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FACADE RESTORATION OF AN 1889 BROWNSTONE

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ABSTRACT

This paper presents a case study of the restoration of an historic three-story brownstone residence in the northeast United States. Years of deterioration created an unsafe condition. Financial constraints did not allow removal and replacement of the exterior veneer with new stone. Restoration techniques utilized synthetic patching materials along with facade stabilization. These methods enabled an owner to restore the building without public grants. The restoration was completed in 1996.

BACKGROUND/HISTORY

This project involved the restoration of the brownstone facade for a residence in Albany, New York, in the northeast United States. The three-and-a-half-story residence was built in 1889 during a period when elegant homes were being constructed of ornate masonry. A popular material for facing those homes was brownstone. Brownstone is a brown colored sandstone which masons found easy to carve. It was used extensively from the 1860s to 1920s. Homes of wealthy individuals in major cities such as Philadelphia and New York were clad in brownstone. The stone was expected to perform for decades.

The brownstone for this residence is unique in that it is one of a few in North America where the carved scrollwork is evident over the entire facade. See Photograph 1 of the facade. No two stone panels are identical.

Research indicated much of the stonework on the city's residences was performed by artisans commissioned to build the State Capitol. Since the capitol took 30 years to construct, the masons contracted during slow periods to build various residences. Thus, the quality of the craftsmanship on these residences is very good.

The first reports of brownstone failures were noted in the 1880's, approximately 20 years after brownstone came into common use. Initial problems were attributed to inferior stone and second-rate workmanship.

In the 1960s and 1970s, many Americans began to recognize the rich resource of older buildings throughout the country; Albany was no exception. An historical society was formed to both acknowledge the rich heritage of Albany's older buildings and assist with their preservation. This residence was purchased by the current owner in the 1970s. In 1975, it received an historic designation.

In 1991, the owner became concerned over the condition of the brownstone. She sought the advice of preservationists and the historical society to help with the growing problems that she observed and believed were becoming dangerous. There was a strong interest in preservation. However, she quickly learned that funding for homeowners to perform historic restoration was not available. The local historical society arranged for a panel of experts to convene in Albany in 1992 for a sandstone symposium on historical facades, using her residence as the focus. Architects, preservationists, contractors, materials suppliers and state officials spent the first part of the day examining the facade from up close, using a lift donated by a contractor. Once the panel had become acquainted with the facade, they moved indoors to absorb the data, identify the problems, discuss causes, and propose solutions. The symposium recommended a restoration to the facade which was estimated to cost between $250,000 and $500,000. Worse yet, the owner was warned that the facade was in jeopardy of delaminating and collapsing at any time. The owner strongly desired to restore the facade but could not afford the cost. In addition, the cost of the residence was less than $120,000; thus an investment of more than $250,000 would not have been prudent.

A masonry contractor who attended the symposium came forward and installed protective scaffolding over the front entrance so the owner could continue safe access into the residence. However, the safety of passersby was still an issue.

The owner continued to seek restoration funding and began to research preservation, in general, and brownstone specifically. In 1995, the problems became critical; pieces of the facade began to fall. The owner quickly contacted the masonry contractor. By this time, she was willing to strip the brownstone from the facade to make it safe. Conversations with the contractor resulted in the owner allowing the contractor to propose new options.

Our firm was contacted by the masonry contractor; we had completed numerous successful restorations together. He suggested we look at repair techniques rather than the replacement options proposed by the symposium.

PROBLEM IDENTIFICATION

The symposium did not result in a written report. But there were various photographs and some videotaped discussions which the owner was given. This formed the basis for the inspection. Because the facade has many windows (see Photograph 1), a complete investigation was possible from the roof, windows and ground. The problems with the brownstone were as bad as identified by members of the symposium. They included:

1. Facade delaminations from the backup. The thickness of the brownstone is generally 100 mm to 175 mm. The backup of the load bearing wall is 2 wythes of brick (200 mm thick). The delaminations of the stone were most evident at window jambs (Photograph 2) and below sills (Photographs 2 & 3).

2. Internal stone delaminations. Horizontal surfaces, primarily sills, were spalled and internally delaminated.

3. Weathering. Carved features were worn.

A thorough review indicated there were no significant cracks in the facade. Thus, there were no cracks in the backup which could reflect through the facade. This was a significant piece of information for seeking solutions.

No water leaks were evident through the walls. However, much of the wood trim around windows and doors had experienced water deterioration.

DIAGNOSIS

There is no mechanical attachment between the brownstone and the brick backup. Some of the stone was interlocked with the brick, but usually only mortar bonded them together.

The diagnosis centered on the three primary problems:

1. Facade delaminations. Overall separation of the brownstone resulted from long-term moisture deterioration of the mortar. The mortar deterioration allowed water to penetrate the joints and get behind brownstone. The water and freeze-thaw effects combined to separate the brownstone from the brick backup. The

moisture damage to the wood trim was also a symptom of water penetration into the wall.

2. Internal stone delaminations. An historical review indicated this brownstone came from a quarry in Connecticut. Over time, the stone from this quarry has proven to be inferior for exterior applications. Stone carvers liked the brownstone for its softness because it was easy to shape and produce scrollwork. However, that same softness made the stone susceptible to moisture absorption, which resulted in spalls and internal delaminations.

   The sills were placed with the stone horizontally bedded. Mortar leaks around window frames and sills allowed moisture penetration from water and snow. Freeze-thaw from the absorbed moisture caused the stone to delaminate internally or spall.

3. Weathering. The softness of the stone also made it susceptible to weathering. Brownstone features can deteriorate from erosion, acid rain or environmental effects.

   This residence experienced little or no significant erosion. The sills were installed with good drainage so that water did not wash the walls below.

   Features of the scrollwork were non-existent in many locations; portions weathered primarily due to acid rain and environmental effects. The acidity of the rain in combination with exhaust fumes from automobiles accelerated the deterioration.

RESTORATION ALTERNATIVES

Preservationists prefer that damaged or deteriorated materials be replaced with original materials. This was considered by the symposium but was financially impossible to implement. The uniqueness of the scrollwork meant that carvers would have to replicate each stone individually. This added to the complications and the cost.

One alternative not considered by the symposium was to patch and repair. Using this method, the brownstone would be patched with a synthetic material and the scrollwork would be replicated in the patches. Based upon our diagnosis, this alternative was considered viable because the brick backup had no active cracks and was in generally sound condition. Otherwise, active cracks would have to be stabilized and repaired and deteriorated brick and mortar would have to be repaired and repointed.

The advantages of the patching method are:

1. It is generally useful for repairing small areas.

2. The cost is less than full stone replacement.

3. The patches can be developed to match both color and texture of the substrate.

The disadvantages are:

1. The patches must be materially compatibile with the masonry substrate which is either brick or brownstone.

2. The ability to color-match the patches is very sensitive to the formulation of the patching material.

3. Skilled craftsmen are needed to carve the ornate scrollwork of patches to match the original. The texture of the patches is also dependent upon application techniques.

Based upon financial considerations, the patch and repair method was selected. The budget was $60,000. The patching material selected was Custom System 45, developed by Edison Coatings, Incorporated. The material properties are similar to brick and sandstone and are also slow curing. The slow-cure property is necessary for carving new scrollwork. Samples of the original material were sent to the company to match the color.

DESIGN AND CONSTRUCTION

Construction documents and specifications were prepared which reflected the budget and set priorities to the work. The first priority was to stabilize the facade by removing loose pieces, to protect passersby. After that, the restoration could proceed with an emphasis on patching the facade to make it weathertight. The lowest priority was placed on replicating the scrollwork because carving is so labor intensive and costly. Work would begin and proceed until the funds were exhausted; however, safety issues would certainly be completed.

The plans were approved by the Historic Commission for the city, and the Building Department issued a building permit. This was the first time a permit was issued without any knowledge of the appearance of the finished work. The city recognized the financial limitations of individuals to fund restorations, and that the prime concern was safety over aesthetics or historic restoration.

Photographs were taken of each feature prior to removal. Fully delaminated stones were completely removed down to the brick backup. Any mortar joint deterioration was repointed. Stainless steel anchors were attached to the brick and a base of patching material was built up. No attempt was made to match color with the base. After the base cured, the final patching material was formulated to match the color and texture of the original stone. While the material was curing, scrollwork was replicated based upon the photographs taken during the removals and older photographs provided by the owner.

Individual stones were patched by removing all spalls and deterioration. A bonding agent was used to adhere the patching material. Isolated patches which were more than 75 mm deep were also pinned to the stone using stainless steel pins epoxied to the brownstone. As with the delaminated stones, ornate features were carved into the patches. Weathered or worn stones were chiseled down to sound material and similarly built up.

Approximately 60 percent of the facade was restored. Once all the repairs were completed, a consolidant was applied to the entire surface to provide added protection to the original sandstone. The patches were also coated to prevent a spotty discoloration of the wall. Photographs 4, 5, & 6 show the results of the restoration. The scrollwork was replicated in all the patches.

CONCLUSIONS

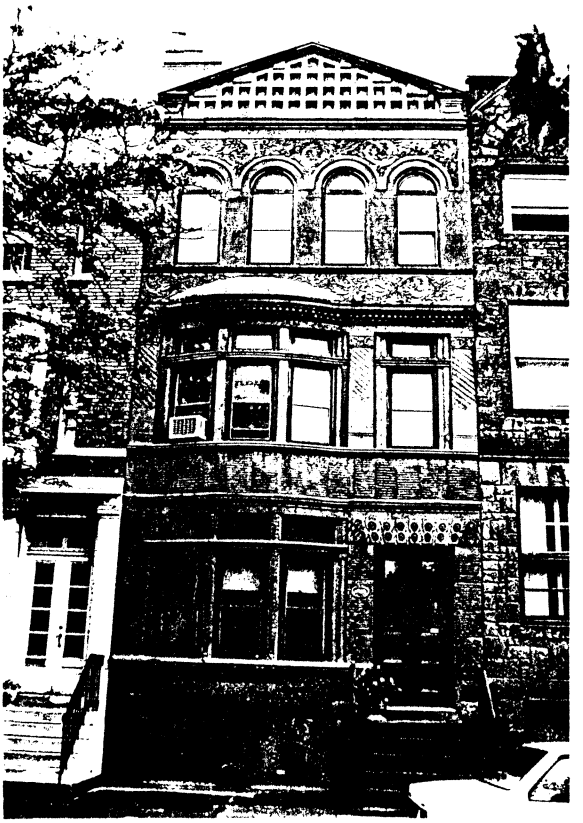
Although the project was begun without knowing how much of the scrollwork could repaired, all of it was repaired within the budget.

The repairs using synthetic material are not as aesthetic as replacement stones. However, most people would be unable to identify the patches.

Most individuals could not afford a pure restoration. Synthetic patching materials offer a practical alternative.

For this project, patching offered a means to stabilize the facade because the brick substrate was in such good condition.

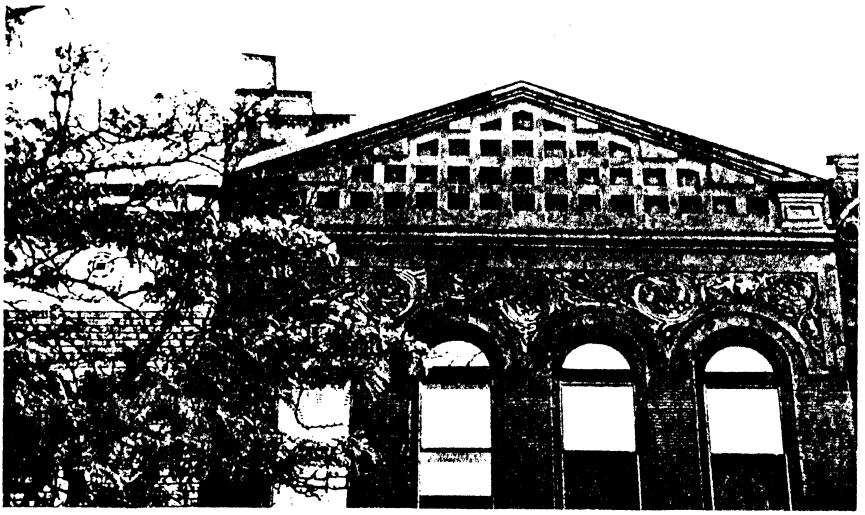
A slow-cure patching material is necessary to replicate scroll work for restoration projects.



Photograph 1 - Building elevation

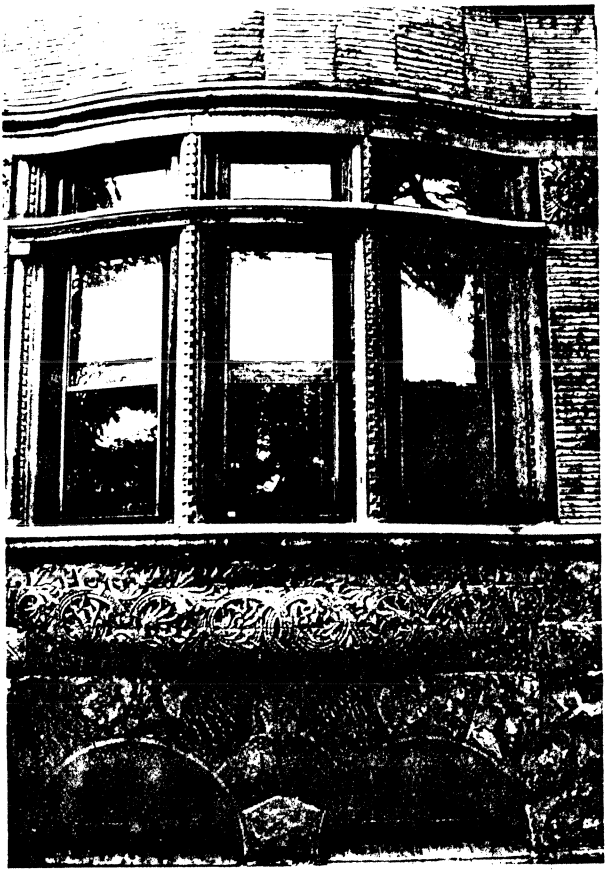
Photograph 2 - Deteriorated jambs & sill

Photograph 3 - Deteriorated sill & scrollwork



Photograph 4 - Restoration completed at roof level

Photograph 5 - Restoration of scrollwork and details



Photograph 6 - Restoration completed at lower level