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

WINDOWS

NUMBER 15

Interior Storms for Steel Casement Windows

Charles E. Fisher
Preservation Assistance Division
National Park Service

Christina Henry
Preservation Assistance Division
National Park Service

THE DRAKE HOTEL (DRAKE TOWER)
Philadelphia, Pennsylvania

The 30-story Drake Hotel in downtown Philadelphia was the city's largest building when constructed in the late 1920s. The brick-clad art deco building, accented with sculptured terra cotta decoration, incorporates Spanish Baroque detailing along with a strong silhouette to create a distinctive appearance against the city skyline. Built with 753 rooms for use as apartments and hotel lodging, this long narrow building has recently been renovated exclusively for use as apartments.

The Drake Tower, as it is known today, has over 1600 steel casement windows, richly adorned with terra cotta detail on the lower and uppermost floors (see figure 1). In between, the wall is simply detailed, characterized by the expanse of masonry and the organization and appearance of the steel casement windows with their multi-pane configuration and vertical meeting line. During the recent renovation, the steel casement windows were maintained and their energy performance enhanced inexpensively through addition of interior storm windows.

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

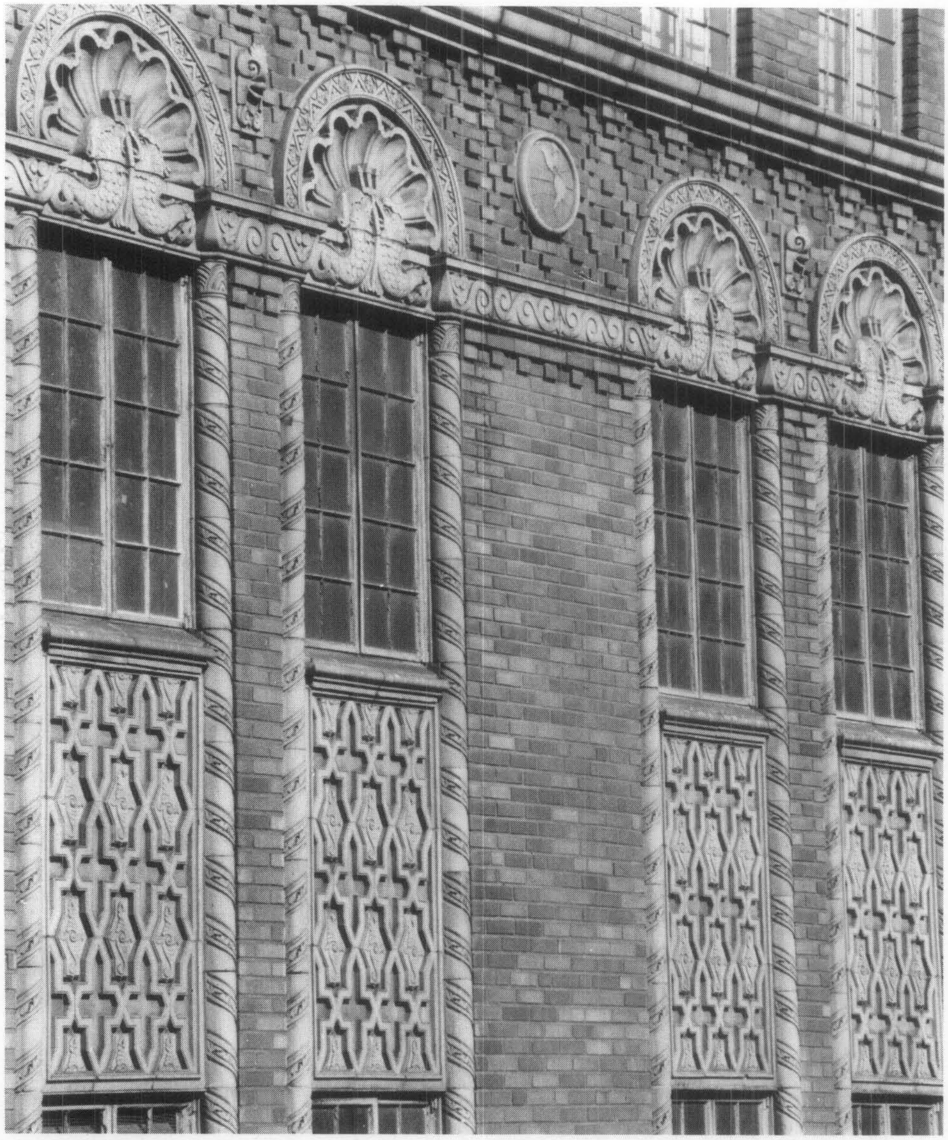

Figure 1. The steel casement windows on the lower and uppermost floors were richly adorned with terra cotta detail. Photo: Mort Bond/National Register Collection.

Problem

There are a number of window sizes and styles in the building ranging from those with arched transoms on the upper floors to small single casements stacked vertically in bathroom locations. The predominant window type consists of a paired casement unit, measuring approximately 3 feet wide by 4¾ feet high. These units are hinged on the jamb side, closing against a center mullion bar. On the interior the windows have a slightly splayed plaster jamb, devoid of any trim except for a rather simple wooden apron.

Having established that the casement units were in relatively good condition, the project architect examined ways to improve their energy efficiency. Caulking around the frames and adding weatherstripping to the operable casement would considerably reduce air infiltration, but would not address the heat loss through the glass and the non-thermally broken metal frame. Double glazing was considered desirable and yet there were very limited choices. The shallow 7/8″ glazing depth and narrow width of the glazing bars in the existing frame precluded retrofitting insulating glass within the individual lights. Since operable windows for seasonal use were a requirement for marketing, the addition of a fixed acrylic or glass panel was not considered. Similarly, an exterior storm unit would prohibit operation of the windows, unless "piggybacked" individually onto each of the casement pairs. An exterior applied storm panel piggybacked onto each operable sash would create aesthetic problems with the appearance of the windows.

Solution

A system to improve the energy performance of the windows was developed by the architect, based on an approach that the firm had specified for other similar projects. It involved the installation of a new horizontally sliding storm window unit, mounted on the interior of the window jamb. The 2 storm panels would run the full height of the opening and would slightly overlap to allow for an effective weather seal (see figure 2). The intersection of the 2 storm panels thus would align at the vertical mullion of the existing paired casement windows. Since the interior face of the steel mullion was 2¼ inches wide, the visual impact on the windows of the intersection of the frames of the two storm panels would be minimal. For insect control, especially on the lower floors, a screen panel half the width of the opening was specified, set within a third track of the aluminum subframe (see figure 3).

Repair Work

The steel casement windows required basic maintenance work. This work included cleaning, reputtying where necessary, limited replacement of cracked glass, and the application of an anti-corrosive paint. The hardware was cleaned and oiled (see figure 4), and the frames caulked on the exterior both to keep water from entering and rusting the steel subframe as well as to reduce air infiltration. The relatively tight closure of the cleaned and repainted casements, coupled with the planned installation of the interior storm unit, rendered the additional expense of retrofitting weatherstripping to the casements unnecessary.

Aluminum Storm Window

Several important factors were taken into account to ensure the successful installation and operation of the storm windows. First, care was taken to make sure that the aluminum window section was thick enough to prevent racking of the sliding sash. For the 3′ by 4¾′ opening, a 5/8″ thick sash frame was used, set into an aluminum 1⅜″ subframe screwed to the existing jamb (see figure 5). Openings larger than these may require thicker frames. Second, correct installation procedures were essential to ensure that the slider unit functioned properly. This required that each subframe be squared off when installed in the existing jamb, since changes in alignment may have

Figure 2. A horizontally sliding storm window unit was installed on the inside of the casement windows for improved energy performance. Photo: Christina Henry.

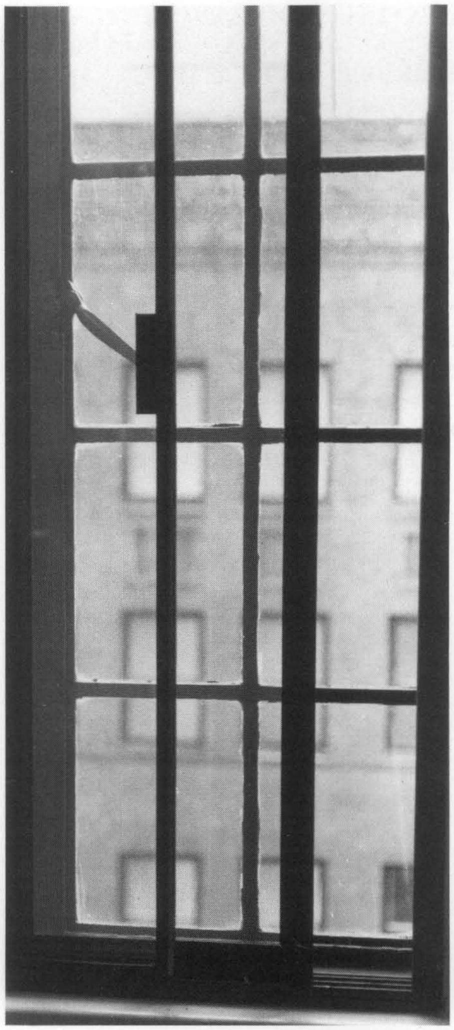

Figure 3. View of the storm unit showing a screen panel and one of the glazed panels partially opened. Photo: Christina Henry.

occurred to the window opening over the years (see figure 6).

Working one floor at a time, the aluminum storm frames were custom-fitted to each opening and prefabricated by the window company. Installation work was easily scheduled since all work could be accomplished from the inside. After the frames were installed, a silicone sealant tinted brown was applied around the intersection of the aluminum subframe and the existing jamb on the exterior face to reduce further air infiltration. In addition, the sash stiles had pile weatherstripping on the inner and outer faces for additional tightness.

Rehabilitation Costs

The cost of repairing and repainting the historic steel windows was $55,000, or $34 per window. Installation of the combination storm/screen interior unit averaged $62 per window for the ap-

Figure 4. The hardware was cleaned and oiled as part of the maintenance and repair work undertaking on the steel casements. Photo: Charles Fisher.

proximately 1600 windows, bringing the total cost to $96 per window.

Evaluation

The installation of the storm units had little visual impact on the exterior appearance of the Drake (see figure 7). This is largely due to the selection of an interior application, use of a dark color for the storm frames, the alignment of the intersection of the two storm panels at a point behind the steel mullion on the historic window, and the setback of the storm unit nearly flush with the interior wall. On the inside, the storms are neatly set within the opening and aesthetically are not disruptive (see figure 8).

Potential condensation problems exist with many storm window applications. The window contractor initially had expressed concern over possible condensation forming on the windows directly above wall air-conditioning units. This certainly was a problem with the historic windows. With installation of the storm units, there has been no problem with condensation forming on the windows over the past two years.

Much of the success of sliding aluminum sash rests on the use of good frames and hardware, and on proper installation. While friction sliders were used for the sash, more expensive ball-bearing rollers would have provided for smoother operation. The subframes for the storm and screen panels are properly squared in each opening and preclude the storm units from catching or jamming during operation. The storm windows along with the historic casement unit have provided a sound weather seal. An added benefit of the work was that the street noise has been considerably reduced within the apartments, particularly on the lower floors.

This simple method for upgrading the performance of the windows proved both practical and cost effective, while preserving both the appearance and the materials of the historic windows.

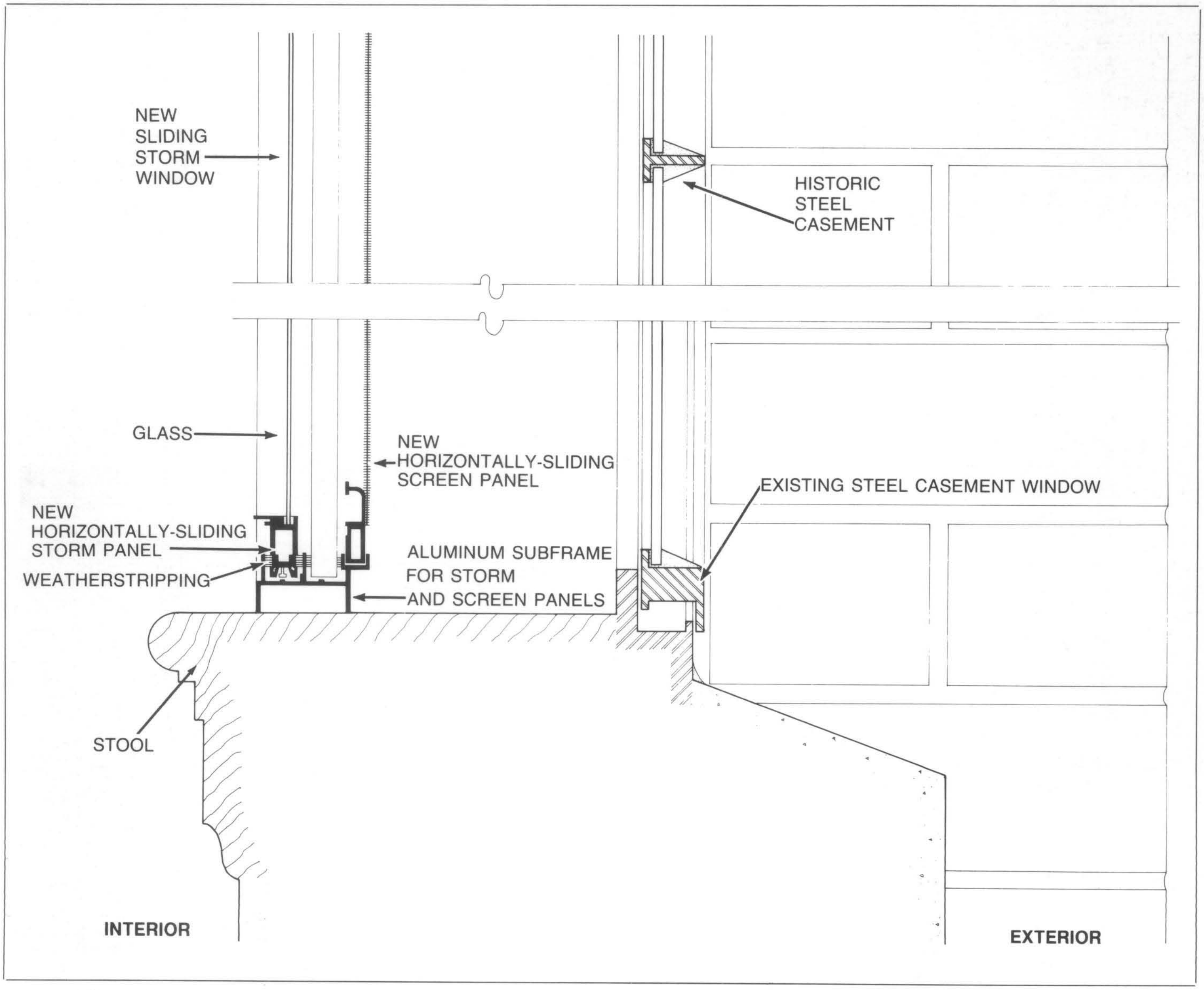

Figure 5. The interior storm window system consisted of an aluminum subframe and sliding aluminum-frame panels with glazed and screened units. Drawing: Christina Henry.

Figure 6. The subframe had to be squared off when installed in each window opening to prevent racking of the sliding panels. Photo: Christina Henry.

Figure 7. The dark frame color and careful installation of the interior storm window resulted in little visual impact on the exterior appearance of the building. Photo: Charles Fisher.

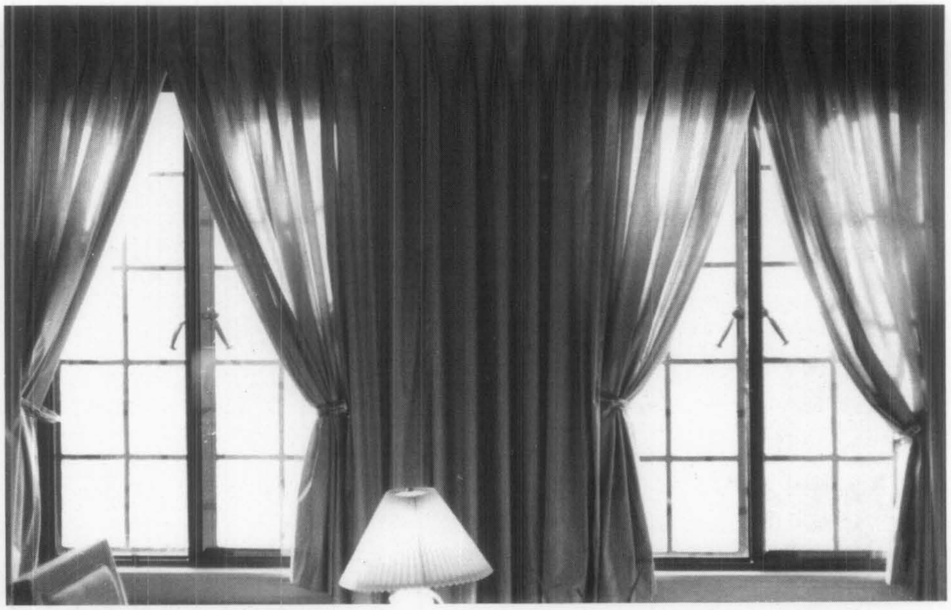

Figure 8. The storm units are neatly set within the opening and aesthetically are not disruptive. Photo: Charles Fisher.

PROJECT DATA:

Building:
The Drake Tower
(formerly Drake Hotel)
1512–1514 Spruce Street
Philadelphia, Pennsylvania

Owners:
Samuel Mindel and Eric Rosenfeld
New York, New York

Project Date:
March 1984 - May 1986

Cost:
Repair and repainting of approximately 1600 windows cost $55,000. The cost of the interior storms averaged $62 per window, totaling approximately $100,000. The total cost of the window work was $155,000, or $96 per window.

Project Architect:
Richard Klein
Goldfarb/Klein and Associates
260 South 23rd Street
Philadelphia, Pennsylvania

This PRESERVATION TECH NOTE was prepared by the National Park Service. Charles E. Fisher, Preservation Assistance Division, National Park Service, serves as Technical Coordinator of the PRESERVATION TECH NOTES. Information on the rehabilitation work at the Drake Tower was generously supplied by Barbara Murry, building manager of the Drake Tower. Special thanks go to Michael J. Auer, Brenda Siler, and Theresa Robinson of the Preservation Assistance Division who contributed to the production of this Tech Note. Cover Photo: Mort Bond, National Register Collection.

This and many of the PRESERVATION TECH NOTES on windows are included in "The Window Handbook, Successful Strategies for Rehabilitating Windows in Historic Buildings," a joint publication of the Preservation Assistance Division, 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 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 Amendments of 1980 which direct the Secretary of the Interior to develop and make available to government agencies and individuals information concerning professional 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, Preservation Assistance Division-424, National Park Service, P.O. Box 37127, Washington, D.C. 20013-7127.

ISSN: 0741-9023 PTN-20 November 1986

☆U.S. GOVERNMENT PRINTING OFFICE: 1989-0-250-007