

THE Greening of Historic Properties National Summit



WHITE PAPER

(WORKING DRAFT)

*Pinpointing Strategies And Tactics
For Integrating Green Building Technologies
Into Historic Structures*

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Overview

Historic preservation efforts have provided many of America's most notable structures with new leases on life. Through initiatives that apply historic preservation standards developed by the Department of Interior in 1977, countless historic structures in large cities and small towns across the country have had their life spans extended by efforts that have staved off the harmful effects of time, environmental damage, deferred maintenance, poorly conceived urban redevelopment initiatives and shifting societal priorities. The benefits generated by these projects have been significant. Beyond simply preserving buildings and reversing the effects of decay, historic preservation efforts have:

- Encouraged large- and small-scale community renewal efforts
- Facilitated the rebirth of numerous downtown areas
- Provided opportunities to cultivate and strengthen community and regional pride
- Supported the development of new business opportunities
- Created opportunities for the collection of incremental tax revenues

Over the past 29 years, numerous historic structures across the country have been returned to their original appearance through the removal of aesthetically insensitive facades and structural updates, restoration and cleaning of original structural and ornamental features, repair or replacement of fenestration with original equipment or historically accurate replicas, and rehabilitation of building systems with appropriate new technologies that do not obscure or destroy the integrity of original floor plans or interior finishes. These undertakings have resulted in accurate preservation of America's strong and varied architectural heritage and continued confirmation of the relevance of regionally and nationally recognized architecture in day-to-day life.

The standards governing historic preservation projects have been questioned – or even disputed – by a number of groups throughout the years. One of the most notable, and perhaps most interesting, discussions in recent memory has involved the green building movement. Within the past 15 years, green building initiatives have challenged existing historic preservation standards with new approaches to building reuse, restorations, materials selection and system retrofits.

Designed to provide architects and building owners with a framework of energy-efficient and environmentally responsible building techniques, green building guidelines are quickly changing the face of both new construction and historic restoration. In addition to providing building owners with more creative approaches to building reuse and energy efficient design, green building guidelines are also encouraging the development of new strategies for recycled material application and integration of new structures with existing historic buildings. Most importantly, green building guidelines are encouraging architects and engineers to think beyond the confines of traditional construction and retrofit techniques, and are enabling building owners to specify, construct and own structures that truly fit their needs, both today and in the future.

Many professionals in the historic preservation and green building communities have recognized that the intersection of these two initiatives has the potential to generate a nearly endless array of positive results for all parties involved. At the same time, however, these same professionals have also found that joint projects have the potential to create points of friction between the two groups, due to a lack of flexibility between their respective standards and guidelines.

The Existing Situation

Three decades ago, the National Parks Service drafted the U.S. Department of Interior Standards for Historic Preservation. As written, these standards focus tightly on the accurate restoration of historic buildings to their original as-built states. This restoration approach entails cleaning and repairing materials whenever possible, rather than simply replacing with new components. The standards also champion the removal of unsympathetic or aesthetically offensive alterations that may have been added over the years. If original materials are damaged beyond repair or restoration and replacement materials must be used, it is mandated that historic preservationists use identical materials – such as stone, terra cotta, replica lighting fixtures, remanufactured wooden windows, etc. – as often as possible. Historic standards also demand that new building systems, including electrical service, HVAC, electronic and fiber optic cabling, security and fire protection components, be installed without compromising the appearance or integrity of interior surfaces, such as plaster or woodwork. Clearly, this requirement can pose a significant challenge, particularly in structures that do not have attics, basements or behind-the-wall access passages to house equipment or cabling.

Green building guidelines, on the other hand, encourage the incorporation of innovative building techniques utilizing newly created and recycled materials into new or renovated structures. Green building guidelines also mandate energy efficiency standards, and assume that state-of-the-art building, environmental and life safety control systems will be used as a matter of course. Integrating these materials and technologies into an existing historic structure, particularly those with solid-wall masonry construction, can provide significant challenges, and may bring green building advocates into direct conflict with accepted historic preservation standards.

The Fresh Approach To Common Ground

To overcome the hurdles between the historic preservation standards and green building guidelines, proponents of both agree that it is essential to reach a meeting of the minds on key areas of concern. After reviewing numerous projects undertaken across the country, both groups have pinpointed four key areas that frequently generate issues with items, such as project funding, tax credits, certification, designer and contractor selection, materials selection and application, construction planning and scheduling, and project management. The four key areas of common concern include:

- Envelope – the outer structure of a building, including roof, walls, windows, and foundation
- Lighting – natural and electric illumination methods, including lighting fixtures, fixture placement, electrical service requirements, and the use of exterior and interior windows and skylights
- HVAC – the systems used to heat and cool buildings
- Materials – the structural components and finishes used to build a structure, enclose it, and then complete the interior spaces

To address the specific concerns involving these key areas, and to encourage larger scale discussion of the integration of historic preservation and green building guidelines, the *Greening of Historic Properties National Summit* was held in Pittsburgh on October 30, 2006. The purpose of the meeting was to coalesce experts from both the green building and historic preservation movements to formulate common goals and guidelines for greening historic properties. It is hoped that the outcomes and recommendations from this meeting – which are detailed in this paper – could be embraced by both the United States Green Building Council and the National Trust for Historic Preservation, and subsequently be applied to projects by members of these groups, as well as by the general public.

Common Areas Between The Green Building and Historic Preservation Movements

While it is clear that the green building and the historic preservation movements each have their own sets of requirements and organizational goals, it is important to note the areas where both groups share common views.

Embodied Energy And Reuse Of Existing Resources

Historic structures required significant expenditures of both energy and natural resources to be constructed. Examples include:

- Stone that was quarried in order to create building blocks and architectural elements
- Iron ore and coal that was mined, processed, and then converted into steel in a highly energy intensive process
- Sand and gravel that was mined for concrete and that involved expending fossil fuels and compromising the natural landscape
- Substantial trees that were felled for wooden structural members, woodwork, and flooring

Both green building and historic preservation advocates agree that demolishing historic structures effectively wastes both the natural resources and energy expended to create the building. In fact, many components used to build historic properties represent high levels of embodied energy and offer excellent durability characteristics. In most cases, the effective lifespan of many materials used in historic structures extends far beyond that of most materials used in modern structures. Demolition also creates a wide range of recycling and disposal challenges for developers, landfill operators and communities. By reusing, restoring and adapting historic structures to the needs of today, society is able to effectively leverage the energy and resource expenditures of past generations, while minimizing waste and current energy and materials usage.

Conservation of Resources

With many historic structures, resources that were once inexpensive and in plentiful supply have been either entirely depleted over the generations or have increased significantly in price. An extensive array of building materials used in historic buildings – such as specific varieties granite and marble – are no longer available, as their original, naturally occurring deposits have been exhausted. In addition, the energy and labor costs involved in manufacturing construction materials and building a structure have skyrocketed over the generations. Looking at this situation collectively, green building advocates and historic preservation professionals agree that existing structures represent a significant investment in resources and that such investments should not be written off simply due to age or disrepair.

Preservation of Regional And Natural Cultural Heritage

Regional architecture is an important fiber in our nation's historic fabric. In many long-established communities, various styles of architecture speak to the historic presence of a city or town and to the wealth and success of its residents. Both green building advocates and historic preservationists share the belief that the importance of regional architecture must be acknowledged and should play a key role in determining appearance and placement of new structures built in established neighborhoods or communities. Frequently, historic structures exist in the cultural heart of a community where businesses and other cultural amenities exist. Reinvesting in these areas can help to mitigate suburban sprawl, maintain local economies and decrease the environmental and health costs of transportation by encouraging walkable communities.

Preservation Stimulates Local and State Economies

Throughout the last thirty years, numerous historic preservation projects have delivered significant financial benefits on both local and state levels. Historic preservation has breathed new life into dwindling downtown areas, stimulated interest in urban living, provided funding sources and the professional support needed to restore urban neighborhoods, and generated significant revenues by nurturing the development of small and mid-sized businesses and creating opportunities for the collection of tax receipts.

Adapting Existing Historic Structures To Current Societal Needs

For years, historic preservationists have advanced the cause of adaptive reuse of historically significant structures. Such reuse ensures the relevance of a structure and encourages ongoing maintenance and preservation. Green building advocates share this view, as adaptive reuse provides exceptional opportunities for architectural and engineering creativity without squandering existing investments in energy and resources.

Common Challenges Shared Between Green And Historic Audiences

While green building practitioners and historic preservationists do indeed share a number of common views, the two movements also share many challenges. Many of these challenges can slow progress on green/historic projects or can hinder acquisition of funding to complete them.

Lack of Clear, Coordinated Public Policy That Encourages Green/Historic Initiatives

Many leaders on the local, state and federal levels of government do not have a clear grasp on the benefits that can be generated by the greening of historic structures in their districts. For many government officials, these projects are more about aesthetics than energy conservation and the recycling of materials and existing structures. This mindset results in a weakened public support for green/historic initiatives and frequent battles over project funding.

Lack of Significant Public Investment In Green/Historic Undertakings

Rather than preserve and enhance existing structures with green technologies, numerous public officials favor new construction to address community goals. In many cases, there seems to be significantly more public relations value inherent in the announcement and implementation of new construction projects than there is in “fixing up” the historic structures in architecturally and culturally significant neighborhoods. As a result, public funding for construction frequently goes to projects that involve new construction.

Lack of Public Interest In Green/Historic Issues

The vast majority of the public knows little or nothing about green/historic initiatives. While the public may see the renovation of existing structures as positive for their communities, few members truly understand the benefits that come from integrating green building techniques into existing historic structures.

Growth of Urban Sprawl And Reliance On Disposable Architecture

The advent of expressways and increased reliance on the automobile over public transit systems has resulted in new developments being located further and further from the urban core or many metropolitan areas. As businesses move from older, historically significant urban structures to suburban buildings with life spans estimated in some cases to be less than 50 years, competition for tenants in inner city green/historic projects becomes increasingly fierce.

Inflexibility Between Existing Green Building Guidelines and Historic Preservation Standards to Support Building Re-use

Green building guidelines and historic preservation standards pose several areas of conflict for owners and developers of historic structures. Rather than try to mediate between the two distinct sets of regulations, many building owners will simply avoid areas of conflict altogether. The outcome is a less than perfect solution for both green building practitioners and historic preservationists.

Cost of Historic Restoration with Green Attributes Compared to New Construction

At this point in time, no good data is available to document the costs of green/historic projects compared to new construction. While the benefits from new construction projects may be fairly straightforward to estimate, green/historic projects typically must deal with issues such as demolition, remediation and retrofitting which can result in unanticipated costs and project overruns.

Cultural Focus On Short-Term Gains

Over the past 50 years, American culture has put more emphasis on short-term gains than long-term benefits. Funding organizations, building owners and tenants want to see returns from their green and historic restoration investments in the shortest time periods possible. Many of the new technologies do not have long-term track records, and may be difficult to justify when projects are specified

Challenges To LEED Standards Used To Rate Green Building Projects

The Leadership in Energy & Environmental Design (LEED) standards form the foundation of the rating scale used to assess the level of compliance with green building guidelines. LEED standards also determine the performance benchmarks for buildings equipped with green building technologies. These comprehensive standards assess every facet of a structure, from the foundation materials to roofing finishes. Green building certification points are awarded for compliance with green construction and technology techniques, as well as for the structure's energy performance attributes.

The Importance of Energy Efficiency

A primary concern with green building guidelines involves the weight given to compliance with energy efficiency benchmarks. While energy efficiency is a paramount concern in both new construction and historic restorations, it is often not possible to incorporate many energy-saving construction techniques in historic structures. For example, in established structures, particularly those in urban environments, it is nearly impossible to insulate a foundation without completely excavating the area around the structure. In addition, in masonry buildings with walls comprised of layers of brickwork, or in structures with exterior walls comprised solely of stone, there is essentially no way to install wall insulation without furring out interior walls and subsequently violating the standards set forth by the Secretary of the Interior.

Direct Conflicts with Secretary of Interior's Standards for Rehabilitation

Green building guidelines often cause concern for owners of historic structures, as many of the guidelines appear to be in direct conflict with the Secretary of Interior's Standards for Rehabilitation, which were developed nearly thirty years ago. A great deal of these conflicts may be attributed to the fact that much of the technology and many of the materials – particularly recycled materials – used in green buildings did not exist when the Secretary of Interior's standards were drafted. Areas of frequent conflict include the envelope of a building, lighting, HVAC systems and selection and application of materials.

Incomplete Data

To date, little data on the benefits generated by "greening" historic structures is available. Since many green building guidelines assume that certain building techniques and technological applications will be used, it can be difficult to measure the impact of green building initiatives on older buildings where such techniques and technologies have not been used or cannot be incorporated.

Issues with the Secretary of Interior's Standards

When the National Parks Service created the U.S. Department of Interior's Standards for Rehabilitation in 1977, great attention was focused on developing clearly defined standards that spelled out what was – and what was not – acceptable in a historic preservation project. Compliance with the standards qualifies owners of historic properties to apply for public and foundation funding to help underwrite the costs involved with their historic restoration projects.

Since their creation nearly thirty years ago, the standards have remained essentially unchanged. While consistency of the standards establishes benchmarks for quality, accuracy and compliance, it also creates a number of challenges for owners considering the integration of green building technologies into their historic structures.

The following are some of the notable challenges faced by green building practitioners when encountering Secretary of Interior's standards.

Lack of Flexibility To Accommodate New Technologies and Changing Preferences

Green buildings routinely incorporate a wide array of resource-saving technologies and create new and innovative environments for users of the spaces. The advent of high-tech building systems, coupled with the market's growing preference for open, flexible floor plans has the potential to create direct conflicts with historical preservation standards. The inability to integrate current technologies into historic structures without disturbing interior finishes, coupled with the constraints presented by having to closely adhere to existing floor plans to preserve the historic integrity of the structure, can make the greening of a historic building considerably more costly, if not entirely prohibitive.

Inflexibility with Replacement Materials

Preservation standards are particularly stringent with it comes to the use of replacement materials in historic structures. Designed to encourage the restoration and conservation of original building features, the standards mandate that replacement materials, such as stonework, windows and lighting fixtures have the same material, aesthetic and functional qualities as the component originally specified for the project. In the time since the standards were drafted, a nearly endless array of new building materials has been introduced to the marketplace. In addition, a growing selection of recycled products has been created to address a variety of application needs. Unfortunately, nearly all of these new products – such as synthetic slate and terra cotta, high-performance windows comprised of thermo panes and composite framing, and high-efficiency lighting – are not viewed as compatible or acceptable for use in historic restoration projects.

Difficulty in Retaining Interior Finishes While Incorporating New Building Control Systems

Many historic buildings were built to accommodate mechanical systems that are considered primitive by today's functional, safety and comfort standards. Gravity heating systems, non-existent or inefficient cooling systems and substandard electrical, fire protection and plumbing systems are more often than not the norm in older, non-updated structures, and are well-known for their inefficiency and ineffectiveness. Integrating new HVAC systems and retrofitting old wiring and plumbing often requires the gutting of an interior of a structure to reach or create mechanical spaces. Unfortunately, this creates a direct conflict with historic standards that mandate the retention of existing interior finishes the replacement of damaged surfaces with like materials, and the invisibility of any new systems or equipment.

Finding Professionals Interested in Integrating Green and Historic Preservation Standards

Without a doubt, it is considerably faster and easier to incorporate green building technology into new structures that pose significantly fewer design and construction obstacles. It is also much less difficult to adhere to historic preservation guidelines by installing old-style building systems, rather than trying to embrace and integrate new green technologies into a historic structure. It is also clear that if an integrated approach is not taken, both historic preservationists and green building advocates fail to take advantage of the substantial benefits the other group offers.

The challenge facing the marketplace involves finding historic preservationists who subscribe to green building concepts, and green building professionals willing to work within the framework of the Secretary of Interior's standards. While there are a growing number of professionals who recognize the importance of integrating both approaches in their work, there is still a shortage of those who can effectively design to accommodate both disciplines.

Common Ground Moving Forward

While there are challenges to overcome, significant benefits can be garnered through the greening of historic properties. From a joint perspective, the positive outcomes that can be created when historic preservationists and green building practitioners partner closely on projects include:

- Innovative reuse of historic structures
- Increased relevance of historic structures to current building users
- Stronger demand for historic structures located within urban areas
- Significantly higher levels of operating system efficiency
- Markedly lower building operation costs
- Preservation of community and natural resources
- Reduction in solid and energy waste
- The potential for significant revenue generation through rents and sales
- Bolstering of the local economy through improved tax and business bases

To tap these benefits, it is necessary to develop flexible policies and creative approaches to new technology integration, materials use, retention of existing materials, integration of new design techniques and the development of innovative protocols.

Finding Points For Cooperation

On October 30, 2006, historic preservationists and green building practitioners gathered in Pittsburgh, Pennsylvania, for a summit meeting, *The Greening of Historic Properties*. At this meeting, more than 75 professionals drawn from the historic preservation, green building, architecture, engineering and government agency communities participated in a series of roundtable discussions to formulate ways preservationists and green building practitioners could work together to overcome challenges in the topic areas of HVAC, envelope, lighting and materials. A subset of attendees also worked on the development of policy initiatives to encourage more effective partnerships between preservationists and green building professionals. Workshop participants were asked to focus their attention on pinpointing three key areas of improvement in their respective topics, as well as to formulate tactics to bring about change in these key areas.

Reaction To The Proposed Strategies

At the **National Preservation Conference, *Making Preservation Work***, held in Pittsburgh, Pennsylvania from October 31 through November 5, 2006, an intercept survey incorporating the recommendations and findings of the roundtable discussions was conducted in the convention hall. The 202 attendees surveyed were asked how much they agreed with the recommendations and tactics. For purposes of this report, a 100-point index scale for each item was created, with 100 points representing very strong agreement and 0 points representing very strong disagreement (i.e., strongly agree=100, agree=75, neither agree nor disagree=50, disagree=25, strongly disagree=0). The recommendations and tactics from each of the summit roundtable groups, and the results from this survey, follow:

HVAC

In the area of HVAC, two roundtable groups discussed the challenges of incorporating state-of-the-art HVAC systems into historic structures.

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| 1. Get to know your client <i>and</i> building | 93.1 |
| • Conduct and sponsor more HVAC research (produce tech reports—develop more data on embodied energy and life cycle analysis)..... | 85.4 |
| • Create a system for collecting case studies on new and old buildings..... | 88.5 |
| • Use evidence-based research and development for HVAC decisions..... | 87.4 |
| 2. Capitalize on the opportunities a building has..... | 91.9 |
| • Apply passive systems and properties..... | 87.4 |
| 3. Consider separating ventilation from heating and cooling | 77.3 |
| • Use radiant and displacement ventilation..... | 79.1 |

Envelope

The roundtable group on envelope issues touched on a number of subjects, including the important topics of windows and roofing.

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| 1. Improve understanding and analysis of historic materials assemblies, then incorporate performance of historic assemblies into energy modeling tools..... | 90.6 |
| • Windows/walls: Choose 15 assemblies to test and publish performance..... | 80.3 |
| • Windows: develop full methodology for full Life Cycle Cost Analysis (LCCA) of window restoration vs. replacement windows..... | 87.7 |
| 2. Show mutual respect of historic preservation <u>and</u> green building guidelines | 93.5 |
| • Roofs: When not visible, green roofs, white roofs and photo-voltaic panels are acceptable.... | 83.6 |
| • Under certain circumstances, photo-voltaic panels and wind turbines are acceptable, as long as they are reversible and are located on non-primary elevations or accessory buildings..... | 78.3 |
| 3. Undertake additional steps: | |
| • For small projects, create a list of prescriptive energy efficiency measures | 85.7 |
| • Work with USGBC to develop embodied energy technology for credit in LEED..... | 83.9 |
| • Preservation community should engage with USGBC in the development of new LEED “V3” | 84.0 |

Lighting

In the area of lighting, the roundtable group focused their discussions on the deployment of various lighting technologies, the role of natural light and the integration of technology.

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| • Take advantage of natural attributes of historic buildings (high windows)..... | 94.7 |
| • Coordinate lighting with the rest of the design team so interior finishes are properly lighted..... | 89.0 |
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| 3. Incorporate modern technology, such as bulbs, fixtures, and lighting control technology (new products) appropriate for historic properties | 89.0 |

Materials

The materials roundtable group focused their efforts on the development of educational programs, product definition and certification, and research.

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| 1. Educate the public, practitioners and architecture and vocational school students | 92.1 |
| • Reach out to major distributors by advertising successes of green buildings..... | 89.1 |
| • Sponsor apprenticeships in restoration manufacturing and construction..... | 90.0 |
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| • Educate on the health impact of materials..... | 89.6 |
| 2. Define and certify products..... | 87.1 |
| • Materials must become readily available..... | 88.0 |
| • Build a network (provider/consumer) to raise awareness of products and reuse opportunities..... | 89.8 |
| • Materials must be ranked comparably..... | 86.3 |
| • Products must be available and suitable for the lay audiences..... | 86.4 |
| • Establish a point system for building materials tied to historic restoration..... | 85.5 |
| 3. Gain more information on life cycle costs of green material appropriate for historic preservation..... | 90.2 |
| • Implement ASTM standards and testing of cleaning products..... | 82.5 |
| • Consider maintainability and sustainability of materials..... | 88.3 |

Policy Initiatives

The policy roundtable groups focused its attention on developing guidelines, increasing knowledge and developing meaningful tools.

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| 1. Develop application guidelines and standards for sustainable design and historic preservation..... | 93.0 |
| • Encourage early consultation with designers and materials manufacturers to develop products that address historic preservation requirements..... | 92.4 |
| • Increase national awareness through development of policy briefs on green issues, cyclical maintenance, HVAC and energy use..... | 90.3 |
| • Create federally certified product ratings..... | 82.5 |
| • Develop a list of current policy initiatives..... | 85.7 |
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| • Develop case studies to demonstrate sustainable preservation..... | 89.6 |
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| 3. Implement life cycle assessments and embodied energy elaboration tools..... | 87.6 |
| • Develop a multifaceted approach for innovation (government, corporate developers, foundations) | 86.8 |
| • Emphasize the value of energy embodied in existing structures through all levels of education..... | 90.4 |
| • Create user-friendly language for life cycle assessment and embodied energy credit for better project marketability | 91.0 |

Conclusions

To bring about meaningful change and unity between historic preservationists and green building practitioners, it is essential to maintain open and constructive dialogs that will support the development of mutually beneficial and effective guidelines, ratings and construction strategies. Each group brings significant value to the table, both for building owners and users, as well as communities at large. This is confirmed by the survey results, which consistently indicate strong support for these initiatives.

By pursuing the tactics discussed at the *Greening of Historic Properties* summit and documenting their outcomes, it is clearly possible to implement the recommendations that will leverage the power and potential of both the historic preservation and green building movements.