**Session Track:** Heritage Conservation Technology and Philosophy
**Session Code:** CS06a

**Paper:** Monitoring and Analysis of the Thermal Performance of Replacement and Restoration Window Treatments

**Presented by**
Robert Score , AIA
Harboe Architects
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**Speaker(s) Biography**
Bob Score is a Project Architect at Harboe Architects in Chicago, Illinois with over fifteen years of experience in historic preservation architecture. He has work on the restoration of commercial and cultural properties throughout the United States. Mr. Score is active in the preservation field. He was chair of the Historic Resources Committee of the Chicago Chapter of the AIA from 2000 to 2002. He also was a Director of the Association for Preservation Technology from 2006 to 2008. Mr. Score is currently helping to found the Western Great Lakes Chapter of the Association for Preservation Technology. Mr. Score speaks regularly to various professional organizations and at conferences on preservation topics. Some of his recent projects include: Sullivan Center Cast Iron Restoration and Cornice Restoration, Unity Temple Preservation Master Plan, Marquette Building Cornice Restoration and Lafayette Building Renovation.

Brad Carpenter is a Senior Engineer in the Building Technology group of the Washington, D.C. office of SGH. Before joining SGH, Brad worked at Newport News Shipbuilding designing mechanical systems for nuclear submarines and aircraft carriers. Following graduate studies in preservation technology at Virginia Tech, Brad gained two years of experience with the Architect of the Capitol in Washington, D.C. where he managed numerous restoration and renovation projects at the U.S. Capitol Complex. During his seven years at SGH, he has participated in numerous projects involving investigation, repair and rehabilitation, and new design of building envelopes. Brad has investigated and designed repairs at numerous historic structures such as the US Capitol complex including the Library of Congress, House and Senate Office buildings as well as the New York State Capitol, The Renwick Gallery of the Smithsonian, the Old Medical School building at the University of Virginia as well as the culturally significant Leigh Street Armory in Richmond, VA.

**Abstract**
The Lafayette Building was built in 1940 to serve as the headquarters of the Federal Loan Agency and the Reconstruction Finance Corporation (RFC) in Washington DC. The building is listed on the National Register of Historic Places as a contributing structure in the 15th Street Historic District. It is also listed as a National Historic Landmark, as part of the World War II and the American Home Front theme.

The Lafayette Building still retains its 1200 original painted steel, double hung windows. As part of a larger building renovation project, Harboe Architects and Simspon Gumpertz and Heger designed and conducted analysis of two window treatment mock-ups at the Lafayette Building. The purpose of these mock-ups was to fully develop two alternative treatments for the most typical window condition at the Lafayette Building and then gather quantitative data about both treatment options. This information was used to identify the advantages and disadvantages of the two options and to recommend which window treatment should be included in the Lafayette Building Modernization. In addition, this project was designed to obtain a LEEDs Silver rating. The treatment of the windows and their thermal performance was an integral part of the sustainable design effort for this project.

One of the mock-ups included the restoration of an original steel double hung window with the addition of a new interior blast resistant storm window. The second mock-up included removing an original steel double hung window and replacing it with a new blast resistant, thermally broken aluminum window with insulated glass. The new window closely matched the original configuration, dimensions, profiles and sight-lines of the original window.

The completed mock-ups were tested for air and water infiltration. In addition, the thermal performance of the two window systems was monitored from March 2006 through July 2006 in order to compare the thermal performance of the two alternatives and to identify the potential for condensation at both systems.

After the construction of the mock-ups was completed, magnitude of estimated costs was prepared.

Analysis of the completed mock-ups and testing program identified that restoration of the original windows provided better thermal performance and lower project cost than the alternative replacement windows.

This presentation will present the restoration and replacement options that were considered and the testing and analysis program that was conducted to identify the expected thermal performance of the two options. It will also identify lessons that were learned by constructing and testing the mock-ups of the options. This presentation will provide analytical data that demonstrates that restored window treatments can be designed to provide better thermal performance than replacement widows at a lower construction cost.7

**Session Track:** Heritage Conservation Technology and Philosophy
**Session Code:** CS06b

**Paper:** A Comprehensive Windows Assessment

**Presented by**
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**Speaker(s) Biography**
Susan Turner is a licensed architect who has worked, lectured and published internationally in the field of Historic Preservation. She has a master of Architecture dgree from the Tehcnical University of Nova Scotia, and certified as a project manager with the Project Management Institute in 2003. Over the span of her 25 year career, she has worked on historic preservation projects in Canada, United States, and England. She has been passionate about old building since traveling to Europe in the 70s, and seeks to learn from other countries and practitioners.

**Abstract**
Windows: to replace, or not to replace, that is the question. While debates on the subject have been long and passionate, few unbiased comparison studies have been made to provide simple empirical information that can be used and assessed by an individual or client. The proposed paper presents the findings of a study to assess the repair of painted wood windows for an entire building, versus the client policy to replace all windows with new aluminum clad models as a matter of course within capital projects. In this renovation of an historic building to a LEED gold standard, the energy requirements were at odds with the retention of historic fabric. To provide unbiased data (as much as possible) upon which to make the decision regarding the windows, an evaluation study with physical mock-ups of identical openings will be conducted in April 2008. The process is as follows: 1) An existing window will be tested to provide a baseline air infiltration and R-Value. 2) An existing window will be restored, retrofitted with a double glazed unit, and completed with the upgraded wall system proposed for the entire project. The restored window will be tested. 3) The same restored window will have a storm window applied, and the assembly will be tested again. 4) A new replacement window will be installed with the upgraded wall system and will be tested. All work will be photo-documented, recording the existing conditions, the construction, the testing, and the final results. These mock-ups will address the proposed options of restoration versus replacement, with the storm window considered to protect the restored windows to minimize maintenance. The results of the testing, R-value simulations performed by a third-party testing agency will be recorded. In consultation with the client, the historic preservation agency, the funding agency, the architects, the engineers, the window suppliers, and the window restorers, evaluation criteria were developed, such as capital costs, operational costs, maintenance costs, and life cycle costing, and assessing other considerations such as renewable resources, off-gassing, embodied energy, land fill volume, hazardous materials disposal, use of local labor versus shipping-and-off-site-manufacture, historic value, appearance, reductions of available light etc. Based on a team assessment of those criteria, a decision will be reached. By the time this paper is presented, the data will be generated, and the client decisions will have been made. The results of the data and the evaluation process culminating in the client decision will be openly discussed with those present.7

**Session Track:** Heritage Conservation Technology and Philosophy
**Session Code:** CS06c

**Paper:** Sustainable Stewardship: Restoring a Historic Train Depot

**Presented by**
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QUINN EVANS | ARCHITECTS
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Ann Dilcher
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Ann Arbor, MI USA

**Speaker(s) Biography**
Maggie McInnis, AIA, LEED AP, an Associate at QUINN EVANS | ARCHITECTS, has been practicing architecture in the field of preservation for 17 years. She has built her career combining her interests in building and environmental preservation. She has been Project Manager for numerous sustainable preservation projects, including the Gold Certified S.T. Dana Building Renovations at the University of Michigan. Ms. McInnis holds a Masters Degree in Architecture from the University of Michigan.

Ann Dilcher, AIA is a Project Architect at QUINN EVANS|ARCHITECTS Ann Arbor office with substantial technical and historic preservation skills. In her eleven years with the firm, she has completed a wide range of building preservation and community planning projects. Before moving to Michigan, she was very active in the APT DC Chapter as newsletter editor and vice-president. She is now working to organize the new Eastern Great Lakes APT Chapter. Ms. Dilcher holds a masters degree in Architecture and a certificate in Historic Preservation from Texas A&M University.

**Abstract**
Pere Marquette Railroad Depot is located in Bay City, Michigan. Once a major stop for the Flint and Pere Marquette Railroad Company it is located in Bay City s central business district. Built in 1904, the depot remained in service until 1969, since which time it became vacant and a victim of vandalism and progressive deterioration. The building was listed in the National Register of Historic Places in 1982. The building was stabilized in anticipation of the 2006-2008 restoration by QUINN EVANS | ARCHITECTS.

This paper focuses on the restoration of the Depot using a basis of design founded in sustainable principles while rehabilitating its historic appearance. The foremost sustainable principle was recognizing the embodied value of existing materials and historic design. Secondly, The LEED credit system was referenced for design decisions. The decision to use durable, historically appropriate materials when replacement was called for and to rehabilitate materials that had serviceable remaining life were consistent with the values of sustainable design. For instance, rehabilitation of the wood double-hung windows, rather than replacement was elected. The wood was not deteriorated and had many years remaining life with proper refinishing. Efficiency was improved by introducing insulated glass in the historic sash.

Another example of sustainable stewardship was to rely on age-old benefits of solid masonry construction and the practical, original design of deep roof overhangs to optimize energy performance rather than introduce insulation on the inside of exterior walls or add new features to the shell like ceramic paint, exterior shading devices, and other green strategies.

Like many renovations the project encountered unforeseen conditions during construction that required the Design Team to make adjustments to the design. One on these situations involved the abandonment of the historic mosaic marble floor in the large Waiting Room. After being cleaned, it revealed concrete patchwork in numerous locations. Extensive loss of the marble led to the decision to install a new concrete slab with terrazzo finish, incorporating energy-efficient radiant heating in the slab. Importantly, the historic character of the building was not compromised and the new floor s green benefits reaped.

Because the Depot is located in the heart of Bay City s business district, the restoration and reopening of this gem positively affects the sustainability of the community and its economic stability, not to mention the environmental benefits of reusing developed land. The area has suffered from loss of business and community activity over the years. With the reopening of the Depot, residents and visitors find reason to venture to the once neglected area. It is interesting to find long-time residents supportive and nostalgic about the revitalization of a building from the past. Such a project can bring community together, in contrast to how a bulldozed structure can divide a community.

Preserving a historic structure for longevity and capitalizing on its inherent value mirror the goals of sustainable design. The Depot project demonstrates the validity preservation has to the sustainability movement.7

**Session Track:** Heritage Conservation Technology and Philosophy
**Session Code:** CS06d

**Paper:** Lasers as Practical Cleaning Tools for Architectural Materials

**Presented by**
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**Speaker(s) Biography**
Andrew Lins, for the past ten years, head of conservation at the Philadelphia Museum of Art; academic training in corrosion engineering, conservation, and art history.

Andrzej Dajnowski, since 1991 to 91 worked as a Sculpture Conservator for the Chicago Park District and the Art Institute of Chicago, where he was responsible for the entire collection of outdoor sculpture of the CPD and Ferguson Monument Fund; academic training in sculpture and conservation. He has directed his own business, Conservation of Sculpture and Objects Studio Inc., since 1991.

**Abstract**
LASERS AS PRACTICAL CLEANING TOOLS FOR ARCHTECTURAL MATERIALS.
Andrzej Dajnowski, Director of CSOS Inc.
Andrew Lins, Chairman, Conservation Department, Philadelphia Museum of Art
Adam Jenkins, Adam Jenkins Conservation Services

The concept of Laser emission was published in 1958, and the first laboratory demonstration of its feasibility was carried out in 1960. The initial application of a laser in the conservation field was reported in 1972. In the intervening 35 years, the potential of this tool has been studied extensively by conservators and scientists around the world. The beginning applications of lasers were limited to small artifacts, where the rates of treatment were typically very slow and often very frustrating due to equipment failures or limitations. Even into the 1990's, the notion of using lasers to clean buildings or large-scale monuments was considered infeasible and too expensive. During the past last decade, new kinds of lasers have become available and practical for use in treating many architectural materials. In the USA over the past five years, laser systems have been employed to clean large-scale bronze monuments and stone buildings, as well as glazed terracotta architectural elements easily damaged by traditional cleaning methods. Advances in laser technology now allow conservators to effectively clean severely stained and deteriorated surfaces without chemicals, without containment costs, and without post-treatment clean up. Comparing the cost of disposal of hazardous chemical waste generated by many traditional methods with the cost using lasers is often surprising. New developments in laser technology such as larger cleaning spot, development of systems using oscillating spots and of a wide variety of wave lengths, the implementation of fiber optic cables to transmit laser light, and the variety of laser systems to choose from make even very large projects possible using laser ablation processes. Even with its high initial purchase cost, current laser technology can achieve economical, safe, environmentally friendly cleaning for very complicated architectural surfaces.

This paper will discuss recent projects in Chicago (cleaning of exterior sand stone walls of Nickerson Mansion), Philadelphia (treatment of glazed terracotta elements of the neoclassical Philadelphia Museum of Art building exterior and bronze sculptures by A. M Calder at the City Hall Tower), Burlington, Iowa (treatment of Gen. Corse by Carol Rohl-Smith by Francis H. Parker bronze monument) and Milwaukee (treatment of Gen.E. B. Wolcott bronze monument), which demonstrate how laser systems have been utilized on large architectural structures. Laboratory studies of the effects of the ablation process on the surfaces cleaned will be presented, as will the

innovative use of analytical monitoring of in situ laser cleaning results to provide direct feedback to the treatment process.7