



Cem-FIL® GRC Renovation

Shepard Hall, City College of New York

INTRODUCTION:

Shepard Hall is home to the school of architecture at the City College of New York. Originally built in 1907 using a combination of load-bearing stone, glazed terracotta and steel, Shepard Hall was suffering major structural deterioration of the terra cotta by the mid 1980's.

In the original design the load-bearing ability of the terracotta had been overestimated, there was insufficient allowance for movement, and the aggressive climatic and urban environment had been underestimated. Water infiltration had also severely corroded the structural steel, putting the building at risk of collapse.

The Dormitory Authority of the City of New York decided that major restoration was called for and commissioned The Stein Partnership to undertake the work.

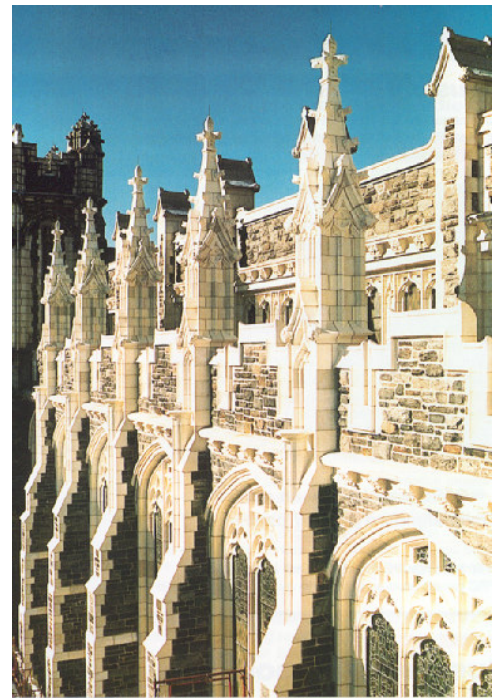


Structural and surface deterioration of the original terracotta



FACTS:

- Cem-FIL® Star GRC chosen after exhaustive testing to simulate 50 years
- 75,000 GRC elements replaced weathered terracotta



Elevation renovated by GFRG

CHOICE OF MATERIALS:

In his approach to materials specification for the project, partner-in-charge Carl Stein, rejected new glazed terracotta because of its past poor performance. Because of the prestige of the building, and the desire that the replacement materials used offer a design life superior to the original terracotta, an exhaustive series of tests was initiated on different materials.

Tests were designed to simulate 50 years exposure to the aggressive New York environment, and included exposure to: high temperature and humidity; UV light and intermittent water spray; acid rain; freeze-thaw and rapid freeze-thaw. After each test the surface appearance and integrity was checked.

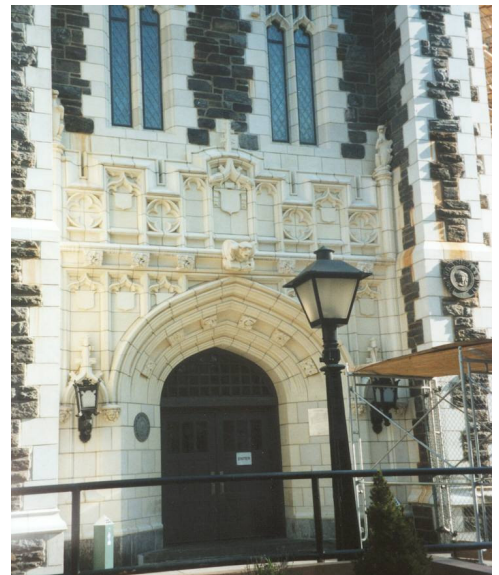
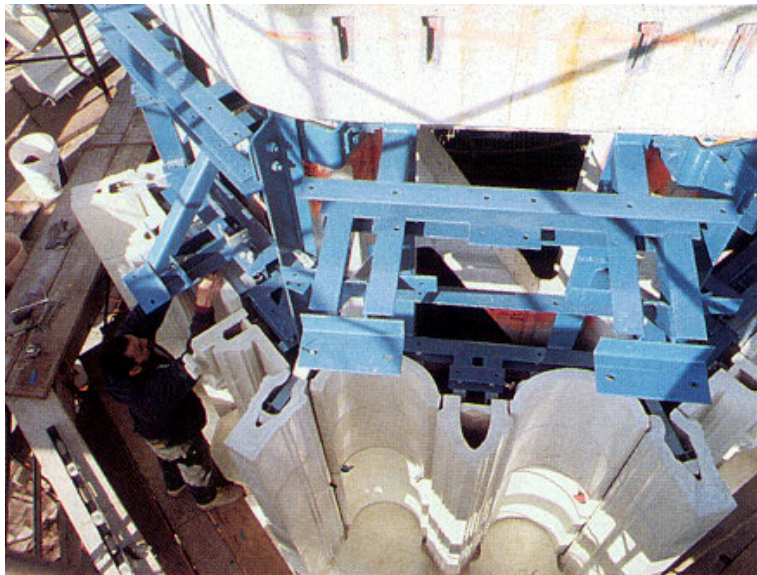
The decision was made to use a composition of GRC known as Cem-FIL® STAR GRC. The material had been shown to have excellent long-term strength retention (as demonstrated by > 10 years of work at the Saint-Gobain research laboratories in Pont-à-Mousson, France) and this was confirmed in tests performed by Prof. S. Shah of the NSF Advanced Cement Based Materials at Northwestern University, Illinois. It has also demonstrated excellent weather resistance, successfully passing the tests based on ASTM standards to simulate 50 years of New York City's environment.

Commenting on the choice of material, Carl Stein said:

"Over the past twelve years, The Stein Partnership has undertaken historic restoration projects that have included around 75,000 GRC replacement units, most with complex shapes. This represents approximately 23,000m² of GRC. The true scope of this work however goes far beyond simple volume. It includes more than 1,000 sculptures. Many of the shapes are non-rectilinear, involving curving forms in several non-orthographic intersecting planes. We believe that the work already installed at Shepard Hall far exceeds any other similar GRC application."

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THE MANUFACTURING CHALLENGE:

During phase two of the project, which began in 1991, some 60,000 pieces of terra cotta needed to be replaced. Using a CAD-linked data-based computer programme, the architects were able to identify each individual element and use the information to generate workshop drawings. This not only saved the architects time and increased their control over the projects but it also proved an invaluable tool for the manufacturers, (GFRC Inc of Lincoln, Nebraska on phase two, and MJM Studios of New York on phase 3).

The complexity of the task actually led to the development of a new GRC production process. The premix-spray process developed by Spray-Tech allowed production in open moulds, so that an architectural surface finish to simulate glazed terracotta could be sprayed into the moulds before being sprayed with the premixed GRC. This made it possible to produce highly detailed "glazed" elements which would have been difficult or impossible to make with conventional GRC manufacturing processes.

In February 1996, the building was singled out for an Award of Merit by the Consulting Engineers of Tennessee. The Award was received jointly by MJM Studios of New York and Consulting Engineers Ross Bryan Associates of Nashville, Tennessee.

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