

Historic Preservation and Green Building: A Lasting Relationship

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Photo: Peter Vanderwarker

Trinity Church in Boston is an international architectural landmark built in 1877. A major rehabilitation of the building employing both historic rehabilitation and green building practices was completed in 2005 under the leadership of Goody Clancy.

It's a common saying in the green building movement that "the greenest building is the one that isn't built." This ideal may be great, but with growing demand in many parts of the U.S.—and the world—for buildings, it's often ignored. Meanwhile, millions of buildings already exist but are not being used to their full potential, despite their historic character and environmental features. Built for a purpose that no longer exists or has changed and often lagging behind today's performance standards, those buildings are strong candidates for rehabilitation.

When rehabbing a historic property, taking an unmoving stance as either a green building advocate or as a historic preservationist can lead to considerable differences with the other camp. There is, however, a growing desire within both communities to align their agendas, as demonstrated by several recent events. Participants in the Greening of Historic Properties National Summit in Pittsburgh in October 2006 contributed to a ground-breaking white paper that is currently circulating as a draft among the National Trust for Historic Preservation, the U.S. Green Building Council (USGBC), and The American Institute of Architects (AIA). That initiative comes on the heels of an increased focus on sustainability by the Association for Preservation Technology International and USGBC's interest in applying its LEED® Rating System to historic properties.



Photo: Pittsburgh History & Landmarks Foundation

Participants in the October 2006 Greening of Historic Properties National Summit in Pittsburgh assembled for a reception at the Heinz History Center.

In the midst of this activity, a new saying has been going around: “The greenest building is the one that is already built.” This article examines that claim, looking at the most common historic preservation standards and at some of the challenges and opportunities that owners, designers, and contractors face in handling historic property. Several case studies address common areas of concern, including energy efficiency, and recommendations follow.

Historic Building Rehabilitation Standards

A nationwide system in the U.S., from the federal level down to the state and local levels, works to protect historic buildings—and to offer incentives for building owners to take on major rehabilitation projects.

The National Register

At the federal level, the National Park Service (NPS), part of the U.S. Department of the Interior, oversees the National Register of Historic Places. Authorized under the National Historic Preservation Act of 1966, the National Register is the official federal list of districts, sites, structures, buildings, and objects deemed worthy of preservation. The register includes all National Historic Landmarks and historic sites administered by NPS. A building may be included in the register either individually or as part of a complex of buildings or a historic district.

Buildings on the National Register are generally at least 50 years old and are associated with historic people or events; significant for their architecture, craftsmanship, or design; or, as with an archeological site, of value for historical research. With about 80,000 listings, the National Register includes well-known national and state landmarks as well as properties of local renown. According to Sharon Park, FAIA, chief of technical preservation services for NPS, with many of those listings encompassing multiple buildings, there are about 1.3 million National Register buildings, the majority of them in private hands.

The National Register is first and foremost a tool for *recognizing* historic properties—not for mandating how they must be treated. A listing helps protect a property from adverse affects of federally funded projects but does not, in itself, restrict private property owners in any way. However, state and local regulation may add restrictions to a listed property. State Historic Preservation Offices (SHPOs, often pronounced “shippees”) were federally mandated to carry out provisions of the Act of 1966. SHPOs in each of the 50 states have several responsibilities, including locating and recording historic resources, nominating historic resources to the National Register, and providing technical assistance and consultation. Some states have also enacted state historic registers, which come with their own regulations, and many municipalities recognize local historic sites or districts. These programs often go beyond federal regulation in restricting what private property owners can do.

According to Ralph DiNola, Assoc. AIA, a principal with Green Building Services, Inc., in Portland, Oregon, “a lot of people misinterpret National Register status. Because a project is listed, they feel that they can’t do certain things to that property,” he said. Noting that for private property owners, state or local regulation is likely to be more restrictive than federal regulation, DiNola recommends contacting the local planning office and the SHPO to see if a property is listed nationally or locally and if local historic property regulations are relevant.

In addition to identifying and recognizing historic properties, the National Register is relevant to building owners and developers because of the Federal Historic Preservation Tax Credit. Owners of a National Register property who follow certain standards for rehabilitation while going through a three-part application process are eligible for a federal tax credit equal to 20% of the construction cost. The Internal Revenue Service (IRS) has a set of financial and ownership requirements for obtaining the credit; most significantly, the construction cost must exceed the building’s cost basis and the building must be income-producing.

According to Park, those restrictions mean that most projects earning the tax credit are substantial renovations. “Most projects are in the range of \$250,000 to \$5 million of capital improvement,” she said, noting that the minimum project size is \$5,000, and one of the largest recent projects, San Francisco’s Ferry Building, was valued at \$94 million. Despite the restrictions, including some complex timing requirements, the program is popular. Each year about 1,200 projects are proposed, and about the same number are completed. “The capital investment in the completed projects is around \$2.8 billion of private-sector investment every year,” Park said.

A 10% tax credit is available not only to National Register properties but also to any property built before 1936. (Buildings older than 50 years are generally eligible to be called “historic”; legislation setting the 1936 date was passed in 1986 and has not been updated.) According to Park, this credit is obtained relatively automatically through income tax filing, but, due to eligibility limitations by the IRS, it is not very popular.

The Secretary's Standards

The major standards document in the U.S. preservation community, promulgated by NPS since 1977, is the Secretary of the Interior's Standards for Rehabilitation. The Secretary's Standards, as they are commonly known (actually one of four distinct Secretary's Standards—see below), were originally developed to help determine the appropriateness of proposed work on registered historic properties. The standards are used to determine if a project qualifies as a Certified Rehabilitation eligible for the 20% federal tax credit. The standards also guide the work of federal agencies, and historic district and planning commissions across the U.S. have adopted them. Widely respected in the preservation community, their significance transcends the individual programs that require them.

The standards define rehabilitation as “the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values.” The standards are summarized in ten points, and respecting the “historic appearance” and “character-defining features” of a historic property is mentioned again and again. Along with the Secretary's Standards, the NPS publishes an application guide, available on its website, dealing with various aspects of rehabilitation, including considerations for masonry, wood, and metal; roofs, windows, entrances, porches, and storefronts; structural systems, interior spaces, and mechanical systems; site and setting; and energy, new additions, accessibility, and health and safety. The standards outline each of these topics with *recommended* and *not recommended* practices and photos representing both scenarios. Summarizing the Secretary's Standard for rehabilitation, Park said, “If you're going to make modifications to upgrade a building or modernize certain parts of it, do it consistently, don't rip out any of the really good stuff, and preserve as much as possible.”

Three other Secretary's Standards guide preservation, restoration, and reconstruction projects. The standard for *preservation* is the most protective of existing features. Park summarized it as: “You keep everything you've got,” including existing contemporary features, “and you keep it going.” *Restoration* means taking a building back to an interpretation of a certain historic period. “That's a pretty aggressive standard,” Park said. “You're ripping off a lot of historic fabric that some people would consider significant.” Reconstruction of a lost building element can occur under rehabilitation standards, but the *reconstruction* standards apply to documented reconstruction of a whole structure, as deemed necessary for interpretive purposes.

The Secretary's Standards for rehabilitation are by far the most commonly applied, especially in private projects, said Park, but they are often misunderstood as being very rigid. “There's inherent flexibility in the standards,” Park told *EBN*. “You can make modifications as long as they are consistent with the character of the building,” she said, noting, “It's a challenge to architects to have a sense of design that's appropriate to the building.”

Applying the Secretary's Standards

In practice, adaptive reuse—or maintaining an old building for a new function without damaging its “character-defining features,” in the language of the Secretary’s Standards—gives owners and architects a great deal of latitude. Two LEED-certified projects in Portland, Oregon, show some opportunities—and pitfalls—and illustrate the amount of flexibility available in historic rehabilitation projects.



Photo: Green Building Services, Inc.

The Gerding Theater, the former Oregon National Guard Armory, built in 1891, became the first building on the National Register of Historic Places to earn LEED Platinum certification following a major renovation completed in 2006.

With thick masonry walls and more gun-slits than windows, the Oregon National Guard Armory, built in 1891, might not seem like a good candidate for green rehabilitation. The developer, Gerding Edlen Development Company, LLC, wanted to make the building into a home for Portland Center Stage. That required a 600-seat main stage, a 200-seat studio theater, dressing and technical areas, reception space, and theater offices—in a National Register landmark previously encompassing none of those uses. Reopened in October 2006, the 55,000 ft² (5,100 m²) building provided those spaces, earned the 20% federal tax credit, and became the first National Register building to achieve LEED Platinum certification.

To meet the need for theater space—and volume—that was not provided in the existing building, the project team excavated the building to below the level of the original basement. Even as the floorplan went through significant changes, a large oculus (an eye-shaped opening) in the second-floor floorplate maintains views from the first floor to the exposed roof trusses that were identified as a “character-defining feature.” The distinctive exterior appearance of the building was not altered, apart from the addition of several skylights, which were part of the historic design. The newer spaces are distinctly contemporary in appearance—and in function, with excellent lighting, air quality, and energy efficiency (modeling predicts a 30% improvement over ASHRAE standards), which all contributed to the LEED rating. NPS’s approval of the changes as required for the 20% tax credit demonstrates how the Secretary’s Standards provide flexibility for a building to be an evolving artifact.



Photo: Melissa Tatge, courtesy Ecotrust

A former warehouse, the Jean Vollum Natural Capital Center in Portland, Oregon was rehabilitated and LEED-certified in 2001.

Also in Portland, Ecotrust, a nonprofit supporting sustainability in the Pacific Northwest, took a similar path of adaptive reuse and rehabilitation of the Jean Vollum Natural Capital Center, a National Register building. (Published by Ecotrust, *Rebuilt Green* discusses the project in detail—see review in EBN **Vol. 13, No. 7** and case study in *BuildingGreen Suite*.) The project rehabbed a warehouse, built in 1895 to store building supplies and a classic example of Richardsonian Romanesque style architecture. Ecotrust added space and earned LEED certification, but it had less success convincing NPS that it had followed the Secretary's Standards.

The project, completed and certified LEED Gold in 2001, transformed the neglected building into 70,000 ft² (6,500 m²) of retail space and offices. In the rehabilitation, steel towers erected alongside the building serve a dual purpose as seismic support and fire stairs. The towers, located on an exterior wall that is less “character-defining” than the other façades, were added to prolong the life of the building and improve its safety. They would likely have been approved under the Secretary's Standards, said DiNola. A penthouse addition, however, changes the appearance of the whole building and was a key factor in preventing the building from earning the 20% federal tax credit (it earned the less rigorous 10% credit). Better communication with the historic preservation authorities might have resulted in changes to the design that would have been more palatable historically, said DiNola.

What's Green About Historic Buildings?

Performance-based energy-efficiency benchmarks are usually expressed in terms of improvement over relevant standards. New buildings typically accomplish these benchmarks using technologies, products, and materials that weren't available when historic properties were built. Also unavailable, however, were air conditioning and other crutches that discourage architects from using passive, energy-saving design strategies. The Secretary's Standards can bar changes that a green project team might be inclined to make, but teams should think twice anyway before scrapping the old strategies.

Old buildings and sustainability

Rather than rushing into a building project with preconceived notions of what needs to happen, many professionals working on historic buildings advocate for a gradual approach. Jean Carroon, AIA, principal for preservation at Goody Clancy in Boston, said that when her firm rehabilitated Trinity Church, an 1877 masterpiece by Henry Hobson Richardson (the only American architect, says Carroon, to have a major architectural style, Richardsonian Romanesque, named for him), she approached the building as an artifact. “Our first mandate was to do no harm,” she said. The firm monitored temperature and humidity conditions in the building, which were a concern relative to the interior artwork, for a year before beginning construction.



Photo: Peter Vanderwarker

In the historic rehabilitation of Boston’s Trinity Church, a shallow undercroft space was expanded into a 13,000 ft² (1,200 m²) meeting and activity space using contemporary materials and designs.

Matthew Bronski, senior staff engineer at Simpson Gumpertz & Heger, Inc., in Boston, said that besides respecting the historic features of a building, there are good reasons for treading lightly. “I think of these older buildings as laboratories for how to do things sustainably. They tend to be simpler, more long-lasting and durable,” he said. “One hundred years ago we didn’t automatically reinforce all our slabs-on-grade with mesh or rebar. Having those examples is helpful from a design standpoint.”

Mark Webster, a senior staff engineer who works with Bronski, agreed: “There are technical benefits of traditional building design and materials that aren’t always recognized or appreciated today.” As an example, Webster points to windows. “On old windows you tend to get old-growth lumber that holds up well,” he said. While acknowledging the environmental benefits of lower-quality, finger-jointed wood commonly used in today’s windows, Webster said, “Their durability is poor. Once they weather, they start opening up.” Based on his experience with modern windows, Webster said, “The bulk of them will go in 20 years.” Although new windows, or insulated glass units (IGUs), boast double- or triple-pane sealed glass with high energy efficiency, Webster says that they just don’t make them the way they used to. “I worked on a job where we rejected 25% of the IGUs that showed up on the site because of voids or defects in the hermetic seal.”

Webster acknowledged many problems with older buildings, too. “Many older buildings don’t perform well in earthquakes,” he said. “You can generally retrofit them, but there are going to be some extra costs there.” Depending on the era of a building and

construction type, it may not be very well built. “Early 20th-century buildings with steel frames embedded in masonry often have corroding structural steel and can be really costly to rehabilitate,” he said. With more recent buildings up for consideration as historic with every passing year, building professionals will find greater diversity and greater challenges as buildings based on newer technologies need historic rehabilitation.

Embodied energy in old buildings

Despite the environmental qualities of many older buildings, concerns about energy efficiency are common. “There’s an incredible bias throughout the green building agenda that if you want to achieve energy efficiency in a building, you have to start over,” said Michael Jackson, FAIA, chief architect for preservation services at the Illinois Historic Preservation Agency.

Jackson, like many in the historic preservation community, touts the *embodied energy* of historic buildings as a way of balancing the desire within the green building community for *operating energy* efficiency improvements that may be difficult to achieve. According to Jackson, in order to realize life-cycle savings in a new building, compared with renovating an old building, “the timeframes you need are longer than the predictable life of some of the buildings being built today.”

Jackson supports his view with studies claiming that the embodied energy associated with upgrading or replacing old buildings would take three decades or more to recoup from reduced operating energy in more efficient new or renovated buildings. The study that *EBN* examined, however, appeared to significantly overstate its case because it failed to differentiate between site energy and source energy for building operations. The study also used outdated embodied-energy numbers rather than current information from environmental life-cycle assessment (LCA) databases.

Many historic buildings contain materials and features that are valuable from several perspectives: the energy and materials expenditure that reuse of existing materials displaces; the architectural features and workmanship that may be impossible to replace; and the societal value of maintaining artifacts. LEED for New Construction awards up to three points for building reuse, and, although numerous historic projects have been awarded the first of those points, for partial reuse of existing walls, floor, and roof elements, buildings are rarely awarded all three points, which require nearly full reuse of the shell and at least 50% maintenance of interior nonstructural elements. Some historic preservation advocates suggest that LEED should be amended to award more credits for building reuse, and especially for reuse of historic buildings. At the same time, some in the green building community argue that the historic value of existing buildings and materials should not be confused with their environmental value. In the end, practical, case-by-case considerations will take precedence. Does the owner have a use for the existing building? Does the building have one foot in the grave, or is it structurally sound? Does the economic benefit of reusing the existing building—which

may include grants or other incentives—balance the cost of rehabilitation? Do the client’s goals support preserving historic attributes of the building?

Operating energy

Whatever the reason for reusing a historic building, reducing energy use is usually at the top of the rehabilitation agenda. Fortunately, neither preservationists nor sustainability advocates believe that older buildings necessarily are, or need to be, energy hogs. “In doing energy modeling on an older building, you might find it’s better than you thought it would be,” said Bronski.

Marc Rosenbaum, P.E., of Energysmiths in Meriden, New Hampshire, has worked on several historic buildings for educational institutions in New England, and he said he has a strong message for his clients: “Here you’ve got a building that has served this institution and community for a century. Given how we are entering a vastly different resource climate, how do you make this building serve the community for another century?” Rosenbaum added, “If you preserve a historic building as an untouched object, then you can’t use it anymore.”



Photo: Bruner Cott & Associates

Harvard University in Cambridge, Massachusetts recently renovated its Operations Services headquarters building, improving its energy performance dramatically by installing new windows and insulating the roof and the inside of the masonry walls.

In Cambridge, Massachusetts, Rosenbaum consulted on the Harvard University Operations Services headquarters building on Blackstone Street. In this building, Rosenbaum focused on improvements to the building envelope, taking on the contentious issue of whether and how to insulate the building’s load-bearing brick walls. With monolithic masonry load-bearing walls, many building-science professionals believe that adding insulation is problematic. Adding insulation to a wall tends to reduce its drying potential by reducing movement of air and heat through and around the wall. These walls do not have the protection of the drainage plane common on today’s brick veneer walls, and, with increased exposure to freeze-thaw cycles with insulation added to the interior of the walls, they can degrade. “You’d love to insulate them on the outside,” said Rosenbaum, which would allow the introduction of a drainage plane and insulation from freeze-thaw cycles, “but if it’s a historic building, this is in direct conflict with the preservation intent.”

At Harvard, Rosenbaum and building scientist John Straube, Ph.D., of the University of Waterloo, Ontario, convinced the project team to insulate from the inside with sprayed, open-cell urethane foam. Recognizing the reduced drying potential of this arrangement, Straube advocated for a preventive approach, which involves keeping the brick dry from the outside with careful detailing of flashing, windows, and parapets so that there is no concentrated wetting of the wall. The team also installed rigid foam insulation across the building's low-slope roof and energy-efficient replacement windows (the windows had been replaced previously in the early 1990s, reducing historic preservation concerns). The project is aiming for LEED Gold certification with targeted 30%–35% energy savings over ASHRAE standards. The building is on the National Register, so the Secretary's Standards were used, but as a tax-exempt nonprofit, Harvard did not seek the federal tax credit.



Photo: GBH Studios

Built in 1893 and part of a National Register historic district in South Royalton, Vermont, Debevoise Hall recently underwent a major rehabilitation that made it relatively energy efficient while employing historic standards.

An educational building in central Vermont is another exemplar in energy performance in historic structures. Debevoise Hall at Vermont Law School in South Royalton, Vermont, was built in 1893 as the town's first central "graded school." The wood-framed building with a distinctive belfry is a town landmark, part of a National Register historic district, and a striking example of Queen Anne-style architecture.

Among the more challenging aspects of Debevoise Hall from a green and a historic standpoint were the original double-hung wooden windows, which, according to Rosenbaum, who served as a consultant to the \$6.5 million renovation and expansion project, were "in terrible condition." The windows were restored, however, complete with sash weights. The building team installed fiberglass interior storm windows with low-emissivity, argon-filled glazing and dealt with the air gap containing the sash weights by adding insulation to both sides of the weights. Due to structural problems and general deterioration, most areas inside the building required a total gut, making insulation relatively easy. The work paid off, said Rosenbaum, with air leakage being reduced by four-fifths, even with a 26% increase in the building's area. Total energy use could not

be compared before and after construction, but energy use for heating dropped by two-thirds.

Although, like Harvard, Vermont Law School did not seek federal tax credits for its work, Lyssa Papazian, a historic preservationist based in Putney, Vermont, was retained for the job. “My job was to ensure that it met the Secretary’s Standards, and I feel that it did,” she said. The building’s most important historic feature, its exterior, was maintained. Historic preservation proceeded on the interior with a “zone system,” Papazian said. Two first-floor classrooms retained their many historic features. That proved more difficult elsewhere due to the need for structural work as well as an unexpectedly broken historic fabric, with renovations having been made over the years that weren’t sensitive to the building’s history, but key features were maintained wherever possible. Cautioning that “the devil’s always in the details with preservation projects,” Papazian noted that, despite carefully thinking through the installation of the storm windows, their visual impact on the original windows from the inside looking out was higher than expected.

Debevoise, the Harvard Operations Services headquarters, and numerous other green historic rehabilitation projects demonstrate that older buildings can compete with new buildings, even high-performing new buildings, in terms of energy performance.

Opportunities and Challenges

Old and historic buildings are often environmentally friendly, and they contain opportunities for becoming greener. The sidebar provides recommendations for teams working on historic rehabilitation projects. It is intended as a selective, not exhaustive, list. Resources such as *EBN* and USGBC provide many more ideas for environmental measures, such as reducing stormwater runoff and potable water use, that design teams are implementing on historic buildings.

Sidebar:

Considerations for Green Building and Historic Preservation

Green and historic conflicts



Photo: Jim Brown, Atomic Ranch, Inc.

The range of historic buildings grows with every passing year. This 1955 ranch in Portland, Oregon illustrates the “atomic ranch” home style, which has its own preservation movement, exemplified by a magazine of the same name.

Rehabilitation standards generally encourage the preservation of existing materials or replacement of them with similar materials that don't disrupt a building's character-defining appearance. Recycled-content and otherwise green products that are increasingly available for roofing, cladding, and decking are unlikely to be approved under current rehabilitation standards.

But even in areas where green and preservationist agendas come into direct conflict, compromise is possible. According to Walter Sedovic, AIA, who has worked on projects combining preservation and green building, many of the earliest incandescent light fixtures showed off dozens, if not hundreds, of bare bulbs, which at the turn of the twentieth century were a “fabulous new sight.” Those fixtures can use an enormous amount of energy, yet in many cases it would be historically inappropriate to remove those fixtures or to retrofit them with compact fluorescent bulbs.

Faced with massive chandeliers in the Eldridge Street Synagogue restoration project in New York City, Sedovic engineered a compromise. “We've outfitted it with

incandescents that are period appropriate, and we've incorporated a dimmer on that and many other light fixtures like it," he said. "We have the ability to present the original light fixtures using far less energy than the first time around." Modern energy-efficient fixtures were installed to supplement that light, and the incandescent lights were wired to come automatically to full brightness in an emergency, fulfilling the need for emergency lighting. "Elements should reflect the time in which they were conceived and manufactured," said Sedovic, explaining the choice, consistent with the Secretary's Standards, to install unobtrusive contemporary fixtures alongside historic ones. Similar challenges—and opportunities to compromise—await architects in the bathroom. "If you look at most early sanitary plumbing fixtures," said Sedovic, "you'll see the piping is oversized, the faucets need to be shut off by hand, the urinals can be so large you can step into them and the toilet tanks are massive 8–12 gallon (30–45 l) affairs." Rehabilitation approaches differ even among preservationists. Said Park, "In most cases, bathrooms and kitchens are considered areas where modernization goes on," unless "you have something that is really extraordinary." Sedovic agreed, but recommended trying to maintain historic fixtures, reducing waste by keeping them in good working condition, considering retrofits that can reduce their water use, and replacing potable water with rainwater or graywater.

The integrated design process has been established as an important component of green building, and examples like these demonstrate that the innovative approaches reached through that kind of process are needed just as much, if not more, in green historic rehabilitation. In fact, as in the case studies already discussed, teams need to involve historic preservationists as well as building-science professionals. The shortage of professionals who can navigate both green building and preservation has been an obstacle in the advancement of this field. There's nothing like learning on the job, however—discussing the success of the Debevoise renovation, Papazian gave credit to the architect on the project, Stephen Rooney, AIA, of Truex, Cullins & Partners, who, she said, "transformed himself into a historic preservationist" during the project.

A shared outlook

Despite inherent conflicts in the environmental and preservationist movements, shared opportunities dwarf those concerns. The greatest enemy of both movements—in the public and in building owners—is short-term thinking, in which buildings are designed and built for the moment, without thought of the long-term consequences of design choices. Both the environment and cultural heritage suffer when buildings are treated as disposable. While green builders who value energy efficiency may not always see eye to eye with preservationists who treasure old windows and other existing features, both groups share a great deal of common ground and have a lot to teach each other.

– *Tristan Roberts*

For more information:

The American Institute of Architects
Historic Resources Committee
www.aia.org/hrc_default/

The Association for Preservation Technology International
www.apti.org

Federal Historic Preservation Tax Incentives
www.cr.nps.gov/hps/tps/tax

The National Park Service
Technical Preservation Services
www.cr.nps.gov/hps/tps/

The National Trust for Historic Preservation
www.nationaltrust.org

National Trust listing of state tax credits:
www.nationaltrust.org/help/taxincentives.pdf