Session Track: Heritage Conservation Technology and Philosophy
Session Code: CS02a

Paper: The Condition Of Facades NYC pre-1900

Presented by
Dan Eschenasy , P.E.
NYC Department of Buildings
New York, NY USA
Mark Davis
Paris, France

Speaker(s) Biography
Dan Eschenasy ,PE, is a Deputy Assistant Commisioner at the NYC Department of Buildings. In this position he organized a Forensic Engineering Unit , that evalutes causes of accidents and level of building distress. Dan is an Honorary Member of the Structural Engineering Association of NY, He is a member of the ASCE Committee on Structural Evaluation of Building Envelopes and was the lead of the NYC Building Code Panel on Masonry. He was the member of the national experts ASCE/FEMA Committee that evaluted the WTC disaster, He participated in various positions to the restauration of several landmark structures - Kingsbridge Armory, Brooklyn Academy of Music, Brooklyn Museum, various buildings at Snug Harbour, SI and St. Andrews Plaza.

Abstract
The Condition Of Facades Built Prior To 1900 In New York City

Authors:
Mark Davis, Architect, Cesar Pelli and Associates
Dan Eschenasy, PE, Deputy Assistant Commissioner, NYC Buildings Department

When asked about the condition of a certain building stock, most preservationists, architects or engineers can only give an answer based on their particular experiences. This paper presents the results of an investigation on the condition of façades of buildings built before 1900 in New York City. The conclusions present a normalized estimate of the state of pre-1900 NYC buildings and historic districts, an essential step in planning the conservation of NYC urban landscape.

The authors performed visual inspections and analyzed both the condition of the entire facade as well as the condition of each material component. They were interested in buildings of three to maximum five story height. Most of these of these buildings are tenements and as their height is lower than 70 feet they are not subject to compulsory periodic inspections and repairs mandated by the New York City local laws.

The authors think the importance of their research resides in its rigorous statistical format that allows the findings be generalized with high reliability. They are valid over the entire population of pre-1900 New York buildings.

The Department of Finance records indicate that there are about 7,000 such buildings over the entire city (4411 in Manhattan and 1922 in Brooklyn and less than 150 in each remaining borough). A statistically significant sample of 185 buildings was randomly chosen, with an additional control group of 25 similar buildings built between 1920 and 1930. The random group included 58 buildings designated landmark. (7 individual and 51 constituents of historic districts.)
Prior to starting the inspection a series of façade elements were chosen to be rated. A form was prepared for each building, together with keyed photos. The terminology corresponds to the Guideline for Condition Assessment of the Building Envelope, SEI/ASCE 30-0 . Each element (parapet, lintel, cornice, sill, etc) had the material and finish indicated together with an evaluation of its condition. As a result the authors could make determinations not only on the aging of the façade, but of many types of materials (brick masonry, terracotta or brownstone.)

The condition is described using a scale (failed, severe, poor, fair or good) where each rating was associated with a numerical mark. In addition there is an evaluation of the prevalence of each type of defect over each individual building facade: general, frequent, several locations, once or localized. This organization allowed the statistical analysis of the data. The conclusions can be applied to the entire building population. The study presents medians and scatter of data.

The authors concluded that overall, the facades of the buildings built before 1900 are not more deteriorated or different then those built 30-40 years later.7

Session Track: Heritage Conservation Technology and Philosophy
Session Code: CS02b

Paper: Restoration of an Unsound Guastavino Barrel Vault

Presented by
Daniel Lane
Jan Hird Pokorny Associates
New York, NY USA

Speaker(s) Biography
Daniel Lane is an architectural conservator at Jan Hird Pokorny Associates, a New York restoration architecture firm. He is a graduate of Columbia University's Historic Preservation program, where he completed a thesis on the history of the Guastavino firm and the technology of the vaulting system patented by Guastavino. He has written several articles on Guastavino for trade magazines.

Abstract
The restoration of the Guastavino barrel vault at the Battery Maritime building in Manhattan presented an interesting philosophical study of how to intervene to stabilize a laminated masonry structure that was in a state of failure. The vault itself is 255' long, 12' wide, with a rise of 18 inches from its spring line. The vault is an imperial vault, i.e. it's two short ends are built so as to fall down to the level of the spring line. The vault covers the ceiling of a high loggia at the street side of the Battery Maritime Building, a Beaux Arts ferry terminal built in 1908 and designed by Walker & Morris.
In 2005, as part of their overall restoration of the exterior envelope of the building, architects and conservators from Jan Hird Pokorny Associates, engineers from Robert Silman Associates, and project managers from Tishman Construction initiated a full survey of the vault. All soffit tiles were sounded manually and the top side of the vault was cleaned to help reveal structural deficiencies. Aside from many loose tile, structural cracking at the east end of the vault proved to be the most serious problem.
The loggia is supported by six sets of paired columns. A pair of columns at the eastern-most end of the vault had fallen several inches due to structural failure at its base. It appeared the vault had also moved laterally and risen significantly since its construction. The combination of these two factors is believed to have caused the severe cracking at the vault's east end. A design to stabilize this portion of the vault, which was deemed to be in a state of failure, was the main portion of the restoration and the one that engendered the most thought as to philosophical issues.
The first step in the design was to consult the record of previous restoration work on Guastavino vaults and domes. The work at the Bridgemarket under the Manhattan side of the Queensboro Bridge by the office of Walter B. Melvin was the most recent example of an intervention into structurally compromised Guastavino vaults. Those vaults exhibited tension cracking from thermal and vibrational movement of the bridge's steel structural frame as well as massive water infiltration. In contrast, cracks at the Battery Maritime Building's vault were isolated to a small portion of a barrel vault and were caused mainly by an isolated structural incident.
The intervention would not need to be as integral as the pinning that was done at the Queensboro Bridge, but opinions as to how to proceed were numberous. The design team first determined that the compromised portion of the vault should remain in place and that it should be stabilized rather than reconstructed. Grouting of cracks rather than pinning was also agreed upon, due to the now stable steel structure that the vault rested on. Further stabilization ideas ranged from pouring a new concrete shell over the back face of the vault to nothing but grouting. In the end, a low tech, reversible solution prevailed. Threaded rod was epoxied into a matrix of holes drilled at the back side of the vault and those rods were hung from a flat horizontally-laid steel grating system that spanned the vault from above with the mansard roof.7

Session Track: Heritage Conservation Technology and Philosophy
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Paper: Accommodating New Design Loadings for Old Masonry Structures

Presented by
Wayne Ruth
Masonry Solutions International, Inc.
Hunt Valley, MD USA
Michael Schuller and Shan Wo
Atkinson-Noland & Associates
Boulder, CO USA

Speaker(s) Biography
Wayne T. Ruth is the president of Masonry Solutions International, Inc. MSII specializes in invisible stabilization techniques, such as compatible injection, for heritage masonry structures.

Michael P. Schuller is the president of Atkinson-Noland and Associates.Atkinson-Noland & Associates, Inc. has provided structural engineering services including nondestructive testing (NDT) as well as nondestructive evaluation (NDE) for federal, state, and private organizations since its founding in 1975.

Abstract
Accommodating New Design Loads for Old Masonry Structures

W. Ruth, S. Wo, M. Schuller

ABSTRACT

With a renovation program underway, a multi-story heritage building at a prominent university campus was found deficient in capacity to withstand new design loads. The proposed retrofit scheme included a change of use that required larger open spaces within the building; subsequent changes to roof and floor framing led to the introduction of large loads at discrete points throughout the exterior building envelope. Concern regarding the stability of these walls and the ability of the poorly-constructed brickwork to carry new structural loads led to the decision to retrofit the walls through a combination of internal reinforcement and stabilization with compatible injection fill.

Hydrated lime and cement-based Compatible Injected Fill (CIF) was used to fill cracks and voids within the historic walls to ensure composite action between the multiple wythes present in exterior bearing walls. CIF formulations were custom developed to be compatible with the host wall constituent materials. No polymers or epoxies were utilized. The main function of the CIF was to bond masonry backup to the thin-bed (eastern method) laid exterior brick façade.

At areas of new concentrated design loads, however, a novel stainless steel stitching program was utilized in conjunction with injection remediation to augment the masonry s inherent compressive capacity throughout the new load paths. Thousands of discrete reinforcing pieces of varying geometries were accurately positioned within the historic walls. The combination of injection and new internal reinforcement effectively confines the highly stressed masonry sections, offering new possibilities for augmenting historic masonry construction in situations where it must resist new loads.

In addition to the structural benefits of internal void filling, water penetration from wind driven rain was reduced. The aesthetics of the heritage masonry were unchanged despite the extensive nature of the injection and stitching programs and the resulting structural upgrade.

The effort required a multi-disciplinary collaboration between the design-side (architects and engineers) and the construction side (injection professionals) to develop materials and protocols suitable for use with the historic building. The effect of wall injection on envelope energy performance was modeled to identify the effect of filling voids on dewpoint within the wall section and the necessity for insertion of a vapor barrier. Microwave radar was used extensively to identify internal wall conditions, verify the position of the stitching pieces, and evaluated the adequacy of the void injection process.7

Session Track: Heritage Conservation Technology and Philosophy
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Paper: Rideau Hall: Restoration of the Mapping Wing Facade

Presented by
John Diodati
Fournier Gersovitz Moss Architects
Montreal, QC Canada

Speaker(s) Biography
Mr. Diodati has over fifteen years of professional experience. He became an associate with Fournier Gersovitz Moss architectes et associés in 1999. He plays a key role as a specialist in materials conservation issues and in traditional construction techniques. He is in charge of building envelope restoration projects with the firm, overseeing and participating in all project phases from the initial diagnosis to completion and in some cases, the long-term building monitoring and maintenance programs.

Abstract
Rideau Hall, located in Ottawa, Ontario, Canada, is the official residence of the Governor General of Canada, for which the National Capital Commission (NCC) is custodian. As the official Government House, the residence of the Crown s representative in Canada, it is a focal point of political and social life in the nation s capital.

Beginning in 1864, when the property was first leased by the government of Canada as a residence for the Governor General, the original villa, built in 1838, was enlarged and extended to meet the needs of an official residence in a series of construction campaigns. In 1913, the Department of Public Works, former custodian, were mandated to design an entrance pavilion and porte-cochere on the northwest façade to serve as principal façade of the official residence and link the Ballroom and Tentroom. As a result, the Mappin Wing, an imposing three-storey stone facade, surmounted by a grand pediment was built in 1914 to bridge the two public rooms.

As part of an ongoing conservation effort of the buildings and grounds, in 2005 the NCC identified the Mappin Wing façade for restoration. The stone façade is built of a local limestone heavily laden with clay-rich bedding planes. Longstanding and repeated saturation combined with detailing flaws in the original design resulted in significant localised deterioration.

The NCC mandated Fournier Gersovitz Moss Architects (FGMAA) to assemble and lead an inter-disciplinary team to restore the façade. The team included a stone conservator and conservation structural engineer. The first steps included visual inspections and crane surveys to assess the nature and extent of the deterioration. It was clear from the outset that the stone replacement component of the restoration would be significant. Characterization of the physical properties of the existing stone and mortar was undertaken to establish suitable criteria such that new materials could be selected to be compatible with the existing.

A philosophy of intervention revolving around minimum-intervention and maximum-retention was developed early in the project. In a first instance this philosophy identified the character defining elements and then set out objectives to guide the restoration and inform all aspects of the decision making process.
A stone by stone repair approach was adopted that was tied to unit costs and heritage recording strategy. The stone conservator was tasked with the physical restoration of all sculptural elements and the on site identification of the stone repairs on a stone by stone basis. Innovative repair techniques, many revolving around the use of hydraulic limes, and dispersed hydrated limes were implemented.

This presentation will focus on the importance of:
" Identifying qualified players from the outset (consultants, craftsmen, and general contractors) to help ensure the projects success,

" Assembling an inter-disciplinary team and fostering discourse between team members throughout the process to help ensure that the best possible option will be implemented in each case,
" Developing a clear philosophy of intervention to guide the project through all its stages,
" Developing a contracting strategy that will allow a stone by stone treatment in keeping with the intervention objectives,
" Developing a heritage recording strategy which is not just an after thought but tied to the nature of the contract,
" Establishing a materials testing program to help ensure compatible interventions,
" Involving a site conservator in all aspects of the process. The repairs outlined in specifications can be further explored and refined on site for each situation by the conservator prior to turning over the work to the masons.
" Developing an ongoing inspection and maintenance program to help protect the investment.

Trevor Gillingwater (the stone conservator) will also be on hand.7