

Session Track: Successes and Failures
Session Code: CS15a

Paper: When Materials Fail: Questions of Reconstruction, Restoration, and Substitute Materials in a Colonial Revival Bell Tower

Presented by

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Speaker(s) Biography

Henry Moss (AIA, LEED, Principal) specializes in planning and designing large-scale adaptive reuse and historic restoration projects. His award-winning projects include the preservation of Charles Bulfinch's University Hall at Harvard University and H.H. Richardson's Hayden Building in Boston. He was also a key member of the design team for MASS MoCA (Massachusetts Museum of Contemporary Art). Prior to joining Bruner/Cott, he practiced in England for 18 years, where he specialized in historic preservation and public housing renovation. He then worked for Historic Boston on a variety of community-based restoration projects. Since 1986, he has led technical workshops for architects and contractors on historic building topics for the Boston Society of Architects. More recently, he became a regional spokesperson for preservation issues associated with post-World War II buildings and landscapes. Mr. Moss is a graduate of Harvard University with Bachelor of Arts (Cum Laude) and Master of Architecture degrees.

Matthew Tonello, P.E. joined Consigli in 2002. In 2004 he opened the company's Portland, Maine office. With fifteen years experience in façade reconstruction, building envelope and structural repair, his technical knowledge is well known throughout the historic preservation community. Having worked on landmark projects for Bowdoin College, Victoria Mansion, the City of Portland, and Phillips Academy, he has continued to develop Consigli's area of expertise in restoring and rebuilding historic structures. A registered structural engineer in Massachusetts and Maine, Tonello holds a Master of Science degree in Structural Engineering from the University of Massachusetts, a Master of Business Administration degree from Boston University, and a Bachelor of Science degree in Civil Engineering from the University of Maine.

Arthur MacLeod provides structural engineering services to architects and building owners. Much of his work is with registered historic buildings and sites including two Massachusetts Historical Commission award winning preservation projects, the Misson Church in Roxbury and the Fitts Buildings in Framingham, both in Massachusetts. Mr. MacLeod started his firm in 1997 following his experience with construction and engineering firms since 1974 when he graduated from Northeastern University with a Bachelor of Science in Civil Engineering. In addition to membership in professional engineering and trade associations, he is an active member of the Historic Resources Committee in the Boston Society of Architects.

Abstract

When Materials Fail: Questions of Reconstruction, Restoration, and Substitute Materials in a Colonial Revival Bell Tower

Originally conceived as a restoration project, the Fuller Memorial Bell Tower at Phillips Academy in Andover, Massachusetts, forced us to reconsider a fundamental dictum of historic preservation: "Repair rather than replace." Our transgressive decisions, during both design and construction, included the demolition of a steel frame and its brick infill/cladding, substitution of new granite blocks with new carving in place of fractured stones with memorial inscriptions, and the substitution of fiberglass urns and column shafts in place of earlier wooden pieces. This presentation will explain the failure modes of the original assemblies and why they were not repaired or replaced exactly in kind.

Designed by Guy Lowell in 1923, the tower utilized hybrid assemblies that combined steel with brick, granite, and timber to construct a soaring campus icon. Seventy-five years later, chronic water penetration, masonry failure, and steel corrosion were pronounced incurable by our assessment team of architect and structural engineer.

Our investigation concluded that the steel shaft had been displaced by brick growth and that porous bricks were distributed frequently and randomly throughout the tower's exterior wall, contributing to serious secondary cracking caused by rust-jacking that would continue to worsen over time. We recommended rebuilding the tower and analyzed alternative reconstruction scenarios, including ones that retained the original steel frame.

Consigli Construction Company was one of two construction management firms invited by Phillips Academy to respond to our Condition Assessment. After a competitive selection process, they were appointed for Preconstruction Services and went on to build the project.

Their scope of work included:

1. Reconstruction of the masonry shaft, conforming exactly to the dimensions and appearance of the original. (The final construction approach included a brick/CMU cavity wall with concrete girts, a complicated English Cross Bond pattern, steel relieving angles, and complicated movement joint.)
2. Repair of fractured and spalled granite blocks with their memorial inscriptions and integration into the new masonry shaft. Replacement of fractured and spalled inscribed granite blocks.
3. Repair of the wooden belfry with reconstruction of decayed wooden elements in kind. Replacement of wooden and later aluminum urns with fiberglass replicas.
4. Demolition of the original steel bell frame and substitution of a reconfigured hanging system to support additional new and existing old bells.

Departures from the Preservation Ethic and Explanations

1. Demolition vs. Reuse of the Steel Tower Frame: Moisture and freeze-growth problems associated with brick were exacerbated in this exposed, unheated tower. Had we rebuilt in kind, the reconstructed tower would have suffered from the same problems. Instead, exterior dimensions were rigorously conserved and the tower was converted to masonry.
2. Replacement vs. Repair of Granite Fractures: We worked with stonemasons to produce Dutchmen with very fine joints to minimize the visibility of epoxy after UV-yellowing. There were enough fractures running through the memorial inscriptions for The Academy to decide that legibility and equality of treatment among the names was more important than preserving original material, either

granite or hand-carved inscription. Mid-stream, Consigli switched stone suppliers and stone finishers to insure that new stones were the exact visual equivalents of original stones.

3. Repair of the Wooden Belfry & Replace Decayed Elements In-Kind: Coopered columns and the 2'-4' tall urns were vulnerable due to multiple joints and the large areas of exposed end grain in places where access for painting and repair was difficult. These were specified as painted fiberglass replacements. These elements were more than 80' above ground level.

4. Demolition of the Original Bell Frame: MacLeod Consulting discovered that the original timber and steel belfry structure could reliably support hanging beams for the combined weight of original and new bells. This new configuration allowed increased access space for maintenance inside the belfry and permits future conversion to a hand-operated, mechanical console for playing the bells. This structure was never visible from outside the belfry.

Session Track: Successes and Failures
Session Code: CS15b

Paper: Modern Technology Applied to Conservation of Ancient Heritage at the Temple of Angkor Wat

Presented by

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Boulder, CO USA

Glenn Boornazian, Integrated Conservation Resources, New York, NY USA

Speaker(s) Biography

Michael Schuller is president of Atkinson-Noland & Associates in Boulder, Colorado, an engineering firm specializing in masonry materials and structures. He has over 20 years' experience with masonry including special expertise with nondestructive evaluation and repair procedures applied to historic masonry. He has worked on evaluation and repair of buildings throughout the United States and internationally and is a technical consultant to the Rocky Mountain Masonry Institute. Mr. Schuller serves on the Board of Directors of The Rocky Mountain Masonry Institute and the Association for Preservation Technology International, and teaches Masonry Structural Design at the University of Colorado in Boulder.

Glenn Boornazian is president of Integrated Conservation Resources, New York, and is a Technical Director in charge of material conservation for the World Monuments Fund Angkor preservation projects.

John Stubbs is vice president of field operations for the World Monuments Fund, New York.

Abstract

In 1998 the World Monuments Fund was presented with the challenge of stabilizing the architecture of the third enclosure southeast intermediate gallery at Angkor Wat and to provide long term protection for the Churning of the Sea of Milk (CSM) bas relief. This bas relief panel measures over 50m in length and is considered to be one of the most important bas reliefs at Angkor, if not all of South East Asia. The WMF Team has completed a research program for the overall architectural and structural stabilization of the gallery and is beginning implementation of a scheme to provide long-term protection for this important heritage site.

A series of investigative and monitoring approaches have been implemented in the course of the conservation study, including a program of laboratory testing, in place monitoring of environmental conditions and structures movement, and nondestructive testing to evaluate the performance of prior repairs and identify damage hidden to view beneath the surface of the sculpture and its roof structure. Based on the survey, in-situ and lab testing, threats were defined and prioritized, and potential solutions were designed. The project has also served as an avenue to introduce modern conservation practice to the work at Angkor. WMF employs a team of Khmer professionals and stone masons and has a long-standing history of providing training opportunities for locals.

The main issue has to do with ongoing leaks in the roofing system, which originally incorporated a passive drainage system. This system was largely closed by the application of cementitious mortar and patching materials in the 1990s. These repairs have not only filled in the natural channeled drainage system and weep-holes of the roof stones, they have created an impermeable barrier which prevents

water from exiting the roof through the channels or through evaporation. Instead, moisture stays in the stone and cement for excessive periods of time, forcing water to percolate down through the wall of the bas relief instead of shedding easily from the roof and through the channels as originally intended. The project has as its main focus restoration of the original draining system and conservation of roof stones.

We are requesting a full session comprised of three presentations. John Stubbs will begin by providing an overview of the project and the history of the World Monuments Fund in Cambodia, including a discussion of current conditions and challenges related to conservation practice in a tropical environment. Glenn Boornazian will describe the GIS-based data collection system used on the project, laboratory testing, and conservation threats. He will also present the designed solution and plans for implementation of the conservation program. Michael Schuller's presentation will include description of nondestructive methods used and examples showing application of ultrasonic pulse velocity testing and microwave radar investigations. These methods were used to evaluate the extent of sandstone deterioration and effect of salts leading from prior roof repairs.

Session Track: Successes and Failures

Session Code: CS15c

Paper: Patrimonio arquitectónico y técnicas constructivas tradicionales: conservación, continuidad e innovación

Presented by

Camilla Mileto profesora del Departamento de Composición Arquitectónica Escuela de Arquitectura de la Universidad Politécnica de Valencia
Valencia, España

Speaker(s) Biography

Camilla Mileto y Fernando Vegas son profesores de la Escuela Técnica Superior de Arquitectura de Valencia (España) y editores de la revista Loggia, Arquitectura & Restauración. Como investigadores, han desarrollado estudios en torno a las técnicas, la conservación y la protección del patrimonio arquitectónico tradicional y la arquitectura del eclecticismo y el modernismo. Su trabajo profesional se centra en torno a la proyectación de arquitectura de nueva planta en contexto histórico y la conservación del patrimonio arquitectónico, tanto vernáculo como monumental, con varios proyectos e intervenciones realizadas en la Alhambra de Granada y otros monumentos destacados. Su trabajo ha recibido, entre otras distinciones, con el 1er Premio de la Unión Europea al Patrimonio Cultural (Europa Nostra 2004) y el Premio Concepción Arenal de Investigación de 2005. Recientemente han sido nombrado expertos asesores en el programa europeo Rehabimed para la rehabilitación de la arquitectura mediterránea tradicional.

Abstract

El patrimonio arquitectónico vernáculo de muchos pueblos y ciudades se ve cada día amenazado no sólo por el abandono y la consiguiente degradación estructural, material y funcional del mismo, sino también por una serie de intervenciones realizadas sin una atención a su carácter específico.

Mucho se ha recorrido en los últimos dos siglos a nivel de pensamiento y reflexión por lo que atañe la conservación de la arquitectura monumental, a la que en muchos casos se reconoce un papel fundamental ligado a la identidad y a la cultura de los pueblos. Sin embargo, la arquitectura tradicional, difusa en los centros históricos de ciudades y pueblos y presente en el territorio rural, todavía no ha alcanzado el mismo nivel de respeto y apreciación como elemento portador y transmisor de la cultura. Esta arquitectura, tan importante para nuestras culturas, se define por un carácter ligado a la inmediatez de la construcción, la espontaneidad de una “arquitectura sin arquitectos”, los materiales locales empleados que la ligan estrechamente a su territorio, las propiedades bioclimáticas que nacen de la experiencia del clima local, etc. En cualquier lugar del mundo la arquitectura tradicional es el espejo de la relación del hombre con su territorio y de la adaptación a las condiciones del mismo.

No obstante la importancia de este tipo de patrimonio arquitectónico, las intervenciones que se realizan en él son muy dispares y con muy diferentes resultados según la sensibilidad de quien intervenga. Los casos que se pueden encontrar a nivel de intervención en la arquitectura tradicional son principalmente tres: la intervención de sustitución y reconstrucción en continuidad con la tradición constructiva allá donde las técnicas tradicionales todavía se conservan en uso; la intervención de innovación y sustitución donde la tradición constructiva se ha perdido y han entrado en uso nuevos materiales como el hormigón, el aluminio, el acero, el plástico, etc.; y por último, la preservación de la arquitectura

tradicional en su condición existente a través del empleo tanto de técnicas tradicionales como de nuevos materiales compatibles con la tradición constructiva local.

Los primeros dos casos son los más frecuentes en muchos lugares que siguen ligados a la práctica usual de reciclaje de la arquitectura tradicional que prevé la posibilidad de sustitución de la misma con nuevas arquitecturas. El tercer caso está ligado sin duda a una reflexión más profunda y menos espontánea, que intenta respetar al máximo el carácter de la arquitectura tradicional porque cree profundamente en sus valores históricos, culturales, sociales, constructivos, bioclimáticos, etc. pero, al mismo tiempo, entiende la necesidad de la innovación y puesta al día de una arquitectura ligada a unos modos de vida superados.

Además de la reflexión general sobre estos temas se propone un ejemplo concreto de un estudio desarrollado a lo largo de más de diez años en el Rincón de Ademuz, una comarca española. Tras el estudio detallado de las técnicas constructivas locales y de los procesos de producción y de construcción, se ha dirigido la investigación al impacto que las intervenciones realizadas en los últimos veinte años han tenido en la arquitectura tradicional de la zona, con sus nuevos materiales, la composición y forma de los nuevos elementos aportados y la adaptación de la arquitectura a nivel funcional y estético a las nuevas exigencias. Se ha tratado de medir el impacto de estas intervenciones espontáneas para dirigir las o canalizarlas hacia una conservación más respetuosa y compatible con la arquitectura tradicional, extrayendo parámetros de intervención objetivos que permitan extender su aplicabilidad a otros ejemplos de arquitectura tradicional del resto del mundo.