

Tech Notes

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MECHANICAL SYSTEMS

NUMBER 1

Replicating Historic Elevator Enclosures

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Cannon



GUARANTY BUILDING Buffalo, New York

Louis Sullivan's Guaranty Building, constructed in Buffalo, New York, between 1895 and 1896, is one of the pre-eminent examples of early highrise building design. Particularly notable is Sullivan's skillful integration of the technical requirements and architectural opportunities presented by the advancement in elevator engineering with the related systems comprising the building's vertical circulation. The 3 year restoration of this National Historic Landmark, completed in 1984, included the replication of the historic elevator enclosures on the first two floors within the significant lobby spaces.

When constructed, the 165' building was the tallest in the City of Buffalo. Its first floor was a rectangle 116' by 93' containing a spacious and richly detailed circulation space that connected the two main entrances and lobbies, central elevator and stair core, and retail spaces. The upper 12 stories

were U-shaped to maximize the penetration of natural daylight. With the exception of the centrally located core that contained the electric elevators and single stairway, the entire building perimeter was occupied by offices entered from a double-loaded corridor.

The genius of Sullivan's design is reflected in the building's ability to transmit light throughout the interior. The openness of the first floor plan was enhanced by 15' high, glazed interior partitions and large art-glass skylights (*see figure 1*). On upper floors, translucent florentine glass at corridor walls maximize the light available to the corridor and offices as well as to the elevators and stairs.

The design of the elevator assembly skillfully integrated the complex daylighting scheme and an efficient vertical circulation system. Although the original cabs were removed in 1962, it is believed they were constructed with

The replication of historic elevator enclosures can be an important component of the restoration plans for significant public spaces.

iron frames and glazed walls. Sullivan's solution included the placement of elevators within a shaft containing a skylight, white reflective glazed brick, and windows that provided the occupants of the elevator cabs views outside the building, including Lake Erie.

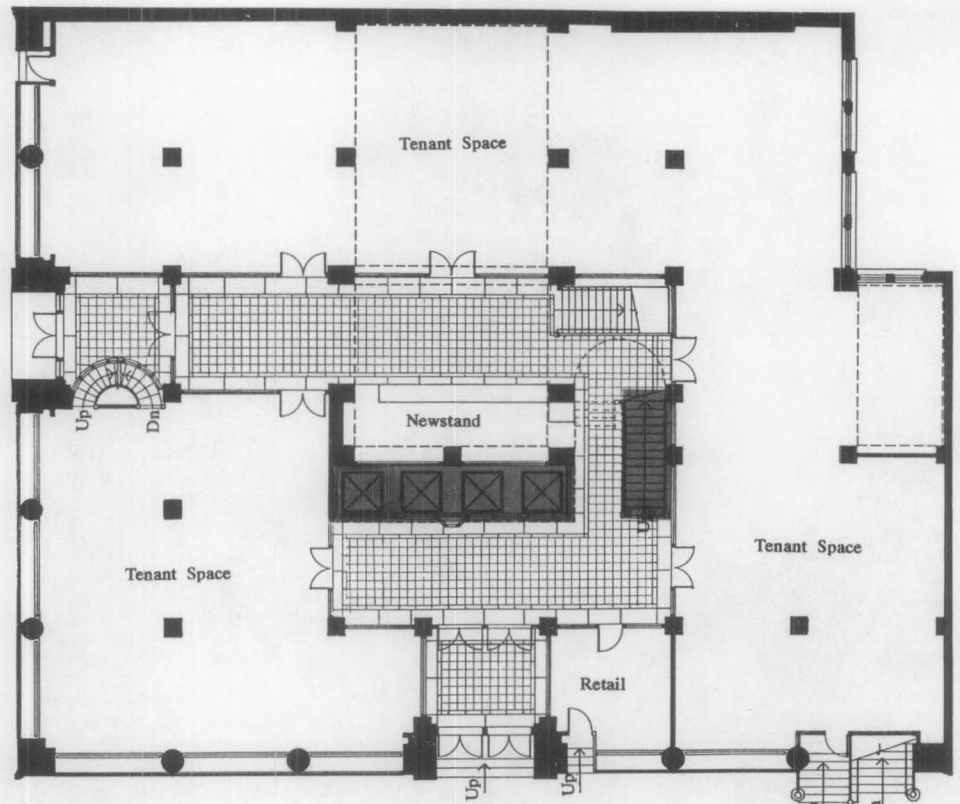
The elevator doors and walls that enclosed the elevator shaft and faced the elevator lobbies were part of a cast iron enclosure assembled from vertical and horizontal members: posts, friezes, cornices, base moldings, and pierced infill grilles. All were detailed with an ornate organic pattern based on the growth and emergence of a germinating seedpod, and finished with electro-plated bronze (see figure 2).

On each floor other miscellaneous cast metal elements followed the building's organic theme. These included ornamental call button plates and mail chutes, and above the elevator doors, medallions placed on wire-welded mesh "veils" intended to obscure the elevator equipment behind. On each floor, one medallion served as the floor indicator.

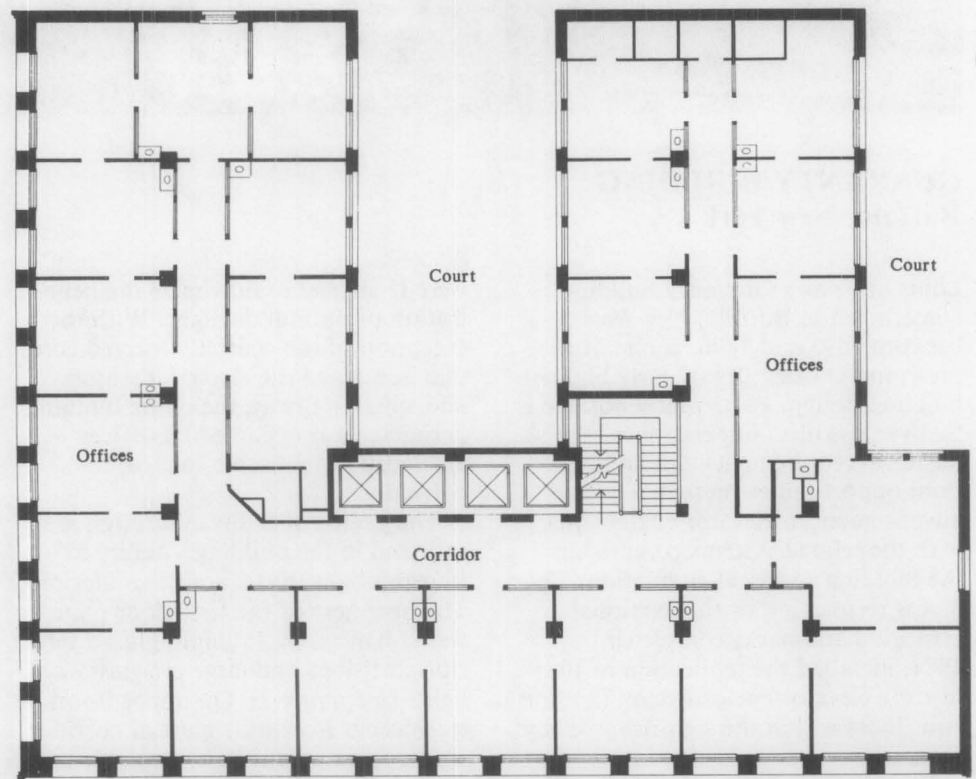
Rehabilitation Problem

The four original elevators performed poorly with respect to both travel and response time. In 1903, less than ten years after the building's construction, the original Sprague electric system was replaced with the Standard Plunger hydraulic system. Although this conversion required little change to the decorative elevator enclosure, subsequent alterations had major impacts. Between 1954 and 1962, the main stair and elevators were fully enclosed and fire-rated sheet rock was placed over the first floor glazed partitions. In 1962, the elevators were again replaced, apparently in response to code requirements and leakage at the seals of the water-based hydraulic system that sprayed water on those waiting for the elevator at each floor.

The 1962 changes had a major impact on Sullivan's original design. The four 1903 cabs were replaced with a 3-cab, electrically powered system, with the remaining shaft left vacant for future use. The glazed elevator cabs were replaced with fully enclosed ones, and the open elevator shaft and single stairway were enclosed with two-hour, fire-rated masonry walls (see figure 3). Throughout the building, almost all elevator ornament was removed, leaving only a small piece of the elevator framework exposed within



FIRST FLOOR PLAN, 1897



TYPICAL UPPER FLOOR PLAN, 1897

Figure 1. First and typical upper floor plans, 1897. Extensive skylit circulation area on the first floor and glazing at corridor partitions contributed to the building's openness and transparency. Drawing: Cannon, Javier Salazar.



Figure 2. First floor elevator lobby, c. 1897, from northwest. Photo: United Founders Life Insurance Company of Illinois.



Figure 3. First floor elevator lobby, c. 1962. Modifications included reduction in number of elevators and addition of masonry enclosure around open elevators and main building stair. Photo: Cannon.

the stair to the west of the elevator bank. Window openings within the elevator shaft were infilled with concrete block, and the shaft's skylight was removed to provide space for a new elevator penthouse.

Subsequent changes and damage to the building occurred as a result of a fire and the lack of a general and consistent maintenance program. The loss

of major tenants in the 1970s gave rise to efforts to demolish the building, fortunately thwarted by the sale of the building in 1981. The new owners embarked upon a project to rehabilitate the Landmark building for its original office and commercial use. Since the project was to receive a federal UDAG grant and take advantage of the federal tax incentives allowed

for the rehabilitation of historic properties, review and approval by the State Historic Preservation Office, Advisory Council for Historic Preservation, and National Park Service were required.

By 1981, building and fire codes had introduced standards of safety far beyond those in existence in either the 1890s or the 1960s. An exact restoration of the 1897 elevator would not have met the City of Buffalo's fire, egress or handicapped accessibility requirements. In case of fire, the glazed elevator cab and non-fire rated shaft would allow the spread of flames, smoke and noxious gases through the building. The lack of either a mechanical ventilation or smoke control system within the shaft prevented smoke and gases from being vented to the outside, and building occupants and fire fighters from moving safely through the building. Further, glazing inserted in the elevator cabs and shaft-way windows could explode from the heat, causing injury or damage to building occupants, pedestrians, or adjacent buildings.

Reconstruction of the original elevator controls (designed to be operated by elevator attendants) would have made it difficult for those with limited mobility or dexterity to use. Reconstruction would not have allowed installation of safety mechanisms to prevent injuries such as those caused by the impact of closing elevator doors or by catching fingers in pierced elevator grilles.

Rehabilitation Solution

For reasons of safety, operation, and budget, as many elements of the existing elevator system as possible were reused, and the elevator enclosures were restored only at the first and second floors. This approach had to be integrated into the overall goal of restoring Louis Sullivan's original design in the primary interior spaces and on the entire exterior, while creating a first-class, efficient, speculative office floor plan. The solution also had to meet or exceed current code requirements, and fit within a project budget that included other highly specialized restoration work on the art glass skylights and marble flooring and friezes.

Historic Research and Physical Evidence

Recreation of the spirit and overall appearance of Sullivan's design required extensive research of historical

records and physical evidence contained within the building. Although original drawings of the elevator enclosure were never located, historical photographs and documents in the possession of a previous building owner proved to be invaluable. These records were an essential complement to the actual architectural fragments discovered in the building: a decorative column on each floor left exposed when the stairway was enclosed in the 1960s, structural and cornice elements, sections of grille, and one of the original medallions.

Rehabilitation of Elevator Cabs

The decision to reuse the existing elevator cabs, in concert with the fire-rated shaft and penthouse equipment introduced in the 1960s, limited the degree to which the building's original transparency and daylighting scheme could be recaptured. The cab interiors were refurbished, however, and the 1960s hardware and laminate finishes were replaced with more compatible raised mahogany panels.

Rehabilitation and Restoration of Elevator Enclosure

At the first and second floor levels, the elevator enclosures and original lobby floor plans were restored (see figure 4). Replication of all elements comprising the enclosures required the recasting of new elements in molds taken from original samples. Cast iron was used (as had originally been specified by Sullivan), and throughout the casting and finishing processes the architects worked closely with the artisans at the foundry. Only a few surviving elements were able to be refinished and reused.

Some modifications to the original design were necessary for a variety of safety and operational reasons. For example, to allow for proper registration between the replicated enclosures and the reused cab doors (fixed with respect to location and dimensions), small cast iron spacers were discreetly added to the enclosure assembly. At all locations where the cast metal elevator enclosures was fixed, 1/4" wire glass was installed on the shaftway side with a specially designed, concealed glass gasket. The portion of the enclosure that opened with the elevator doors was double faced with wire glass installed on the lobby side as added protection (see figure 5).

Although the entire building was retrofitted with sprinklers, double

coverage was used at the elevator and first floor where glazing was installed or retained in lieu of solid fire-rated walls (2 hours). Sprinkler heads were located 6' on center (o.c.), selected and located to minimize their impact on the elevator enclosure. At the elevator shaft, two heads were placed at each 6' o.c. location, one directed upwards to protect the glazing above, and the other directed horizontally to protect the lobby area below. Sprinkler heads were connected to piping located in the elevator shaft. To ensure an unobtrusive installation, sprinklers and piping on the lobby side of the enclosure were finished to match the decorative metal; piping within the shaft was painted black to match the shaftway walls.

Electroplating of bronze was not a perfected science in 1897, and the original elements began to oxidize soon after installation. Rather than repeating a finish likely to corrode, new cast iron elements were plated with copper and then finished with a tinted varnish to recreate the depth and patina of the original and aged electroplated bronze finish. Exceptions were at the west side of the elevator enclosure at all upper levels, where the surviving original elements were stripped and refurbished with a liquid bronze.

Overall Safety Plan

In 1981, the City of Buffalo still used its own code, the Buffalo Building Code, 1979 edition. Early consultation with the city code official and fire marshal revealed significant code compliance issues concerning the open elevator and the building's single stair.

Successful resolution was reached in part due to the involvement of the code official, fire marshal, and architect from the State Historic Preservation Office from the earliest stages of architectural planning through to project completion. With respect to code and safety issues, this relationship proved essential, since the solution for the elevator enclosure evolved as a part of the overall safety plan for the building.

The acceptance of the wire glass and sprinkler solution as an alternative to fire-rated walls around the elevator enclosure and stairway followed the approval of a similar scheme for the restoration of a nearby historic building that contained glazed doors and transoms in corridors adjacent to a large, open atrium. As had been the case with that structure, the rehabilitation of the Guaranty included an improved exiting design for the entire building.

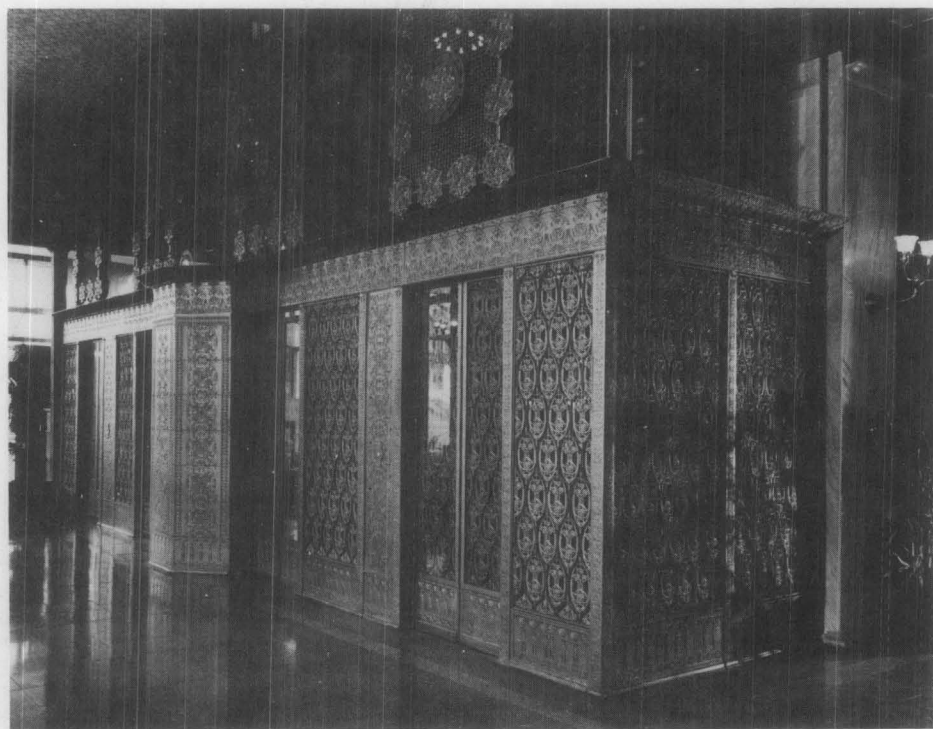


Figure 4. First floor elevator lobby as restored, 1984, showing the replicated cast ornament on the elevator enclosure, with sprinkler heads discreetly placed to protect elevator cabs. The elevator door far left (number 4) is inoperable since the cab and equipment had been removed in 1962. Photo: Patricia Layman Bazelon.

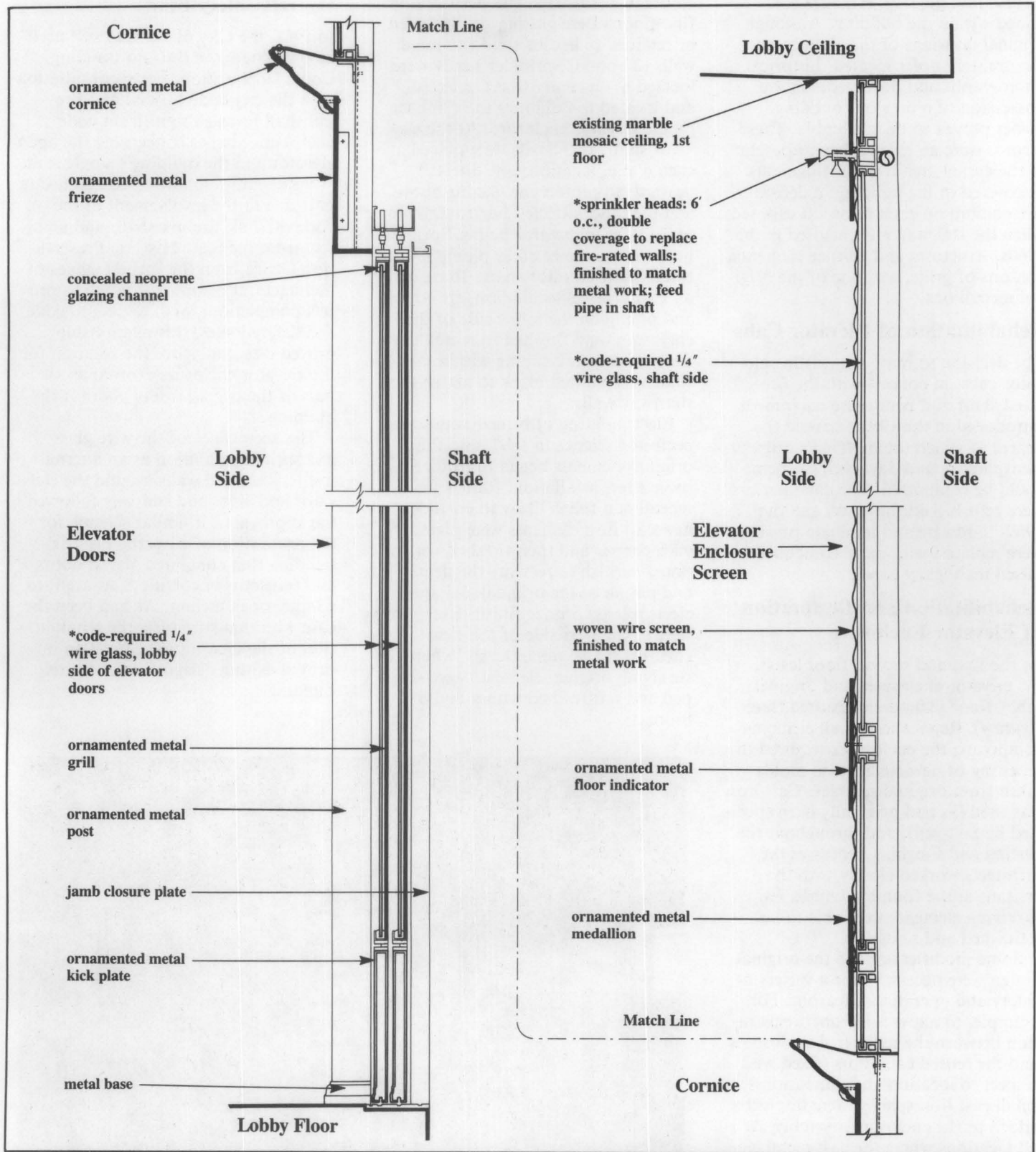


Figure 5. The reconstruction of the elevator enclosures was a complex integration of code-required features (marked by an *) and architectural elements. Wire glass and double-coverage fire sprinklers replaced fire-rated walls while retaining the quality of light in Sullivan's original design. The metal ornament was reproduced in copper-plated cast iron and finished with a tinted varnish to match the original bronze electroplated finish.

Drawing: Kaye Ellen Simonson

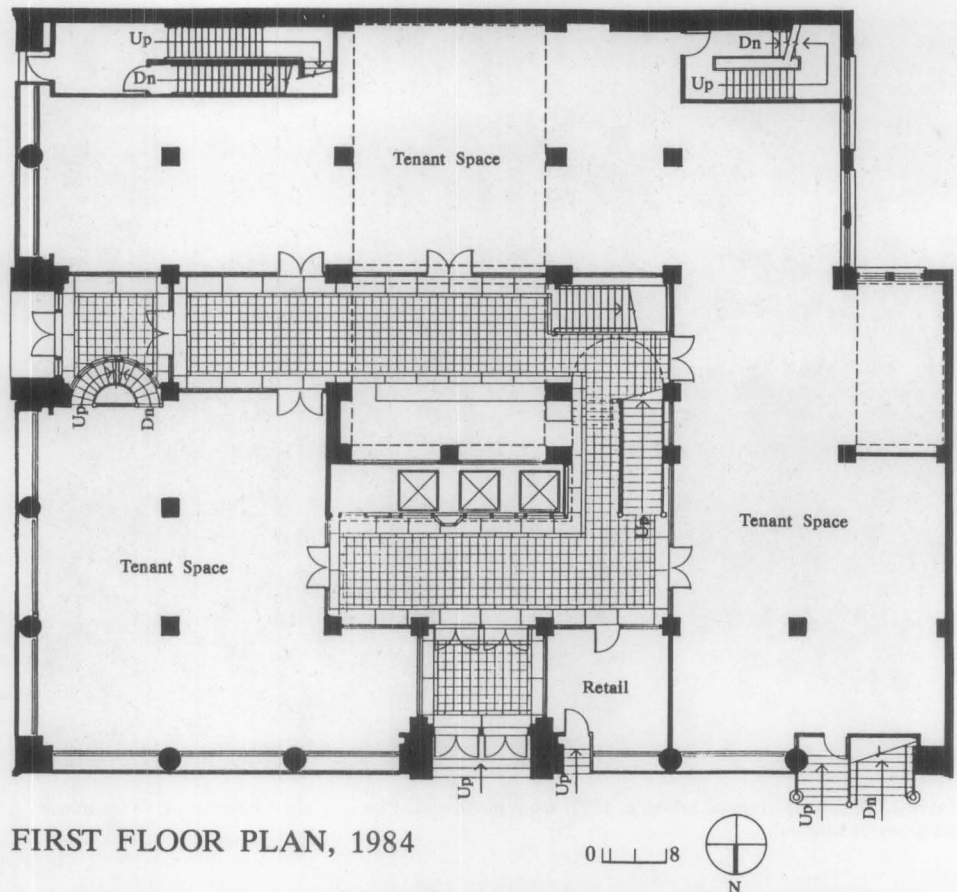
New stairs exiting directly to the outside were unobtrusively added at the southeast and southwest corners of the building (see figure 6). The stairs at the southwest connected to the building's original open stair; at

the south wall of the open stair's intermediary landing between the second and third floor, a fire separation and door to a new half-flight of stairs were added. This half-flight was considered part of the new fire-rated corridor that

led directly to the southwest exit stair. Other fire safety elements added to the building included a fire detection annunciator and alarm system, stand-pipes, and a sprinkler system throughout the building.

Evaluation

After more than four years, the elevator solution in the rehabilitated Guaranty Building has proven successful. The owner and architect are satisfied that important components of the building's original grandeur and transparency were reestablished, and building occupants are content with the day-to-day operations. A less restrictive budget might have allowed the replacement of elevator cabs with more transparent units, and additional restoration work within the elevator shaft. However, as executed, the elevator and surrounding work on the building's first two floors restored the spirit of Sullivan's work. The Guaranty Building project clearly demonstrates that even when major changes have occurred over the years, sensitive restoration and rehabilitation work that still meets code requirements is possible.



FIRST FLOOR PLAN, 1984

Figure 6. First floor as restored, 1984. With the exception of two new exit stairs added at southeast and southwest corners, the first floor has been faithfully restored to its 1897 appearance, including the 4-bay elevator enclosure. Drawing: Cannon, Javier Salazar.

PROJECT DATA

Building:

Guaranty Building
Buffalo, New York

Developer:

Prudential Associates
Cleveland, Ohio

Project Date:

Construction began, 1981
Construction completed, 1984

Architect:

Cannon
Buffalo, New York

Elevator Enclosure:

Foundry—Robinson Iron Company,
Alexander City, Alabama
Fabricator—Sen-Wel Iron Inc.
Buffalo, New York

Elevator Cab Work:

Gallagher Elevator
Buffalo, New York

Project Cost:

The overall development costs for the project were \$12.7 million. Excluding electrical, plumbing, and sprinkler work, rehabilitation of the elevators is estimated at \$112,500 for rehabilitation of the elevator cabs, and \$144,000 for replication of elevator grillage.

This PRESERVATION TECH NOTE was prepared by the National Park Service. Charles E. Fisher, Preservation Assistance Division, National Park Service, serves as the Technical Coordinator for the PRESERVATION TECH NOTES. Special thanks go to Peter T. Flynn, Javier Salazar and Bernadette Sykes of Cannon and William Scott for their help in the writing of this Tech Note. Thanks also go to the following people who contributed to the production: Michael J. Auer, Brenda Siler, Kaye Simonson, and Theresa Robinson, Preservation Assistance Division, National Park Service. Cover Photo: Guaranty Building after 1980s Rehabilitation/Patricia Layman Bazelon.

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 the National Historic Preservation Act 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.

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