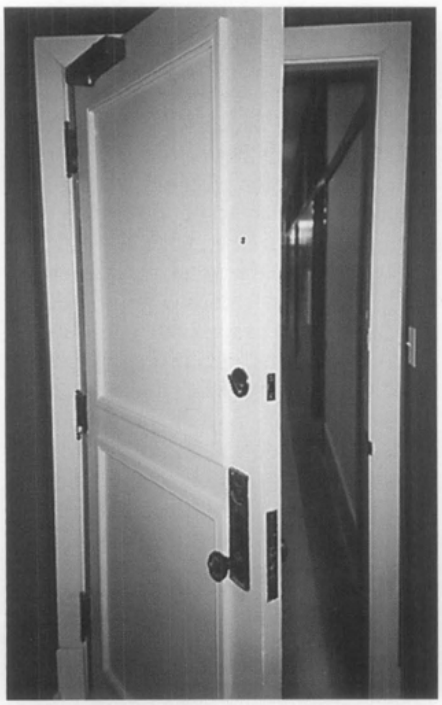

Figure 9. Fisher Building door viewed from apartment showing gypsum board infill panels, new trim and retained hardware. Photo: National Park Service File.

Figure 10. Completed Fisher building corridor with back painted door and tripartite transom. Photo: National Park Service File.

Reliance and Fisher Building Project Evaluation

By introducing new fire resistant assemblies and mechanical upgrades in the already altered office spaces, there was no impact upon the scale of the corridors and the views along their length *(see figure 11)*. Although the construction of new interior walls preserved the transoms and sidelights and the continued appearance of the corridor, it did obscure the glazed areas and their moldings from inside the former tenant space. Painting the inside face of the glass panels also resulted in a visual change in the corridor. Back painting was necessary in order to hide the gypsum infill panels, but the result lacked depth and failed to suggest the original office space within. The change was less noticeable in areas with patterned glass where the texture provided some relief from the flat, spandrel-like appearance of the new assembly. Covering the glazed panels with solid materials also darkened what were once daylight-flooded corridor spaces.

With the continuing evolution of fire resistant materials and increased acceptance of building codes specific to historic properties, it is hoped that future projects will be able to improve upon the techniques described in this *Tech Note*. Developments in fire-rated glass technology offer the possibility of using

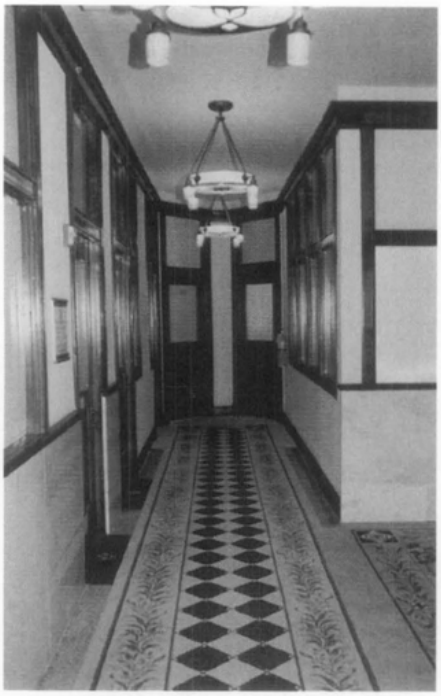

Figure 11. View of the completed Reliance Building corridor. Photo: McClier.

glass sheets rather than solid gypsum board behind the historic transoms and door panels. New rehabilitation code provisions may permit transoms to be retained without the addition of fire resistant panels if they are sealed in a fixed position and have double coverage sprinklers installed above the openings. Both solutions will thus allow the light qualities of historic transoms, doors and sidelights to be more easily and effectively preserved.

Conclusion

Life safety regulation and historic preservation need not be mutually exclusive. In the case studies presented above, similar treatments were used to reconcile code provisions and the desire to retain historic features. In concert with local code officials, architects and fire protection engineers can develop equivalent safety measures to retain and upgrade the fire resistance of surviving door assemblies and glazed areas. Preserving these major assemblies makes possible the retention of other features such as original moldings and door hardware, as well as the dimensions and floor plan of the historic corridors. The Fisher and Reliance building rehabilitation projects are good examples of how historic corridors can be sensitively modified to ensure occupant safety and the continued existence of the historic resource.

Additional Reading

• *Guideline on Fire Rating of Archaic Materials and Assemblies.* Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development, February 2000.
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• *NFPA 914 Code for Fire Protection of Historic Structures.* Quincy, MA: National Fire Protection Association, 2001.
• Pianca, Elizabeth G. "Smart Codes: A New Approach to Building Codes," *Forum News* May/June 2001.
• Solomon, Robert E., PE. "Preserving History from Fire. Bridging the Gap Between Safety Codes and Historic Buildings," *Old House Journal*, Nov./Dec. 2000, 41.
• *Timber Panelled Doors and Fire. Upgrading the Fire Resistance Performance of Timber Panelled Doors and Frames.* London, England: English Heritage, 1997.

Project Data:

Reliance Building
(Hotel Burnham)
Chicago, IL

Project Dates:
1997-1999

Architect:
Antunovich Associates
Chicago, IL

Consultant:
McClier
Chicago, IL

Fisher Building
Chicago, IL

Project Dates:
1999-2001

Architect:
Pappageorge/Haymes Ltd.
Chicago, IL

Consultant:
Baldwin Historic Properties
Chicago, IL

THIS PRESERVATION TECH NOTE was prepared by the National Park Service. Charles E. Fisher, Heritage Preservation Services, National Park Service, serves as the Technical Editor of the PRESERVATION TECH NOTES. Information on the Fisher and Reliance building projects was generously provided by Garet Stefanowski of Pappageorge/Haymes Ltd., and Jeff Zelisko of Antunovich Associates. Special thanks are extended to Marilyn E. Kaplan of Preservation Architecture, Jack Watts of Fire Safety Institute, Brian C. Olson, PE, of the National Park Service's Denver Service Center and Kaaren Staveteig, Antonio Aguilar, Sharon C. Park and Kay D. Weeks of the National Park Service's Heritage Preservation Services for their review and comments. Thanks also to Douglas Gilbert and Gunny Harboe of McClier, for providing photographs.

PRESERVATION TECH NOTES are designed to provide practical information on traditional practices and innovative techniques 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 the National Historic Preservation Act, which direct the Secretary of the Interior to develop and make available to government agencies and individuals information concerning profesional methods and techniques for the preservation of historic properties.

Comments on the usefulness of this information are welcomed and should be addressed to PRESERVATION TECH NOTES, Technical Preservation Services – NC200, National Center for Cultural Resources, National Park Service, 1849 C Street, NW, Washington, DC 20240.

ISSN: 0741-9023 PTN 43 September 2001