GREENER PASTURES FOR PRESERVATION: PROPOSING A STRONGER MARRIAGE BETWEEN THE WORLDS OF PRESERVATION AND SUSTAINABILITY

by

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(Under the Direction of John C. Waters)

ABSTRACT

This thesis examines the important relationship between preservation and sustainability. Due to the growing concern over greenhouse gas emissions and the fact that the construction industry is the largest contributor to this problem, it is the perfect time for preservation to gain the recognition it deserves at the sustainability table. Preservation and sustainability in the United States have a tied history. Both movements have similar goals that are concerned with making sure that decisions today do not have negative impacts on future generations. Because of our throwaway culture and the trendiness of new "green" products, it is easy to overlook preservation and reuse as a sustainable method. In fact, preservation in itself is inherently sustainable due to both the approach and the inherent qualities of historic buildings. This thesis points out all of these past and current ties as well as the future steps that must be made in order to enhance the relationship between the two movements. This includes making connections with current sustainability programs and organizations, and incorporating sustainability into preservation education for both professionals and the community.

INDEX WORDS: Sustainability, Preservation, Sustainable preservation, Embodied energy, Life cycle assessment, Building reuse, Rehabilitation, LEED, Preservation education

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DEDICATION

I would like to dedicate this thesis to my grandmother, Isabell Ingram, who passed before she could see me finish. I don't know that anybody has ever been as confident in me and as proud of me as my grandmother. That confidence that she instilled in me always drove me to try to give her more things to be proud of. She was often the first person that I ran to when I was happy and the first I ran to when I was sad. Whether it was an up or a down, she always knew what to say to get me back to being level headed and looking forward to a new day.

Education was something that my grandmother always stressed. "Never stop learning," she would say. That stress she put on education drove me to where I am today. I know that she is looking down and smiling, but I can still hear her telling me to never stop and stop I never will.

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CHAPTER 1

AN INTRODUCTION TO THE WORLDS OF PRESERVATION AND SUSTAINABILITY

The past two decades have witnessed a rise in interest of sustainability and green construction. Unless you are a preservationist, when you hear the words "sustainable" or "green," historic preservation probably isn't the first thing that comes to mind. It probably is not even one of the first dozen or so things that pop into your head. You probably think of solar panels or fancy new LEED certified buildings, as these currently dominate the press coverage. Where does preservation fit into the conversation? Many preservationists have argued the greenest building is the one that already exists and preservation and the environmental movement, which is where the roots of the current sustainability movement and push for green construction lie, have a very close past.

It is troubling that two movements, the preservation of the environment and green building, with such similar goals and history have not made enough of a connection to get mentioned together in most conversations. The fact is that the two are interconnected and may have formed a sibling rivalry that has kept supporters of each bumping heads with the other for years. By looking into the history of each movement and exposing these connections, one can begin to understand how the two relate to each other.

A Connected Past

To understand the relationship between the two social movements, one must first understand both the goals and history of each. From the beginning, the goal of the preservation movement has been to protect our resources of the past so that they can be appreciated by future

generations. This is as clear in the example of one of the first acts of preservation in the United States, the effort to save Independence Hall in Philadelphia in 1816, as it is in the recent interest in reinvesting in Main Streets across the country. This goal is not exclusive to physical structures. The actual beginning of the preservation, or conservation, movement began with the protection of natural areas. In 1872 Yellowstone National Park was designated as a protected area by the federal government making it the world's first national park[1]. Seventeen years later the Casa Grande Ruin in Arizona became the nation's first National Monument. The passage of the 1906 Antiquities Act kept the progress of the movement going in the new century, as it became the nation's first historic preservation legislation. The Act encouraged the surveying and identification of sites across the country and established stiff penalties for causing damage to recognized historic sites. Ten years later, in 1916, the National Park Service was created to handle sites too large for private protection or preservation. In 1935, the Historic Sites Act enabled the National Park Service to buy and own private buildings in order to maintain and operate them for the public benefit.

The 1960's proved to be full of great events for both the preservation and environmental movements. The decade began with two books that would have huge impacts. Jane Jacobs wrote *The Death and Life of Great American* Cities in 1961 and attacked the widespread demolition of neighborhoods to make way for new construction. She pointed out the importance of retaining older buildings in communities and encouraged public recognition of preservation. Just a year later, Rachel Carson wrote a book that galvanized the environmental movement. *Silent Spring* spoke out against the widespread use of chemical toxins as pesticides and their environmental impact. Despite the huge impacts that both of these books had in their movements and beyond,

[1] Norman Tyler, *Historic Preservation: An Introduction to Its History, Principles, and Practice*, 2nd ed. (New York: W.W. Norton & Company, 2009), 30.

With Heritage So Rich, a book published by the National Trust in 1966, was perhaps the most influential book of the decade. The book pictured significant historic structures that had been previously lost. As effective as the pictures were alone, the book followed them with not only a proposal for an expanded role for preservation, but methods to achieve these goals. That same year that the book was released, the most important historic preservation legislation to this day, the National Historic Preservation Act of 1966, was passed by Congress. Three years later, influenced by Carson and several other authors of the decade, the National Environmental Policy Act of 1969 passed. This was the official start of the environmental movement, as it established a national policy promoting the enhancement of the environment.

The 1970s was the decade when the issue of energy really came to the forefront, tying preservation to the environmental movement, and what would later be known as "sustainability", forever. This can most directly be associated with the 1973 Organization of Petroleum Exporting Countries (OPEC) oil embargo, the crisis that caused people to realize that our natural resources were actually limited and that relying on technologies that rely on them might not be a smart idea. This led to the establishment of the Federal Energy Office and Federal Energy Management Program in 1973 and The Department of Energy and the Solar Energy Research Institute in 1977. Widespread concern about the energy crisis led directly to preservation professionals emphasizing energy conservation by reusing existing buildings instead of demolishing them. They would go to the extremes of draping banners across buildings that demonstrated the amount of oil saved by preserving buildings.[2] The federal government got the message and passed the Public Buildings Cooperative Use Act encouraging the rehabilitation of federal properties soon after. In 1976, Richard Stein Associates and researchers at the University of Illinois released

[2] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 59.

Energy Use for Building Construction, introducing the concept of embodied energy for the first time. This provided people with the ability to approximate the energy spent on the production of existing buildings and compare to that which would be spent in constructing a new one.

The use of the energy scare to promote preservation continued into the 1980's. In 1981 *New Energy from Old Buildings* was published by the National Trust of Historic Preservation to "explain the special factors that should be kept in mind to avoid damaging the character of old and historic buildings during conservation efforts."[3] These special factors included how older architecture was designed to conserve energy naturally, how to take advantage of the design, another introduction to embodied energy, and financial and legal issues.

Two important events that directly related the environmental movement to the built environment happened in the late 1980's. In 1987 the United Nations' World Commission on Environment and Development, also known as the Brundtland Commission, met and presented a report called *Our Common Future*, also known as the Brundtland Report. In this report the word "sustainability" came up for the first time. The report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[4] This was the first time this word would be defined and put it on political agendas across the world. In 1989 the American Institute of Architects Committee on the Environment steered the profession towards sustainable design by assessing building products by what would become known as life-cycle analysis. This led to an American Institute of Architects (AIA) Environmental Resource Guide being published in 1992, which

[3] National Trust for Historic Preservation, *New Energy from Old Buildings*, ed. Diane Maddex (Washington, D.C.: Preservation Press, 1981), back cover.
[4] World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, USA, 1987), page 43.

directly impacted the construction market by focusing decisions about materials on how sensitive they were to the environment.

During the 1990s the green building revolution expanded. Two events early in the decade had a large impact. The twentieth anniversary of the original Earth Day in 1990 and the United Nations Conference on Environment and Development in 1992, also known as the Earth Summit led directly to the formation of the United States Green Building Council (USGBC) in 1993.[5] The launch of the Environmental Protection Agency's (EPA) Energy Star labeling program, a program involving the labeling of products and buildings based on their energy efficiency, and a project to "green" several historic government buildings, including the White House and the Pentagon, occurred in the mid 90s. The late nineties saw the government focus on "greening" itself even more with the passing of additional executive orders that led the path to many of the federal environmental policies we see today.[6] The late 90s also saw the establishment of an amendment to the United Nations Framework Convention on Climate Change that initiated the first attempt to regulate greenhouse gas emissions on a global scale. More than 170 countries signed this amendment, called the Kyoto Protocol.[7]

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System was created in the year 2000 in order to provide a way to judge how environmentally friendly buildings were. It went beyond looking at just energy use and began to look at effects on water use, infrastructure, land use, indoor air quality, and several other aspects of healthy buildings. LEED has become widely known and has led to many studies, laws, policies, and even

[5] Jerry Yudelson, *The Green Building Revolution* (Washington: Island Press, 2008), page 2.
[6] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 61.
[7] Jerry Yudelson, *The Green Building Revolution* (Washington: Island Press, 2008), page 3.

other ways of looking at buildings. LEED was not the first rating system, but was the one that took off in the United States and was largely responsible for elevating interest in green buildings.

Despite the progress made in connecting preservation to the issues of energy consumption made in the 1970's and the growth of the green building movement in the 1990's, little dialogue occurred between 1980 and 2000. The single publication linking the two during this time period was the National Park Service's *Guiding Principles for Sustainable Design* in 1994. The goal of this publication was to "provide a basis for achieving sustainability in facility planning and design, emphasize the importance of biodiversity, and encourage responsible decisions."[8] This leads to a short section of the document relating to preservation that says, "Cultural resource preservation intrinsically is a form of sustainable conservation" and recognizes that the built environment represents the embodied energy of the past. It also states that historic buildings should be evaluated in order to improve efficiencies.[9]

Making the Connection Today

The two acts that passed during the 1960s are not only the most important early acts to their movements because of the framework that they provided, but they also directly tie the two movements together. The National Historic Preservation Act lists some of the rewards of preservation. Included in the list is the fact that preservation has energy benefits. The National Environmental Policy Act established several goals, one of which is to "preserve important historic, cultural, and natural aspects of our national heritage..."[10] Both of the acts state that their purpose is to ensure the "social, economic, and other requirements of present and future

[8] *Guiding Principles of Sustainable Design (in Parks & Other Conservation Areas)* (Diane Pub., 1993).
[9] Ibid.
[10] The National Environmental Policy Act of 1969, as amended, Title 1, Sec. 101 (b)(4)

generations."[11] Contrary to popular belief, both movements are forward thinking. It is easy to tell that this is true for the sustainability movement, but it is a harder sell for preservation. Many critics seem to think preservation is all about the past because it deals with older and existing buildings, but what may be less apparent is that the goal is to preserve the resources of the past, so that they can be enjoyed by future generations. This is fundamentally the same goal of sustainability, just with built resources instead of natural ones. In doing the first we are inevitably doing the second.

The Problem with "Sustainability"

One of the main challenges with sustainability and the green building movement today is a lack of clarity in its definition. While the Brundtland Report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," the word sustainable tends to be applied without context much of the time. Many people out there who support the idea of a "green" culture do not understand this definition, as they tend to associate any product labeled as green with sustainability and conclude that if they buy these products they are being sustainable. They might notice that their paper towels have now been perforated into smaller pieces now and think that is making them more sustainable. All the while, these same products are being shipped from across the country to a Wal-Mart that they are driving across town to get to. These people do not understand what it is that they believe that they are supporting. This misunderstanding is cause for concern because it shows that people who want to support the goal of living more sustainably and think that they are, are actually supporting unsustainable practices. It is easy, even for somebody who has heard the Brundtland definition, to get confused when sustainability is

[11] The National Environmental Policy Act of 1969, as amended, Title 1, Sec. 101 (a), The National Historic Preservation Act of 1966, as amended. Section 2 (1)

defined in the terms of who ever speaking. This opens up the door for more confusion. When use means everything, how can an often-misused term like sustainability mean anything? The truth is that it will not mean anything, at least in the big picture, until we get rid of all of the confusion and disagreement about what it does mean. Chapter two of this thesis will attempt to define sustainability holistically and explain how preservation ties into that definition.

One common association with sustainability is recycling. Does recycling equal sustainability? Recycling is better than creating wasting, but does that make it sustainable? We often forget that everything manmade requires significant amounts of resources to produce. We tend to think that all of the things we use are expendable. Our society has become accustomed to replacing the old with something new. When our computer gets old, we buy a new one. When our car gets old, we purchase a new one. We seem to have developed a throwaway mentality, which assumes "there's always more where that came from." This approach obviously won't work when we are relying on limited resources. Recycling is a decent answer to this problem. When that computer gets old, we can recycle it. In her book *Sustainable Preservation*, Jean Carroon points out that bottled water offers an insightful example. Despite the fact that we have perfectly good drinking water coming out of the faucets in our homes, the use of plastic water bottles increased 1,000 percent between 1997 and 2006.[12] Instead of reusing refillable bottles with the water from our faucets, we throw away eight out of every ten plastic water bottles.[13] This is analogous to how we use our buildings. Why are we demolishing, or throwing away, our buildings when we could reuse them, thus reusing the energy required to build them initially and the additional energy that would be required to demolish and replace them? That is not

[12] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), xi.
[13] ibid

sustainable in. Even recycling is not a perfect solution because it takes energy to break down that water bottle and turn it into something else or update that building and turn it into something new. Reuse should be is the ultimate goal.

Throughout this thesis the phrase "green building" and the word sustainability will be used often. As mentioned previously, both have their roots in the environmental movement, as they fundamentally seek to do less harm to the environment, but the two are slightly different in the scale of their approach. The green building movement has focused on the design, construction, and operation of buildings to minimize negative impacts on the environment. As discussed further in the next chapter, environmental concern is only one aspect of sustainability. In the past few years the United States Green Building Council has begun to implement different ways to incorporate the broader picture of sustainability into its green building rating systems. This leads to a broader definition of green building and ties the two together more.

Urgency

In 2008, the United Nations Environment Programme Year Book announced that climate change "is now recognized as a universal public issue that will dominate global attention for at least a generation."[14] It is largely accepted that this climate change is due to the greenhouse gas emissions that have dramatically increased in the last century, specifically including a dramatic increase in annual carbon dioxide emissions. Between 1970 and 2004 carbon emissions grew about 70 percent, due largely to the growth in the use of fossil fuels. The single largest contributor of fossil fuels has been proven to be the building industry.[15] This points to the fact

[14] United Nations, *UNEP Year Book 2008: An Overview of Our Changing Environment (Formerly Titled* (United Nations Environment Programme, 2008).
[15] Ibid.

that we need to change the way we are approaching this industry. Preservation provides this opportunity.

Facts:

- The United States has only 5% of the world's population, but is responsible for 22% of the world's greenhouse gas emissions.[16]
- 43% of America's carbon emissions come from the operation of buildings (note: this figure does not include emissions associated with extracting, manufacturing, and transporting of building materials).[17]

Due to acknowledgement of these facts, the building sector is striving to become more and more "green." Unfortunately, most of the changes are coming in the way of new construction. For example, there is an increase in new high efficiency buildings. This is a great step, but ultimately, how we treat our existing buildings will have far more of an impact on our carbon footprint than even the cumulative effects of new construction. For this reason it is time to acknowledge preservation as a sustainable approach before it is too late.

Layout of thesis

This thesis attempts to build upon the evolution of the fields of preservation and sustainability and propose ways to improve the relationship between the two. Chapter two will further break down the definition of sustainable development into three facets and discuss how preservation relates to each in order substantiate the argument that preservation is essential to any movement that intends on calling itself sustainable. Chapter three will continue to build on these connections by discussing physical design characteristics common in historic buildings that

[16] Richard Moe, "Historic Preservation and Green Building: Finding Common Ground," in "Positioning Preservation in a Green World," special issue, *Forum Journal* 23, no. 3 (Spring 2009): 8.
[17] Ibid.

make them inherently sustainable. Chapter four will discuss ways the preservation and green building movements are working together currently and offer suggestions on how those relationships can improve. Chapter five examines pressing changes to enhance the future development in each field. Case studies will be presented in chapter six in order to provide some examples of successful integration of preservation and sustainability can be when used together. Chapter seven will conclude with recommendations for integrating sustainability and preservation practice and education.

CHAPTER 2

WHAT MAKES PRESERVATION SUSTAINABLE?

The Brundtland Report defined sustainable development as, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs,"[18] but that definition falls short of introducing the big picture. A more precise way to look at sustainability is to break the definition down further into the several aspects of sustainability. This is commonly referred to as the triple bottom line, or the three legs that hold up the stool of sustainability. The first aspect, the planet perspective or environmental sustainability tends to be the most commonly considered. This aspect looks at the impacts on the planet, in terms of energy savings, potential negative environmental impacts, or the accumulation of waste due to demolition. The second aspect of sustainability is that of people, or social sustainability. This refers to the idea of political and social capital and equity within the need for cultural enrichment. The third aspect of sustainability is profit, or economic sustainability, which focuses on economic stability. This chapter examines ways that preservation ties into each of these three aspects of sustainability.

Environmental Sustainability

Environmental sustainability relates the most to the overarching goal of reducing our physical impact on our planet. Obviously preservation has a huge impact on sustainability because reusing or recycling is environmentally preferable to scrapping and rebuilding. By reusing a structure, tremendous environmental impacts are avoided. This seems obvious, but

[18] World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, USA, 1987), page 43.

quantitative analysis proves this point. To date, three different approaches have typically been used to calculate the impact of reuse versus new construction: embodied energy, avoided impacts, and life cycle assessment.

Embodied Energy Approach

In1976, when Richard Stein Associates and researchers at the University of Illinois released *Energy Use for Building Construction*, they made the first attempt to introduce the concept of embodied energy. Embodied energy is defined as "the sum of all the energy required to extract, process, deliver, and install the materials needed to construct a building.[19]" The report used construction industry data from 1967 to put together typical embodied energy values for many different types of buildings. The data was put together based on both typical building materials and typical building assemblies for each building type. Using these numbers, one can quickly estimate the overall embodied energy of a typical building based on 1967 construction typology.

Obviously, *Energy Use for Building Construction*'s numbers fall short when it comes to estimating the value of historic building today based on age. The numbers are old, but this reason is a little more complicated than it seems, and depends on if one wanted to determine the embodied energy of a building based on if it were to be built today, or based on the actual energy put into it when it was constructed. Due to progress in manufacturing and construction, it is likely that the numbers could be lower if based on current materials manufacturing and construction techniques. This approach might undervalue the actual energy put into the building, but would still be useful in making decisions about a structure. Another reason is that, according to Chief Architect of the Preservation Services Division of the Illinois Historic Preservation

[19] Mike Jackson, "Embodied Energy and Historic Preservation: A Needed Reassessment," *APT Bulletin* 36, no. 4 (2005): 47.

Agency, Mike Jackson, the numbers actually undervalued the embodied energy in historic buildings even when the study was current. He suggests that this is due to the fact that older buildings often have more volume and greater amounts of materials due to having higher ceilings and more massive load-bearing masonry walls used in lieu of current masonry veneer.[20] Despite these accounting issues, Jackson claimed in a 2005 report that the Stein study was "still the most thorough evaluation of embodied energy of building materials that has been produced in the U.S."[21]

In 1979 the Advisory Council on Historic Preservation released a study called *Assessing the Energy Conservation Benefits of Historic Preservation: Methods and Examples*, which sought to measure four things:

1. Energy already existing in structures to be rehabilitated;
2. Energy needed for construction and rehabilitation;
3. Energy needed for demolition and preparation of a construction site; and
4. Energy needed to operate a rehabilitated or newly constructed building.[22]

The study provided formulas measuring each and provided three case studies. One of the case studies was the Grand Central Arcade in Seattle. It was reported using the provided formulas that the building had an embodied energy of 17 billion British Thermal Units (BTU's) and that replacing the building with one of similar size would require 109 billion BTU's to construct. Preserving the structure resulted in the difference, 92 billion BTU's. That is the equivalent of 730,000 gallons of gas, which is enough to power 250 automobiles for 60,000 miles.[23] In his

[20] Ibid.
[21] Ibid.
[22] Carter, Calvin W., "Assessing Energy Conservation Benefits: A Study" in New Energy from Old Buildings (Washington, D.C.: National Trust for Historic Preservation, 1981). Pg. 103-104
[23] Ibid, 106.

paper about the report, Calvin W. Carter, former member of the Advisory Council on Preservation, calculated that the building only consumed about six percent more than an equivalent new building (based on 1980 data). That six percent increase in operating energy is offset by the savings from preservation, and without doing any upgrades, would take sixteen years to equal out.[24]

Overall, the study concluded that, in all of the selected case studies, rehabilitation could produce significant energy conservation benefits, requires much less initial investment of energy than constructing comparable new facilities, consumes about the same amount of energy annually as equivalent new structures, and can result in net energy savings over the expected life of the structures.[25] It also made the important statements that:

1. Once energy is embodied in a building, it cannot be recovered and used for another purpose—8 bricks embody energy equivalent to a gallon of gasoline but cannot fuel a car.
2. Preservation saves energy by taking advantage of the nonrecoverable energy embodied in an existing building and extending the use of it.
3. Because the energy embodied in an existing building was invested long ago, and is nonrecoverable, its economic value is not adequately recognized by normal economic comparisons of preservation versus new construction.

[24] Ibid, 107.
[25] Advisory Council on Historic Preservation, "Assessing the Energy Conservation Benefits of Historic Preservation: Methods and Examples," Washington, D.C., 1979, p. 3-6

4. Publicizing the energy conservation benefits of preservation can increase public awareness of this hidden benefit of preservation, even though the energy savings do not translate directly into dollar savings in the marketplace.[26]

These two reports definitely made strides in introducing the concept of embodied energy and tying it to preservation in order to gain more public support for preservation as a way of reducing our energy demands on the environment. The National Trust for Historic Preservation capitalized on the momentum of studies and published *New Energy from Old Buildings* in 1981 to advertise the information. The book included papers from preservation professionals, most of which were presented at the symposium "Preservation: Reusing America's Energy" in May of 1980. In the preface to the book, then-president of the National Trust, Michael L. Ainslie states that the book "reaffirms that preservation is not just a mechanical or legal or economic process. It is an ethic." He goes on to say,

> "The fact that preservation conserves energy must now be taken to our legislators, our corporate leaders and our opinion molders. It must become the foundation for national policy on the built environment. We must find, highlight and change the laws, practices and misconceptions that have led us as a nation to treat buildings as simply more disposable items, rather than the capital assets that they are.[27]"

Ainslie was right on point with his statements, but soon after, the nation's focus on energy conservation dwindled and the goals and ambitions of the book were never realized.

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[26] Ibid, 7.
[27] Ainslie, Michael L, New Energy from Old Buildings (Washington, D.C.: Preservation Press, 1981): 16.

Embodied energy seemed to be a lost concept until Jackson wrote his piece in 2005 pointing out that it needed a reassessment.[28] While it is true that embodied energy can be seen as a useful tool for evaluating rehabilitation, many green building advocates dismiss it as a sunk cost. In a recent Green Building Advisor article, "Does Saving Historic Buildings Save Energy," LEED expert and editorial director for BuildingGreen Inc, Tristan Roberts, claims that energy spent in the past to build a structure is water under the bridge. "Energy spent 2, 20, or 200 years ago to build a building simply isn't a resource to us today" he claims[29]. Roberts' argument is based on the premise that, while it will obviously take energy to demolish a building and build something new, the new structure could be more efficient in its operation, therefore making up ground on the energy put into the process. This comes from the fact that over a building's lifetime, embodied energy only accounts for approximately 16% of the building's total life cycle energy consumption, whereas 74% of that consumption comes in the operation of the building.[30] Jackson combats this argument by demonstrating through a series of calculations that new buildings' life span must reach 26 years to save more energy than the continued use of an existing building. He claims that as building energy efficiency increases, embodied energy consumes a larger amount of the life cycle energy consumption making it even more important. Further calculations show that "if a building were demolished and partially salvaged and replaced with a new energy efficient building, it would take 65 years to recover the energy lost in

[28] Mike Jackson, "Embodied Energy and Historic Preservation: A Needed Reassessment," *APT* 38, no. 4 (2005), 45- 52.
[29] Tristan Roberts, "Does Saving Historic Buildings Save Energy?" GreenBuildingAdvisor.com, http://www.greenbuildingadvisor.com/blogs/dept/energy-solutions/does-saving-historic-buildings-save-energy (accessed October 1, 2011).
[30] Mike Jackson, "Embodied Energy and Historic Preservation: A Needed Reassessment," *APT* 38, no. 4 (2005), 45- 52.

demolishing a building and reconstructing a new structure in its place," which is longer than the life span of many modern buildings.[31]

Another way of looking at embodied energy may combat the criticism of the tool by green building advocates. Instead of looking at the embodied energy in the existing building that would be lost, one could use the embodied energy tools to look at the energy that would be embodied in the replacement building.

Avoided Impacts Approach

One of the reasons that green building advocates quickly dismiss embodied energy as a sunk cost is that it only makes up a small percentage of the total energy of a building. Operating energy, or the energy required to operate the building over its life span, takes up a much bigger piece of the pie. For this reason, the avoided impacts approach could be considered a better option. This approach considers the energy that would be embodied in a new building due to its construction, but also looks at both the operating energy of the existing building and the operating energy that the new building would require.

The 2008 United Kingdom-based Empty Homes Agency study is well known for using the avoided impacts approach. This report, called "New Tricks with Old Bricks: How Reusing Old Buildings Can Cut Carbon Energy Emissions," compares the carbon footprint of refurbished existing buildings with the carbon generated by new construction and found that the refurbished buildings generated 70 percent less carbon dioxide than the new construction. It also found that it takes as many as fifty years for new efficient homes to surpass the savings produced by renovating existing homes to make them energy efficient.[32] The website BuildNuetral.org also

[31] Ibid.
[32] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 49.

uses the avoided impacts approach and has concluded that the carbon dioxide produced during construction of a building is typically around 17 percent of the carbon it uses during its lifetime.[33] This is an up-front cost that immediately adds to our environmental problem that could be avoided by reuse.

Life Cycle Assessment Approach

Both the embodied energy approach and the avoided impacts approach have laid the foundation for the most current and widely accepted approach, called life cycle assessment (LCA). Whereas embodied energy only looks at the energy stored within an existing structure and the avoided impacts approach only looks at impacts averted by avoiding construction, LCA is more holistic. The United States Department of Energy defines LCA as "an internationally recognized approach to evaluating the potential environmental and human health impacts associated with products and services throughout their life cycles."[34] The key here is that it considers the cradle to grave life cycle, not just a particular stage, of not only the buildings, but also the products that make up the building. It goes beyond looking at embodied and operating energies by also looking at things like building transportation energy, or the energy required to transport occupants to and from a building. This allows for a more comprehensive understanding of the impacts made by a building.

The Athena Institute is one of the leading developers of LCA software in North America. Their software, ATHENA EcoCalculator, measures the impacts of building construction and demolition, such as embodied primary energy use, global warming potential, solid waste

[33] Sean Cryan and Mark Simmons, "BuildCarbonNuetral.org; Measuring a Construction Project's Carbon Footprint," Eco-Structure (November-December 2007), www.eco-structure.com

[34] U.S. Energy Information Administration, Green Building Facts (Department of Energy, 2009)

emissions, pollutants to air, pollutants to water, and natural resource use.[35] They claim that the software is applicable to 95% of the building stock in North America because of the input availability of thousands of different assemblies and materials.[36]

In 2007, Dian Ross did a groundbreaking study on an 1867 house in Victoria, British Columbia using the Athena software. She used three different scenarios to compare the embodied energy of the existing house to a hypothetical replacement, the life cycles of the original to the replacement, and to assess the environmental impacts associated with the demolition of the existing house and the replacement with a new home. Her findings for all three scenarios showed that preservation was environmentally superior to demolition. She found that to replace the house with a new one would emit approximately twice the carbon dioxide used for the existing house[37]. She estimated that the life span of the existing house would be about 300 years, whereas due to the more frequent tearing down and rebuilding of houses today, the new home would have a life span of around 50 years leading to calculations of annual carbon emissions that showed an increase of approximately 250 kg per year for the new house[38].

Earlier this year, Preservation Green Lab, a sustainability research branch of the National Trust, released a groundbreaking report titled "The Greenest Building: Quantifying the Environmental Value of Building Reuse." This report goes further than any previous to support the claim that the greenest building is the one that is already standing. It used the LCA approach

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[35] Patrice Frey, "Making the Case: Historic Preservation as Sustainable Development" (a DRAFT White Paper presented in advance of the Sustainable Preservation Research Retreat), http://www.preservationnation.org/information-center/sustainable-communities/sustainability/additional-resources/DiscussionDraft_10_15.pdf (accessed August 7, 2011).
[36] Wayne Trusty, "Renovating Vs. Building New: The Environmental Merits," http://www.athenasmi.ca/publications/docs/OECD_paper.pdf (accessed August 7, 2011).
[37] Dian Ross, "Life Cycle Assessment in Heritage Buildings" (Work Term Report, Victoria, British Columbia, 2007), pg. 20.
[38] Ibid, pg 56

to compare the relative impacts of building reuse and renovation versus new construction. While previous reports have looked at either just individual impacts, or single buildings types, or in one location, this report goes beyond the scopes of previous studies in each of those aspects. It examined buildings based on four different environmental impact categories: climate change, human health, ecosystem quality, and resource depletion; and looked at six different building typologies: single-family home, multifamily housing, commercial office, urban village mixed-use, elementary schools, and warehouse conversions. Four different U.S. cities were also used in the study, each representing a different climatic zone.

The study admits that the range of environmental savings from building reuse varies widely based on building type, location, and assumed level of energy efficiency, but concludes that "building reuse almost always yields fewer environmental impacts than new construction when comparing buildings of similar size and function." It states, "savings from reuse are between 4 and 46 percent over new construction when comparing buildings with the same energy performance level."[39] The lone exception is the warehouse-to-multifamily conversion, as it generates a 1 to 6 percent greater environmental impact relative to new construction in the ecosystem quality and human health impact categories because it requires significantly more new materials than other reuse scenarios.

While the study admits that reuse based impact reduction may seem small when considering a single building, it makes the point that the "the absolute carbon-related impact reductions can be substantial when these results are scaled across the building stock of a city."[40]

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[39] Preservation Green Lab, The National Trust for Historic Preservation, "The Greenest Building: Quantifying the Environmental Value of Building Reuse," https://ilbi.org/education/Resources-Documents/Reports-Docs/ProcessDocs/the-greenest-building-report (accessed February 25, 2012) page vi.
[40] Ibid, pg. viii.

It provides the example of the city of Portland and claims that "if it were to retrofit and reuse the single-family homes and commercial office buildings that it is otherwise to demolish over the next 10 years, the potential impact reduction would total approximately 231,000 metric tons of CO_2 – approximately 15% of their county's total CO_2 reduction targets over the next decade."[41]

While green upgrades in new construction should provide future energy efficiency, reusing buildings with even an average level of energy performance consistently offers more immediate climate-change impact reductions, suggesting that we may not be able to build our way out of the mess that we are in. The study found that "it takes 10 to 80 years for a new building that is 30 percent more efficient than an average performing existing building to overcome, through efficient operations, the negative climate change impacts related to the construction process."[42] This information confirms that preservation and reuse always deserve at least consideration before demolition and new construction. Reuse and retrofitting for energy efficiency, together, is usually going to be the best option and yield the best results when it comes to wanting to cause the least negative environmental impacts.

Additional Aspects of Environmental Sustainability

As mentioned previously, the development of the concept of embodied energy has been effective at tying preservation to sustainability. Two additional concepts helpful to showing the sustainability of preservation have evolved directly from the embodied energy concept. Embodied carbon is intended to "estimate the amount of carbon emitted through building construction, including the entire cycle of material extraction, fabrication, transportation, and

[41] Ibid.
[42] Ibid.

final assemblage.[43] The *Inventory of Carbon and Energy* (ICE) is a database of the embodied carbon in common building materials put together by the University of Bath. It was the basis for the research done in the previously mentioned *New Tricks With Old Bricks* report. Embodied water takes the concept of embodied energy and embodied carbon and applies it to water. This is becoming an important way to look at older resources as we realize that usable water is a resource that is every bit as nonrenewable as oil. A 2004 study in Australia estimated that a typical Australian house represents about fifteen years worth of operational water – 15 years of water for cooking, cleaning, washing, drinking, toilet flushing, and gardening, all embedded in one house.[44]

Another important environmental impact that often times gets overlooked is that of waste generation. When you tear a building down, you create waste that burdens our landfills. According to Patrice Frey's report "Making the Case: Historic Preservation as Sustainable Development" the demolition of housing produces an average of 115 pounds of waste per square foot, while the demolition of commercial buildings produces around 155 pounds.[45] Perhaps more alarming than these large numbers, is the fact that these numbers are growing. According to the EPA around 136 million tons of construction and demolition debris was generated in the United

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[43] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 7-8.
[44] G. Treloar, M. McCormack, L. Palmowski, and R. Fay, "Embodied Water of Construction," Environmental Design Guide (May 2004), pp. 1-8. The Royal Australian Institute of Architects.
[45] Patrice Frey, "Making the Case: Historic Preservation as Sustainable Development" (a DRAFT White Paper presented in advance of the Sustainable Preservation Research Retreat), http://www.preservationnation.org/information-center/sustainable-communities/sustainability/additional-resources/DiscussionDraft_10_15.pdf (accessed August 7, 2011) page 10.

States in 1996. Just seven years later that number jumped to 170 million tons – an increase of about 25%.[46]

Another important impact that does not get brought up in the sustainability conversation enough is the impact of urban sprawl. Sprawl is the process in which the spread of development across the landscape far outpaces population growth.[47] The development pressure associated with sprawl can cause many negative environmental impacts. Developing on the urban fringe of cities causes natural habitat to be lost due to construction, an increased reliance on automobiles to drive to and from the city, and the need for new infrastructure to support the new development. For these reasons, sprawl is not sustainable. It is the opposite of sustainable. Sustainability relies on density. The more dense development is, the less natural habitat lost, the less reliance on automobiles, and the less new infrastructure needed. Preservation reduces the pressure for sprawl.

Sprawl has a negative impact on quality of life. According to the study "Measuring Sprawl and its Impact," "people living in more sprawling regions tend to drive greater distances, own more cars, breathe more polluted air, face a greater risk of traffic fatalities and walk and use transit less.[48]" The study made six recommendations to avoid sprawl. All six of them directly relate to preservation.

1. Reinvest in Neglected Communities and Provide More Housing Opportunities;
2. Rehabilitate Abandoned Properties;
3. Encourage New Development or Redevelopment in Already Built Up Areas;

[46] Environmental Protection Agency, "Estimating 2003 Building-Related Construction and Demolition Materials Amounts," http://www.epa.gov/wastes/conserve/rrr/imr/cdm/pubs/cd-meas.pdf (accessed February 25, 2012) page 25.
[47] Reid Ewing, "Measuring Sprawl and its Impact," (Smart Growth America, Washington, D.C., 2002) pg. 3.
[48] Ibid, pg. 5.

4. Create and Nurture Thriving, Mixed-Use Centers of Activity;
5. Support Growth Management Strategies; and
6. Craft Transportation Policies that Complement Smarter Growth.[49]

The first two recommendations are two things that preservation prides its focus on. The third one relates directly back to density. Because older homes were typically built on smaller lots and therefore closer together, they allowed for more dense neighborhoods. The fourth recommendation has been going on in the preservation movement for a long time. Mixed-use projects have been some of preservation's most successful. The final two recommend policies that are already included in preservation. Preservation itself is a growth management strategy, as it looks to minimize unnecessary growth by using what already exists. Preserving older buildings is also beneficial to any transportation policies, as they are typically placed in locations that allow reliance on public transportation or for walking to be an efficient means of transportation. This decreases the reliance on automobiles and therefore our dependence on fossil fuels.

Economic Sustainability

When economics and sustainability are used in the same sentence it probably is not usually about economical sustainability. More often it is probably something about how much it cost to buy something that is labeled as sustainable. What exactly is a sustainable economy? The answer to that question is not well defined. Economics is a complicated field and developing a "sustainable" economy is a thesis topic of its own. In her 2007 paper, "Making the Case: Historic Preservation as Sustainable Development," Patrice Frey assumed that a sustainable economy should use fewer natural resources, produce higher wage jobs, and be equitable.[50] Further than

[49] Ibid, pg. 6.
[50] Patrice Frey, "Making the Case: Historic Preservation as Sustainable Development" (a DRAFT White Paper presented in advance of the Sustainable Preservation Research Retreat),

those characteristics, there are several other benefits that preservation provides that lend themselves to creating a sustainable economy.

The first thing that preservation does for an economy is create jobs. In fact, not only does it create jobs, it creates more jobs than the alternative, new construction. In his book *The Economics of Historic Preservation*, Donovan Rypkema indicates, "dollar for dollar, historic preservation is one of the highest job-generating economic development options available.[51]" He gives several examples of this by listing different states and their main industry and comparing the amount of jobs produced by $1 million worth of that industry to $1 million worth of rehabilitation and preservation. In every case, whether it is manufacturing cars in Michigan or cutting timber in Oregon, preservation creates more jobs.[52] He also states that, due to the fact preservation is extremely labor intensive, typically between 60 and 80 percent of total cost on a typical rehabilitation project goes to labor. On a typical new construction project the largest portion is going towards materials.[53] He has also stated that for every investment of $1 million on a rehabilitation project between nine and thirteen more jobs are created than when those same funds are spent on new construction.[54] These numbers are supported by other studies done on the subject. In her paper "Making the Case: Historic Preservation as Sustainable Development," Patrice used Carnegie Mellon's Economic Input-Output Life Cycle Analysis tool and found that $1 million of new commercial construction is expected to create ten jobs and produce $2 million

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http://www.preservationnation.org/information-center/sustainable-communities/sustainability/additional-resources/DiscussionDraft_10_15.pdf (accessed August 7, 2011) page 17.

[51] Donovan D. Rypkema, *The Economics of Historic Preservation: a Community Leader's Guide*, 2nd ed. (Washington, D.C.: National Trust for Historic Preservation, 2005), page 11.

[52] Ibid

[53] Ibid, pg. 12

[54] Donovan D. Rypkema, *The Economics of Historic Preservation: a Community Leader's Guide*. (Washington, D.C.: National Trust for Historic Preservation, 1994), pg. 14.

of economic development, while the same investment in rehabilitation creates twelve jobs and the same amount of economic development. The numbers for homes lean even more on the preservation side at thirteen jobs and $2.23 million for new construction and fifteen jobs and $2.6 million for rehabilitation.[55] In order to claim to be a sustainable economy, one must provide opportunities for work. The fact that preservation provides more jobs than the alternative seems to lend credence to the fact that it would be a more sustainable choice. Another benefit includes that the jobs preservation provides are higher skill jobs than new construction and therefore gain higher wages.

More than just the job creation, preservation supports a healthy, sustainable economy because it serves as a catalyst for further investment in the community. The article "The Contributions of Historic Preservation to Housing and Economic Development" notes that "the direct benefits associated with historic preservation, such as enhanced rehabilitation and heritage tourism spending, have advantageous multiplier effects."[56] This refers to the fact that not only is money spent on goods and services directly related to preservation work, but the workers involved also spend it. We have already established that preservation provides more jobs than new construction, thus it will provide more opportunities for this multiplier effect to work. That same article uses the National Historic Rehabilitation Tax Credit certified investment as an example. In 1997 that investment was $688 million, but it generated $762 million in income and $319 million in taxes.[57]

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[55] Carnegie Mellon Green Design Institute, "Economic Input-Output Life Cycle Analysis Model," Carnegie Mellon University, http://www.eiolca.net/
[56] David Listokin, Barbara Listokin and Michael Lahr, "The Contributions of Historic Preservation to Housing and Economic Development," Housing Policy Debate, no. 3 (1998), pg. 456
[57] Ibid.

The ultimate example of how preservation promotes a sustainable economy may be the National Trust for Historic Preservation's Main Street program. The program uses a four-point approach of organization, promotion, design, and economic restructuring. They look to strengthen the community's existing economic assets while diversifying its economic base. To do this they promote retaining and expanding successful businesses to provide a balanced commercial mix, sharpening the competitiveness and merchandizing skills of business owners, and attracting new businesses that the market can support. The effort starts with converting unused or underused commercial space into economically productive property boosting the overall profitability of the district.[58] The program is clearly working, as over the past thirty years they claim a total reinvestment of $51.1 billion, a net gain of 99,508 businesses, a net gain of 436,909 jobs, 221,775 building rehabilitations, and a reinvestment ratio of $16 of new investment for every $1 spent to support the operation of its Main Street program.[59]

Another thing that would lend itself to making an economy sustainable is bringing in more creative people. Creative people tend to be the type of people who keep communities going in the right direction and historic resources can increase economic competitiveness. The leading figure in this discussion is Richard Florida. In his book The Rise of the Creative Class, Florida details a new social class that he calls the creative class. This class is comprised of individuals who are typically not only well educated, but creative and innovative. He claims that this creative class is crucial to driving economic growth. In order for any economy to be considered sustainable it must grow in order to be able to support itself. What connects this creative class

[58] "The Main Street Four-Point Approach®," PreservationNation.org, http://www.preservationnation.org/main-street/about-main-street/the-approach/ (accessed September 2, 2011).
[59] "Reinvestment Statistics," PreservationNation.org, http://www.preservationnation.org/main-street/about-main-street/reinvestment-statistics.html (accessed September 2, 2011).

and the smart growth they bring to preservation is Florida's claim that they value the power of place. They seek diverse places, places with a diverse culture, diverse architecture, and diverse tastes. Preservation promotes all of these things. These creative people are also typically looking for cheap places to locate their creativity and a lot of times choose historic structures because they provide flexibility and allow for creativity. Using preservation to provide these places is crucial to drawing in this new class to drive economic growth.

The affordability and flexibility of historic structures goes further than just attracting Florida's creative class. It also attracts small businesses and provides affordable housing. Small businesses look to these buildings because of affordable rents and the flexibility to set up their business the way that they want to. People look to them for affordable housing simply because they are just that – affordable. In the Listokin and Lahr report, they claimed that between the 1970s and the late 1990s, 40,000 units of affordable housing were created using Historic Tax Credits.[60] These units are typically available for affordable rents and provide the opportunity for more equitable economic development.

Social Sustainability

While environmental sustainability gets most of the attention of the three legs of sustainability, social sustainability is also important and preservation goes a long way towards achieving it. Social sustainability, or the people part of the triple bottom line, is hard to define. It looks at culture. A community is more than just the buildings that make its physical form. It is a collective of people. One source defines social sustainability as being "focused on the development of programs and processes that promote social interaction and cultural

[60] Listokin, Listokin, and Lahr, *The Contributions of Historic Preservation to Housing and Economic Development*, pg. 449.

enrichment."[61] Another relates it more back to the Brundtland definition of sustainability and claims it "is about the process of meeting the needs of people and communities today in a way that does not compromise the ability of future generations to meet their needs."[62] Either way, social sustainability is about people and their culture.

Economics professor David Throsby might have the best grasp on social sustainability with his concept of "cultural ecosystems." He claims, "Cultural ecosystems support and maintain cultural life and human civilization in the same way that natural ecosystems support and maintain the natural world."[63] Professor of City and Regional Planning John Keene agrees with Throsby, as he states that, cultural conservation is "maintaining cultural diversity in much the same way that environmentalists seek to maintain biological diversity."[64] He explains that "to demolish the distinctive neighborhoods that characterize the world's cities and replace them with uniform twenty-first-century settlements is comparable to cutting down a rain forest and replacing it with pasture or monocrop tillage. It reduces cultural diversity and increases entropy."[65] This concept of relating communities to nature supports the idea of preservation, as the whole idea behind preservation is protecting surviving pieces of communities. That being said, there must be a realization that not all buildings and pieces of community must be preserved, as change is necessary for growth and growth is imminent. The purpose of the

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[61] "Social Sustainability," Berea.edu, http://www.berea.edu/sens/sacresourceguide/socialresources/default.asp (accessed September 2, 2011).
[62] Interfaith Center on Corporate Responsibility, "ICCR's Social Sustainability Resource Guide" (building Sustainable Communities through Multi-Party Collaboration), http://www.iccr.org/publications/2011SSRG.pdf (accessed September 2, 2011) page 7.
[63] David Throsby, "Sustainability in the Conservation of the Built Environment: An Economist's Perspective," The Getty Conservation Institute, 2003, pg.7.
[64] John Keene, "The Link between Historic Preservation and Sustainability: An Urbanist's Perspective," The Getty Conservation Institute, 2003, pg.13.
[65] Ibid, pg.15.

Secretary of the Interior's Standards is to help recognize what has cultural significance and what does not.

A large part of social sustainability has to do with psychological well-being. A large part of what helps foster psychological well-being is having a sense of place. Sense of place is a familiar term for anybody involved in preservation. It is a lot of what preservationists pride themselves on because few things can provide a sense of place like historic structures. Historic structures provide physical reminders of the past. To have a sense of place one must know where they came from. These historic structures tell the story of the past in physical form. When we tear down our built environment we are getting rid of our sense of place. Donovan Rypkema touches on this in his argument about globalization. He claims that there are two globalizations occurring right now: economic globalization and cultural globalization. He states that economic globalization has some benefits, but cultural globalization "has few if any benefits, but has significant adverse social and political consequences in the short term and negative economic consequences in the long term."[66]

Maybe the person with the best concept of social sustainability is author and designer Steve Mouzon. His site "Original Green" has a section devoted to what he calls "lovability." He claims, "Any serious conversation about sustainable buildings must begin with lovability."[67] His belief is basically that, no matter how efficient or technically advanced a building is, it will be demolished within a decade or two if it is not lovable. This brilliant concept points to the fact that there must be a reason that many historic buildings are still around. There must be something lovable about them. Mouzon points out that it may not be entirely possible to know

[66] Donovan Rypkema, "Historic, Green, and Profitable," (March 8, 2007)(Speech delivered at Traditional Buildings Conference in Boston, MA), pg. 12.
[67] Steve Mouzon, "Lovable," OriginalGreen.org, http://www.originalgreen.org/foundations/lovable/ (accessed September 8, 2011).

what will be the architectural fashions of the future, but we do know what has stood the test of time. Making sure that we provide “lovable” buildings for the future begins with preservation.

CHAPTER 3

INHERENT BENEFITIAL FEATURES OF HISTORIC BUILDINGS

In addition to the previous ways that reusing and preserving existing buildings have proven to be sustainable, there are several other ways that many historic buildings are inherently sustainable. In order to reuse these structures in a way that maximizes their efficiency and therefore their sustainability we must first acknowledge them. This is even more important given the evidence shown in the previous chapters that we cannot build our way out of our greenhouse gas mess.

One of the most common issues brought up in preservation talks today is that of windows. Are historic windows more sustainable than new ones? Most green building professionals tend to claim that replacing old windows with new energy efficient windows is one of the first things you should do. Windows are definitely a major source of heat loss in a building. Any window is allows heat loss. New or old, one's window is letting heat out of one's building. According to a report by the Newport Restoration foundation, "even the best (and most expensive) replacement windows will only save you about $50 per month on heating in an average size house and even then they will only do that in the coldest five months of the year and will save that much only if your current windows are truly dreadful."[68] This adds up to a savings of only $250 per year. Compare this to the actual cost of buying and installing the new windows. The same report claims that the average two-story historic house has between twenty-four and thirty windows and decent quality replacement windows are between $500 and $1,000 installed

[68] Pieter Nicholson Roos, "Windows in Hard Times: Do the Math and Save Some Real Money," Newport Restoration Foundation, 2009, pg. 1.

totaling $12,000-30,000.[69] This means you will be spending this money to save $250 a year. This means that it is going to take 48 years to pay off the initial investment and see actual savings. Because most new windows are not going to last this long, there are no apparent savings.

Another thing to consider about new windows being sold as sustainable today is their repairability, or lack there of. Historic windows are usually simple and repairable and built of long lasting materials. The Newport report quotes a window salesman as saying that he does not believe that his windows will pass the 40-year mark, while many old windows have been around for over a hundred years or more. With some tender love and care these windows could last another forty or potentially another hundred years. The report claims that even custom wooden replacement sash can be bought far cheaper than buying a whole new replacement window and it is much more sustainable to replace a few sashes and repair the rest than to throw the windows away and start all over.[70]

The durability and repairability found in historic buildings is not limited to windows. Durable features such as thick masonry walls, slate roofs, terrazzo floors, old-growth wood framing, and even plaster on wood lath are found in many historic buildings. These features are durable and low maintenance and can last hundreds of years. Newer, less durable materials often require less energy to manufacture, but they need more frequent replacement lowering their sustainability. Again, windows are a good example of this. The repairability of the materials is essential in their sustainability. They already have longer lifetimes, but they are infinitely repairable. This keeps the need for new material down and keeps material out of the waste stream.

[69] Ibid.
[70] Ibid, pg. 2.

In addition to the durability and repairability of older buildings, many of them also take advantage of indigenous materials. Generally, the older a building is, the more likely that it incorporates mostly indigenous material. This is obviously due to the lack of transportation available before the use of the automobile. As pointed out in the previous chapter, local materials are more sustainable because they do not have to travel far, therefore reducing the amount of energy required to move them. Indigenous materials also offer benefits in the form of their inherent durability in the climate in which they originate and in the fact that they support local economies because they are being bought local.[71]

Passive Systems

One of the most sustainable design features of historic buildings is their passive systems. What is meant by passive is that the features allow it to function without modern systems and energy sources. In her book *Sustainable Preservation*, Jean Carroon calls this feature "passive survivability."[72] This passive survivability was not something that the builders of historic buildings chose to do, but it was done out of necessity. There are three main ways that older buildings are passive: daylighting, ventilation, and water.

Before the use of electricity, light came from one of two sources: daylight or candle. In order to illuminate historic buildings large windows, light wells, narrow footprints, and glass transoms were used. All of these features let the maximum amount of light in the structure. In addition to these features, prism glass was also common because of its ability to spread light around a larger area. These features are sustainable because they do not rely on any energy other than that of the sun. They do not create any waste and they do not cause any harm. Passive

[71] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 9.
[72] Ibid, pg. 10.

daylighting is a strategy that is often overlooked today due simply to the fact that we have electricity and therefore do not have to rely on the sun. We have created spaces impossible to light without electricity. Utilizing the passive daylighting design found in historic buildings allows us to be a much more sustainable culture.

Historic ventilation was very different than it is now. There was no HVAC to move air around, so windows and doors had to be placed to allow for maximum air flow using cross-ventilation. Chimneys were also utilized to circulate air, as they would bring cool air up from a basement and allow warmer air to leave at the top. Much in the same way electricity has spoiled our culture in lighting, HVAC has spoiled us in the way of ventilation and airflow. Instead of letting windows and doors circulate air naturally, we rely on systems that require fossil fuels and emit pollution. Utilizing passive ventilation is another crucial step in the right direction towards a more sustainable planet.

Water is an often-overlooked aspect of sustainability. Our culture often takes water for granted, but not only is there a limited supply of usable water; it takes energy to move it. In the past cisterns, water storage tanks, and wells collected runoff. Instead of using these opportunities to collect rainwater, we rely on a system that forces water to be pumped from treatment plants. Again, this is a passive strategy that historic buildings use that gets overlooked, as mechanical systems are over-utilized today.

The three passive strategies mentioned above add up to save on energy. This has been proven time and time again. In her book, Carroon references data from the Department of Energy that shows that commercial buildings constructed before 1920 use less energy per square foot than buildings from any other decade up until 2000. She also points to a 1999 study by the

General Services Administration (GSA) that found that utility costs in the GSA's inventory of historic buildings are about twenty-seven percent less than in non-historic structures.[73]

Long Life/Loose Fit

Stuart Brand coined the term long life/loose fit in this book *How Buildings Learn: What Happens After They're Built.* The book studies buildings over time and discusses how buildings can learn and grow if they are allowed to, but this can only happen if buildings are built so that they can last and adjust to different inhabitants. Long life/loose fit is the key factor in why so many historic buildings still stand. They allow for dynamic new uses because of their ability to adapt, which is the essence of sustainability. If we built buildings that would last and were designed to be flexible, instead of being tied down to one use, we would not need to build so many new buildings. There are buildings like this out there. They are the buildings that often sit abandoned until one day they turn into a success story. There are tons of them. There are abandoned mills that that are transformed into housing, abandoned armories that become theaters, and houses that become commercial offices. This is the ultimate sustainability success story.

[73] Ibid, pg. 10.

CHAPTER 4

ENHANCING THE RELATIONSHIP

The information to this point in this thesis has provided background information about the intertwined history of preservation and sustainability, given a further breakdown as to exactly how preservation contributes to sustainable development, and provided information about how historic structures are inherently sustainable by design. Hopefully after all of that, one can see that preservation needs to be included in any talk of sustainable development. This chapter will introduce ways that the preservation movement must start to interact with the sustainability/green building movement in order to enhance the relationship.

Green Rating Systems

The most common way green buildings are judged today is by their ability to score points on a rating scale. These rating systems provide a framework to be followed, a discipline, and a common language. Dozens of these rating systems exist, and several are used here in the United States In a 2008 article two University of Sydney professors described first-generation systems as pass-fail systems, such as Energy Star; second-generation systems as simply additive, like LEED; and third-generation systems as weighted-additive systems that include BREEAM, SBTool, and Green Globes.[74] In his 2010 article, "*Green Home-Rating Systems: A Preservation Perspective,*" Mike Jackson states that there are over 25 different green home-rating systems in

[74] M.Y.L. Chew and Sutapa Das, "Building Grading Systems: A Review of the State-of-the-Art," Architectural Science Review 51(1) (2008): pg. 6.

North America and England.[75] With that many systems it can be hard for preservationists to get a grasp on what is happening. The following are some of the more common and more preservation-friendly systems available.

LEED

In 1993 the United States Green Building Council (USGBC) was formed with a mission "to transform the way buildings and communities are designed, built, and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life."[76] Shortly after its formation, the USGBC realized "that a priority for the sustainable building industry was to have a system to define and measure green buildings."[77] That was when they started developing the rating system that would eventually come to be known as the Leadership in Energy and Environmental Design (LEED) standards. LEED first became available for public use in 2000 and has done nothing but grow since then.

The first LEED standards available were the LEED-NC (New Construction) standards, but currently there is a LEED family that includes Existing Buildings: Operations and Management (EB), Commercial Interiors (CI), Core and Shell, Schools, Retail, Healthcare, and Homes. LEED focuses on five main categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Air Quality. Each category is broken down into separate criteria. For each criterion, points are given out based on goals that are met. LEED is a third-party rating system, so LEED certified professionals rate the building

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[75] Mike Jackson, "*Green Home-Rating Systems: A Preservation Perspective,"* APT Bulletin, Vol. 41, No. 1, SPECIAL ISSUE ON SUSTAINABILITY (2010), pg. 13.
[76]"About USGBC," USGBC.org, http://www.usgbc.org/DisplayPage.aspx?CategoryID=1 (accessed October 1, 2011).
[77] "History of LEED," Access Point, http://www.businessrecovery.ws/leed-certification/history-of-leed (accessed October 10, 2011).

and score the point total. Depending on where the score falls a building can get certified as basic, silver, gold, or platinum.

Today, LEED dominates the green building rating scene in the United States and is gaining momentum globally as well. When researching any other rating system, you are more likely to come across an article comparing it to LEED than to any other system. LEED NC not only represents new construction, but also significant alterations or rehabilitations, so most often when dealing with historic structures it is what has been used. For the most part it has been argued that LEED does not give enough credit to preservation, but because LEED is continuously updated work is being done to change this. There are now many examples of National Register listed buildings that have been certified at each of the LEED levels.

BREEAM

The Building Research Establishment's Environmental Assessment Method (BREEAM) is a United Kingdom based system that claims to be "the world's foremost environmental assessment method and rating system for buildings, with 200,000 buildings certified BREEAM assessment ratings and over a million registered for assessment since it was first launched in 1990."[78] According to the BREEAM website, "A BREEAM assessment uses recognized measures of performance, which are set against established benchmarks, to evaluate a building's specification, design, construction, and use. The measures used represent a broad range of categories and criteria from energy to ecology. They include aspects related to energy and water use, the internal environment (health and well-being), pollution, transport, materials, waste, ecology and management processes."[79] BREEAM International has been introduced in recent

[78] "What Is BREEAM?" BREEAM.org, http://www.breeam.org/page.jsp?id=66 (accessed October 15, 2011).
[79] Ibid.

years in an effort to globalize BREEAM and can be tailored to suit local circumstances. Criteria for each BREEAM International project are developed specifically for the project by the BRE. Based on these criteria an accredited assessor will assess the building and submit the report back to BRE, where they will determine whether it deserves a rating of Pass, Good, Very Good, Excellent, or Outstanding. In 2005 the Van de Kamp Bakery Building in Los Angeles became the first U.S. building to achieve a BREEAM rating.

Green Globes

Green Globes was developed in Canada in 2002 as a web-based tool. It describes itself as "a revolutionary building environmental design and management tool" and states that "it delivers an online assessment protocol, rating system and guidance for green building design, operation and management," while being "interactive, flexible and affordable, and providing market recognition of a building's environmental attributes through third-part verification."[80] It is largely based on the BREEAM system and was released in the United States in 2005. The system consists of a series of online questionnaires that have been customized by project phase and role. Because Green Globes is customized to a specific project, it does not have a set amount of points available and therefore does not count off for non-applicable goals or strategies. There are up to 1000 points available, but since non-applicable questions do not count against the total, the score is based off of the percentage of points associated with applicable questions. Once the questionnaires are completed, the system automatically generates a report based on the answers provided. The report both lists the score and where the building stands in each category and how it can improve in each. Four different rating levels can be achieved – 35-54%, 55-69%, 70-84%, and 85-100%.

[80] "The Practical Building Rating," GreenGlobes.com, http://www.greenglobes.com/ (accessed October 20, 2011).

SBTool

SBTool is a software-based system that has been in development since 1996. It is a generic framework for rating the sustainable performance of buildings that can be tailored to be as broad or narrow as desired. It is intended as a toolkit for a national or regional organization to use to develop a local sustainable building assessment system.[81] SBTool is meant to be tailored to a particular region and therefore requires expertise from the organization using it. It aids in establishing scope, eligible occupancy types, and locally relevant benchmarks and weights. The criteria it recommends are site selection, project planning, and developments; energy and resource consumption; environmental loadings; indoor environmental quality; service quality; social and economic aspects; and cultural and perceptual aspects.[82]

Energy Star

The Environmental Protection Agency (EPA) introduced Energy Star as a labeling program to promote energy efficient products in 1992. Recently, the program has begun to include homes and buildings. For commercial buildings, it "evaluates conformance to energy efficiency and indoor environmental standards . . .using a statistical analysis set to compare energy intensity of similar buildings across the country."[83] For existing buildings an energy performance benchmark is established using a web-based tool, then a provided building upgrade manual aids in achieving savings. This allows for some flexibility to achieve the goal as there is no single path provided, but most often energy efficient equipment and sound operating practices are recommended.

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[81] Linda Reeder, *Guide to Green Building Rating Systems (Wiley Series in Sustainable Design)* (Hoboken, N.J.: Wiley, 2010), page 208.
[82] Ibid.
[83] Peter D'Antonio, "Energy Star and LEED: Which Is Right For You?" PremierInc.com, https://www.premierinc.com/safety/topics/sphere/downloads/GB-1-EnergStarLEED.pdf (accessed November 1, 2011).

System Selection

Mike Jackson claims, "The development and use of green building-rating systems are going to be a part of the future, and the historic preservation community needs to find common ground with green building practices."[84] It is hard to argue that point. In order for preservation to be taken seriously in a world where no building is looked at as sustainable unless it has a plaque on one of its walls that states it is certified this or that, the preservation community is going to have to get on board. With so much of the rating systems of the past being based on, and pushing for, new construction, it is time for preservation to form a partnership with one or more of these rating systems to make sure that existing buildings get the attention that they deserve.

While making connections with each rating system to ensure the inclusion of preservation and reuse is the best idea, a better solution for right now would be to adopt one rating system as the official preservation and reuse rating system. This allows a firm entry at the table that can be implemented now. We can focus on making the best connection possible right now instead of making lesser connections across the board. The system chosen should be supported fully by the National Trust and recommended by State Historic Preservation Offices (SHPO's) across the country for any preservation project. Doing this would show that preservationists are serious about being included in the green building conversation.

Choosing a single rating system to sponsor should be based not only on how the system acknowledges preservation and reuse, but also about image. Most of the systems mentioned have similar concerns, but when it comes to image and reputation of the rating systems in the United States, the decision is simple. LEED is by far the most well-known and respected green building

[84] Mike Jackson, "*Green Home-Rating Systems: A Preservation Perspective,"* APT Bulletin, Vol. 41, No. 1, SPECIAL ISSUE ON SUSTAINABILITY (2010), pg. 18.

rating system in the United States. In 2011, LEED certified its 10,000th project and has certified more than 1.4 million ft^2 of new and existing buildings per day.[85] Those numbers have been met in only ten short years. While early LEED models definitely undervalued the sustainability of preservation, more recently the USGBC has been working to incorporate existing buildings into their system. With the National Trust pushing them everyday, the potential is endless.

With any green rating standard being used, it does not matter the level of achievement - whether it be silver, gold, or platinum – if the users of the building are irresponsible in their daily habits and the equipment is not properly checked and maintained to assure proper use. For this reason, it is essential that post-occupancy assessments and commissioning be done to track the energy usage and success of the building. This is a firm requirement with the LEED system and should be followed closely.

[85] "LEED Certifies 10,000th Project," Green Building News, http://greenbuildingnews.com/articles/2011/08/31/leed-certifies-10000th-project (accessed November 1, 2011).

Table 4.1 Comparing the Rating Systems

LEED Introduced: 2000 Run by: USGBC	**BREEAM** Introduced: 1990 Run by: BRE (UK)	**Green Globes** Introduced: 2000 Run by: GBI	**SBTool** Introduced: 1996 No Current Backing	**Energy Star** Introduced: 1992 Run by: EPA
Basics: • Points based • Looks at Triple Bottom Line • 3rd party verification • Ratings of certified, silver, gold, and platinum • Defines high performance buildings • Sets quantifiable target and goals • Recognizes leaders • Promotes improvement • Stimulates green competition • Raises consumer awareness Pros: • Momentum • National and International Recognition	Basics: • Points based • Looks at Triple Bottom Line • 3rd party verification • Ratings of pass, good, very good, excellent, and outstanding Pros: • Some International Recognition (UK) • Claims to be more demanding than LEED • Can be tailored to meet individual needs • Requires assessors to pass exam • Can work with LEED • Has mandatory credits	Basics: • Web based • Based off of BREEAM • Questionnaire based (22 page) • Percentage based Pros: • User friendly • Low cost • Non-applicable questions don't count against total • Simple process • Allows for large range for all types of buildings • Greater allowance for location specifics • Continually updated Cons: • Not as stringent as LEED or BREEAM	Basics: • Framework for developing a building assessment system • Focus on energy use Pros: • More direct than LEED • Relies less on proxy measures • Provided transparent framework for discussing options Cons: • Is just a framework Not an actual system • Best in discussing performance goals, but not necessarily for rating • Looks mostly only at energy usage	Basics: • Government run • Web based • Provides design guidance, building upgrade manual, and energy performance target finder Pros: • Recommends actions at each stage of process • No single path to reaching goals • Works with other systems (actually required in LEED and BREEAM) Cons: • Very focused on new technology • Looks only at energy usage

Table 4.1 Comparing the Rating Systems (Continued)

LEED Introduced: 2000 Run by: USGBC	**BREEAM** Introduced: 1990 Run by: BRE (UK)	**Green Globes** Introduced: 2000 Run by: GBI	**SBTool** Introduced: 1996 No Current Backing	**Energy Star** Introduced: 1992 Run by: EPA
• Has quickly become the standard for green buildings • Already being required by government programs • Diverse market • Continually updated • Shown to work with preservation despite current shortcomings • Has prerequisites Cons: • Expensive • Intense documentation process • Doesn't require assessors to pass exam before assessing (does give bonus point) Decision: • Best option for preservation	• More credit given to embodied energy Cons: • Very exact requirements • Complex weighting system • Cost Decision: • Good option, but not enough U.S. presence of stout to be best option • Good to use with LEED to achieve maximum benefits	• Doesn't require ongoing documentation • Doesn't certify or require accredited professionals to certify Decision: • Good option, but not strict enough	• Still just a research product • Requires expertise to even begin using product • Requires expertise to even begin using • Excel spreadsheets not designed well • Environmental measures are very uneven with some requiring great detail and others requiring little more than gross estimates Decision: • Good concept if new system was to be created, but would need to be adjusted to look broader at sustainability	Decision: • Not broad enough scope • Great used in conjunction with other systems (LEED and BREEAM)

LEED vs. The Standards

Preservation in the United States is based largely on the Secretary of the Interior's Standards. The Standards are probably the most referred to documents when undertaking a preservation project. They were originally developed to help determine the appropriateness of proposed work on registered historic properties, but have grown to be much more important than that original goal. Today, the Standards are also used to determine if a project qualifies for tax credits. There are actually four different standards for treatment, each with their own guidelines: preservation, rehabilitation, restoration, and reconstruction. Most sustainable preservation projects would follow the rehabilitation standards because they offer the most flexibility and relate to most projects.

In her 2009 article, "*The Secretary's Standards and LEED: Where They Work Together and Where They Diverge*," senior historical architect Audrey T. Tepper points out that there are two terms commonly used in both the Standards and in the field of historic preservation in general: "the historic character" and the "integrity" of a property. She points out that these two terms are of great importance in the field of preservation and therefore have to be taken into consideration in any effort to tie preservation to sustainability. Tepper defines "historic character" as the things that make a building special, or its "visually distinctive materials, features and spaces."[86] This can also include unique methods of construction or craftsmanship. She defines "integrity" as "whether or not a building retains these important "character-defining" features and has not been inappropriately changed over time."[87] Being sensitive to these two terms is going to be crucial to any success that may come with tying preservation and

[86] Audrey Tepper, "The Secretary's Standards and Leed: Where They Work Together and Where They Diverge," in "Positioning Preservation in a Green World," special issue, *Forum Journal* 23, no. 3 (Spring 2009): 24.
[87] Ibid

sustainability together. Having chosen LEED to be the green rating system for preservation, there is a need to look at how the Standards and LEED come together and how they do not.

One of the main problems with past LEED systems is that they have not given enough points for saving historic building materials. Because LEED was developed to mainly be used for new construction, it is largely geared towards advocating new green building materials. Often these materials are either of recycled content, or constructed using new technology, which makes them more efficient. While these are great alternatives to some of the materials that have been used in new construction in the past, they do not consider the fact that in rehabilitation work saving historic building materials is often even more sustainable. There are very few points offered for saving materials in place.

Another downfall to past LEED standards is that there is no acknowledgement of the inherent efficiency of existing buildings. The system rewards points for changes that increase efficiency, but not for keeping past efficient technology in place. Because of this, project leaders seeking LEED certification could even be persuaded to involve a new technology, which may not even be as efficient as what is in place just to gain points. Some of the inherent features discussed in previous chapters such as operable windows and clerestory windows are likely to be overlooked to incorporate new technology. In this same respect, durable existing building materials such as thick masonry walls, which provide some inherently sustainable qualities, get overlooked as well.

LEED also advocates some new energy efficient technologies, which may compromise the integrity of a historic building. Technologies such as solar panels, photovoltaic cells, and roof gardens are great ideas, but may not be appropriate for some historic buildings. Because adding these things adds points to a building's scorecard, owners may look to add them regardless of

their negative impact on the character of the building. This is not to say that these technologies should not be used for historic buildings, but great care and consideration must be used in deciding when and where to locate them if they are to be used.

In her 2007 paper "Measuring Up: The Performance of Historic Buildings Under the LEED-NC Green Building Rating System," current Director of Sustainability Research for the National Trust, Partrice Frey, examined the ways that LEED-NC worked with historic buildings and the ways that it did not. Frey broke down each of the five categories looked at by LEED and rated the typical performance of historic buildings versus non-historic buildings based on her study of 22 historic properties. After averaging scores, she pointed out specific categories where historic buildings did not perform well compared to non-historic. Her findings were that in every category except water efficiency there were criteria that shortchanged the historic buildings (See chart below). Frey concluded that, while there were flaws with the system, "overall performance of historic buildings is somewhat stronger than expected," but "modest changes to LEED-NC can be made to further improve the performance of this class of buildings.[88]" She also suggests that guidelines could be helpful in helping historic buildings achieve points.

Frey's intense study of LEED paired with recent historic building success stories with LEED show that LEED and preservation can work together. As stated earlier, LEED is the leading green rating system and it is imperative that if preservation is to succeed in the future, it

[88] Patrice Frey, "Measuring Up: The Performance of Historic Buildings Under the LEED-NC Green Building Rating System" (Master's thesis, University of Pennsylvania, 2007), 155, in Repository.Upenn.edu, http://repository.upenn.edu/cgi/viewcontent.cgi?article=1076&context=hp_theses&sei-redir=1&referer=http%3A%2F%2Fwww.google.com%2Furl%3Fsa%3Dt%26rct%3Dj%26q%3Dpatrice%2520frey%252C%2520%25E2%2580%259Cmeasuring%2520up%253A%2520the%2520performance%2520of%252 (accessed December 3, 2011).

must form a partnership with the USGBC to make sure that historic buildings will be given the credit they are due in the LEED system.

Green Building Codes

The growth in popularity of green buildings and sustainability has not only been with builders; both federal and local governments have become interested in these ideas as well. For this reason, we have seen a great number of green building codes sprout up across the nation in the past ten or so years. According to a 2008 USA Today article on the subject, nearly three times as many cities and counties approved green building policies in 2007 as they did in 2004. It stated that in 2007 fourteen states took action on green building codes and in 2008 at least eight more states and twenty-two localities had begun to endorse them.[89] These numbers show that this trend has taken off and is becoming the standard. This is great for new green construction, but not so much for partnering green building and sustainability with preservation.

In theory, energy codes are a good thing. They aim to raise the bar for how buildings perform on larger scales than just building-by-building. The problem with the codes the way they are, is that most of them are prescriptive. Instead of holding a building accountable for actual performance, they set goals for how the building is designed to work before it is put to use. Usually, these codes force the building to meet a prescribed level of energy performance before it can obtain its certificate of occupancy. This makes sure that the builder and owner comply with the goal of reducing energy use in their design if they want their building to be put to

[89] Wendy Koch, "'green' Building Codes Sprout up Across USA," USAToday.com, http://www.usatoday.com/news/nation/environment/2008-08-06-Buildgreen_N.htm (accessed December 20th, 2011).

Table 4.2 Problematic LEED Credits for Historic Structures[90]

Credit	Requirement	Disadvantage	Points	%
Sustainable Sites - 5.1-2 (Site Development)	Restore at least 50% of the site area with native or adapted vegetation and provide a high ratio of open space to development by exceeding local open space requirements	Constrained by existing site and design – not always appropriate to replace existing vegetation because of historic aesthetic	2	5.1 30% NHP[91] 6% HP 5.2 60% NHP 34% HP
Sustainable Sites 6.1-2 (Stormwater Management)	Reduce stormwater quantity and improve the quality of runoff through stormwater management	Constrained by existing site and design – not easy to implement new design	2	Not Provided
Sustainable Sites 7.1 (Non-Roof Heat Island Effect)	Place a minimum of 50% of parking spaces under cover, or by shading, using paving materials with a Solar Reflective Index of 29, or by using an open grid pavement system for 50% of the site	Constrained by existing site and design – not easy to implement new strategy	1	63% NHP 43% HP
Energy and Atmosphere – 3-5 (Enhanced Commissioning, Enhanced Refrigerant Management and Measurement and Verification)	Optimize energy performance	None given – HVAC systems should be upgraded as part of any rehabilitation process, but historic buildings still tend to underperform in this category	3	Not Provided

[90] Information taken from: Patrice Frey, "Measuring Up: The Performance of Historic Buildings Under the LEED-NC Green Building Rating System" (Master's thesis, University of Pennsylvania, 2007), 155, in Repository.Upenn.edu, http://repository.upenn.edu/cgi/viewcontent.cgi?article=1076&context=hp_theses&sei-redir=1&referer=http%3A%2F%2Fwww.google.com%2Furl%3Fsa%3Dt%26rct%3Dj%26q%3Dpatrice%2520frey%252C%2520%25E2%2580%259Cmeasuring%2520up%253A%2520the%2520performance%2520of%252 (accessed December 3, 2011).

[91] NHP stands for non-historic property, while HP stands for historic property.

Table 4.2 Problematic LEED Credits for Historic Structures (Continued)

Credit	Requirement	Disadvantage	Points	%
Materials & Resources – 1.1-1.3 (Building Reuse)	Maintain at least 75% of existing building structure and envelope, maintain additional 20% of existing building structure and envelope, and maintain at least 50% of existing interior non-structural elements	Overly stringent requirements to gain minimal points Embodied energy undervalued	3	Not Provided
Materials & Resources – 3.1 (Materials Re-Use)	Use salvaged, refurbished, or reused materials that total at least 5% of the total value of materials on the project (additional point for 10%)	Basing the percentage on costs of materials doesn't recognize the reuse of existing materials in the building, such as doors, windows, lighting fixtures, and moldings	1 (1)	12.5% HP (6% HP)
Materials & Resources – 4.1 (Recycled Content)	Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of total value of the materials in the project	While historic buildings seem to incorporate recycled content, many don't claim this point; it may be difficult for historic projects to reach 10% due to the nature of materials required for rehabilitation project	1	70% NHP 37% HP
Indoor Air Quality – 1 (Outdoor Air Delivery Monitoring)	Install permanent monitoring systems that provide feedback on ventilation system performance to ensure that ventilation systems maintain design minimum requirements	No reason given – requirements do not seem to affect historic buildings any more than non-historic	1	61% NHP 46% HP
Indoor Air Quality – 3.1-2 (Indoor Air Quality Management Plans)	Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building	No reason given – requirements do not seem to affect historic buildings any more than non-historic	2	61% NHP 46% HP

Table 4.2 Problematic LEED Credits for Historic Structures (Continued)

Credit	Requirement	Disadvantage	Points	%
Indoor Air Quality – 5 (Chemical & Pollutant Source Control)	Design to minimize and control pollutant entry into buildings and later cross-contamination of regularly occupied areas	Conflict between preserving historic fabric and installing mats and venting janitors closets	1	70% NHP 50% HP
Indoor Air Quality – 6.1-6.2 (Lighting and Thermal Control)	Provide individual lighting controls for at least 90% of the building occupants to enable adjustments to suit individual task needs and preferences and provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences; Provide individual thermal controls for at least 50% of building occupants and provide comfort systems for all shares multi-occupant spaces	Existing wiring may not be easily modified to provide required task lighting and existing design may be difficult to reconfigure to meet requirements for thermal conditions	2	6.1 77% NHP 67% HO 6.2 49% NHP 28% HP
Innovation Points	Points awarded for exceptional performance above the requirements set by LEED and/or innovative performance in categories not specifically addressed by LEED	Historic buildings simply are not being given as much credit as new construction	up to 5	NHP avg. 4 HP avg. 3

use. The problem here is that up to ninety percent of the energy consumed in a building can come from plug loads that are not going to show up until after the building is inhabited.[92] With the prescriptive codes this large chunk of energy use is being overlooked. On top of this, because the codes only look at the building before use, they do not account for any problems that could occur when systems do not work or are not used as expected. According to an article on the subject, "studies are now showing that no one, from policymakers to architects to developers to tenants, really knows how that building will perform until they begin to use it."[93] Because these codes are prescriptive, and essentially "one size fits all," they do not recognize the inherent strengths of existing buildings. This creates problems for those wanting to upgrade these buildings to be more efficient. Instead of promoting finding the best way to achieve better energy efficiency, they encourage methods involving new technology that often endanger the character of the building. This either discourages the owners of these existing building from doing the upgrades, if they care about the character of their building, or leads them down a path of irresponsibility if they do not. If preservation wants a role in the movement towards a more sustainable society, we have to make sure that these codes change in a way that will fit with, and promote, preservation and reuse.

The way to fix this problem is by making the green codes outcome-based instead of prescriptive. This means that the codes would look at the way the building is performing once it has been occupied and allow more flexibility in how to achieve better efficiency. The buildings would still be required to achieve a pre-negotiated performance target on an ongoing basis. In order to ensure that goals are being met and equipment is worked as intended buildings would be

[92] Julia Levitt, "Living Future 2010: Energy Code Overhaul," WorldChanging.com, http://www.worldchanging.com/archives/011168.html (accessed December 14, 2011).
[93] Ibid.

monitored on a regular basis. Penalties would be handed out in the form of fines for not meeting targets. The National Trust's Preservation Green Lab is currently working with the city of Seattle to explore the possibilities of using one of these outcome-based energy codes. They claim that, "energy consumption in both new and existing buildings could be cut by an estimated thirty to fifty percent by 2020 through readily available technologies, design, equipment, alternative energy generation solutions, and most significantly, by changes in how buildings are operated and in the behavior of their occupants."[94] While prescriptive codes advocate the use of those technologies, design, equipment, and alternative energy solutions, they neither make sure that these things are used correctly, or even used at all, once the building is completed. Nor do they take into account those possible changes in operation or occupant behavior for existing buildings.

The Seattle project was started in 2009, "to serve as a national model for how jurisdictions can provide energy code flexibility to owners of older and historic buildings who commit to achieving appropriately ambitious energy performance outcomes while protecting valuable architectural features and pursuing retrofit strategies that will provide the highest return-on-investment."[95] By implementing the outcome-based codes they are holding buildings accountable for actual performance outcomes, while allowing some flexibility on how owners approach getting there. The project report points out that this approach will especially benefit smaller, older buildings, where certain new technology might not work or even fit. It points out that, "ninety-five percent of commercial buildings in the United States are smaller than 50,000

[94] "Model Energy Code Project," PreservationNation.org, http://www.preservationnation.org/information-center/sustainable-communities/sustainability/green-lab/additional-resources/Green_Lab_Model_Energy_Code_Project.pdf (accessed December 14, 2011).
[95] National Trust for Historic Preservation, "Outcome-Based Energy Code For Existing Buildings," New Buildings Institute, http://vwww.newbuildings.org/sites/default/files/SeattleOutcomeBasedEnergyCodesReport.pdf (accessed January 3, 2012).

square feet, seventy-two percent are less than 10,000 square feet, and more than half are less than 5,000 square feet.[96] On top of that, almost eighteen percent of commercial buildings were built before 1946, and thirty percent were built before 1960.[97] These buildings are already providing sustainability in all of the ways mentioned in previous chapters and would not necessarily work with prescriptive codes requiring new technology that would not only be inappropriate for their character, but also likely would not achieve better efficiency than some more passive approaches. Existing buildings are not blank slates, like new construction, so the one size fits all prescriptive approach does not work. This is where outcome-based codes are crucial. Owners who would be reluctant to come up with money for aggressive retrofit measures, or who simply do not want to disturb the character of their structures, can focus their investment on areas that work well to achieve better efficiency in their building.

In Seattle they are testing out this process by developing an outcome-based approach that is a voluntary, alternative, code path for existing buildings. This approach is meant to be part of a group of "energy performance policy tools that will eventually be used in concert."[98] The rest of the group includes benchmarking and disclosure, participation in a regional working group, demonstration projects, development of a demonstration ordinance, adoption of sub-metering and measurement requirements for each load type and each tenant, development of market tools, and influencing the national policy framework. Basically, they are looking to set a standard and do it right by making sure they get each step in the process right. They are setting standards based on data they collect, setting up charrettes to make sure all ideas are heard, using demonstration projects to test the process and expose challenges, developing the ordinance based

[96] Ibid, pg. 6.
[97] Ibid.
[98] Ibid, pg. 11.

on the demonstration projects, figuring out the best way to measure the efficiency, and trying to make sure that they incorporate tools that aid the process. All the while, they are setting the standard for the rest of the nation to follow. Hopefully the success of this project will lead to other cities taking note and exploring the benefits of outcome-based codes themselves. If energy codes are going to be put in use, we must make sure these are getting the attention they deserve because these are the ones that are going to allow for existing buildings, and therefore preservation, to succeed.

In addition to work being done in Seattle by the Preservation Green Lab, the International Code Council (ICC) is working on a more international green code. This code is being called the International Green Construction Code (IGCC). The ICC is the publisher of model codes already used by many states and local municipalities, so it already has a good reputation for code making. The IGCC sets minimum requirements in areas such as site development, material resource conservation, energy conservation, and water use. While doing this, it also leaves room for customization and takes into account that existing buildings require different approaches to being sustainable. It allows historic buildings to bypass or find alternatives to compliance that could adversely affect its historic character.[99] Most of what the code requires of existing buildings is routine maintenance that owners should be doing anyway to ensure a clean and properly functioning building. For alteration projects, the code has additional requirements such as energy audits, metering devices, and a commitment to a maintenance plan for equipment, but caps the cost at no more than ten percent of the total cost of the project.[100] This should help to keep from deterring adoption due to cost. Because this IGCC is being developed by such a

[99] John Cluver, "The Green Code and Preservation," Voith & Mactavish Architects LLP, http://www.voithandmactavish.com/innovation/blog/the_green_code_and_preservation (accessed February 4, 2012).
[100] Ibid.

known and established entity, and is flexible and takes into account that existing buildings have different needs for achieving sustainability, it is a great step in the right direction. It is doing much of the same job as the Seattle project, but without actual testing first. The combination of the success of the Seattle project and the ease of the adoption of the IGCC will hopefully lead to widespread adoption of codes that aim for a more sustainable future, but allow existing buildings a better way to get there.

The District Approach

Another approach, which would allow for even more specific goals and procedures for a community, is developing sustainability guidelines for specific historic districts. All historic districts, whether designated as a National Register district or a state or local district, should already have a set of guidelines in place. These guidelines are usually the key part of design review and aid in the preservation of the buildings within the district. The problem with most current design guidelines for historic districts, right now, is that they do not directly approach the subject of sustainability. Because preservation is obviously geared towards preserving original materials and respecting the inherent energy saving properties that exist in historic structures, sustainability is usually included in some way even if the actual word does not appear. This approach is great in that it is at least advocating some sustainability, but a more balanced approach that includes dealing with changes that involve the potential of new techniques that are geared towards a more sustainable building is key. Because these more current issues are not included in the guidelines, and preservationists often are not up to date on the new techniques and approaches, commissioners or board members often feel uncomfortable helping owners balance energy and preservation concerns. Because these preservationists are more geared

towards the preservation aspect, they may take the approach that preservation "trumps" energy concerns. In order to fix this problem clearer guidance is needed.

In February of 2011, the National Trust published a booklet called, "Developing Sustainability Guidelines for Historic Districts.[101]" This booklet includes several different approaches for how to introduce sustainability into preservation guidelines. It states that the key issue in starting to do so is to first introduce general concepts of sustainability and establish a rationale for preservation as a sustainable initiative.[102] The key concepts they suggest introduce many of the concepts touched on earlier in this thesis, such as: avoiding negative environmental impacts from new construction, making smart use of land, life cycle analysis, and energy conservation. Next the booklet recommends outlining an overall strategy for energy conservation and generation for the property owners. It lists the basic steps to do so as:

(1.) Conducting an energy audit,

(2.) Setting goals for sustainability as part of the project,

(3.) Identifying management strategies to improve energy efficiency; and

(4.) Developing the components of the strategy.[103]

In addition to suggesting these crucial steps, the booklet suggests the possibility of including sustainability in specific guidelines such as guidelines on energy conservation, building insulation, solar collectors, etc. This is very similar to the way that the National Trust publishes its guides, just on a much smaller and more specific scale. In the conclusion the booklet presents the three approaches to publishing green guidelines and gives advantages and concerns for each.

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[101] Nora V. Winter, *Developing Sustainability Guidelines For Historic Districts* (Washington, D.C.: National Trust for Historic Preservation, 2011), page 3.
[102] Ibid, pg 4.
[103] Ibid, pg. 6-7.

Table 4.3 Approaches for Publishing Green Guidelines for Districts – Advantages and Disadvantages of Each[104]

Approach	Advantages	Disadvantages
Integrate Sustainability throughout the Preservation Guidelines	• Embeds the green ethic in all preservation design topics • Allows the commission to highlight how many of the existing guidelines are already green • More integrated approach that demonstrates that sustainability is an inherent tenet of preservation	• Would require substantial editing to weave sustainability in • May require a complete rewrite • May be a bit too "subtle" for attracting positive public attention
Place Sustainability Information in a Special Chapter of the Preservation Design Guidelines	• Helps focus attention on "green building" issues because the discussion is in one place • Makes it easier to convey to the public that the commission addressed the topic • More practical when a full rewrite isn't merited or feasible • Easier to execute because only affects one chapter	• May fail to show how existing design guidelines inherently contain sustainable concepts • May tend to focus only on technology issues and miss some of the broader points
Develop a Separate Brochure	• Relatively easy to produce • Can be made accessible to property owners rather easily • Can gain wider exposure because easier to distribute	• May not provide an integrated view • Difficult to provide the same level of information that the other approaches can

[104] Information taken from: Nora V. Winter, *Developing Sustainability Guidelines For Historic Districts* (Washington, D.C.: National Trust for Historic Preservation, 2011)

CHAPTER 5

GETTING THE POINT ACROSS AND DRIVING IT HOME

Now that we have established the ties that preservation and sustainability have had in the past and the ones that are happening right now, it is time to look toward the future. None of the information presented in this thesis means anything if it is not reaching preservation or sustainability professionals. An important step in this regard is making sure that future professionals understand the relationship between preservation and sustainability. The best way to do this is to make sure that they are being taught the information while working towards their degrees. For current professionals, there are several ways to convey this information. They can be given the information in published articles, they can receive the information via seminars, or State Historic Preservation Offices in their states can train them. Beyond professionals, it is also important that communities are introduced to this information. This can be done in much the same way as it could be for current professionals, but we must get their attention first. Not only must we get their attention, but also we must work hard to overcome their preconceived notions about the truths of older buildings and sustainability.

Preservation Education

James Marston Finch launched the first graduate program in historic preservation at Columbia University in 1973, just a few weeks apart from the Arab Oil Embargo.[105] The National Council for Preservation Education now has over fifty member institutions located across the Unites States focusing on historic preservation and related fields. These institutions

[105] Jeffrey Chusid, "Teaching Sustainability to Preservation Students," APT Bulletin, Vol. 41, No. 1, SPECIAL ISSUE ON SUSTAINABILITY (2010), pg. 43.

have educated thousands of students who have gone on to become leaders in historic preservation.[106] Included programs offer some forty-four different degree types ranging from certificates, concentrations, and full-fledged degrees in historic preservation, conservation, heritage resources, building-preservation technology, or similar topics, granted at the associate's, bachelor's, master's, and doctoral levels or in separate post-graduate programs. As if that diversity was not enough, the degrees are offered in a wide range of department types, from stand alone preservation programs, departments, or centers, to departments of history, public history, architectural history, American studies, planning, landscape architecture, law, anthropology, public health, interior design, urban design, construction management, and social sciences.[107] With this wide range of preservation education, preservation students learn very different things based on their program. Programs based in schools of architecture might learn more physical preservation practice, while those based in schools of public policy are probably going to learn more of the policy and advocacy side of preservation. This diversity allows many approaches to teaching preservation.

No matter the approach any given program might take regarding how they educate their students about preservation, sustainability should be discussed. While it may not be appropriate to spend a semester focusing on the science behind life cycle assessment or LEED certification at a program that focuses more on history or policy, there is still a place for sustainability at the table. Chusid argues that "programs that are strong in teaching advocacy and planning may be able to address the political and regulatory battles surrounding alternative rating systems in their courses, using cities such as Boulder, Colorado as a case study of cities that are integrating

[106] "About the National Council For Preservation Education," NCPE.us, http://www.ncpe.us/index.html (accessed January 3, 2012).
[107] Jeffrey Chusid, "Teaching Sustainability to Preservation Students," APT Bulletin, Vol. 41, No. 1, SPECIAL ISSUE ON SUSTAINABILITY (2010), pg. 45.

preservation and sustainability in their regulatory framework. Meanwhile, programs that are housed in architecture departments can address the design and technical issues associated with LEED and its many cousins."[108] This concept of taking the aspect of sustainability that is relevant to the program is a great start, but an even better approach would be to have a class dedicated to the subject of sustainable preservation that would touch on the key elements discussed in this thesis: the history between preservation and sustainability, the ways of assessing the sustainability of existing buildings, the inherent features of historic buildings that make them sustainable, and the different ways that preservation can make a difference in becoming a more sustainable culture. Preservationist are going to have to fight an uphill battle to get respect at the sustainability table and to be able to do this, we must make sure that we are educated in effective ways to convey this message.

There are two other ways to bring sustainability and preservation together at the college level. The first is by preservation programs, no matter the department that they are under, teaming up with the campus sustainability organizations. Most colleges today have both faculty led and student led groups and organizations dedicated to bringing sustainable practices to their campus. Like the rest of the world, most of the groups are currently focused on green gadgets and new technology. Tying preservation programs to these organizations would be a giant step in the right direction, as it would both give preservation students experience in convincing outside minds about sustainable preservation and introduce those outside minds to the concepts. This exposure for preservation would help tremendously.

The other approach is to introduce preservation to sustainability students. Sustainability has become such a hot topic over the past decade that there are now colleges across the country

[108] Ibid.

offering degrees on the subject. According to a USA Today article, "From MBAs in sustainable business practices to programs that give students the technical training necessary to operate wind turbines, student have an increasing array of options to choose from."[109] In the article, Julian Dautremont-Smith, of the Association for Sustainability in Higher Education, states that, "The past few years, society as a whole has become interested in sustainability. Higher education has been swept up too."[110] Sustainability is more than just a concern now, it is a career; students are being taught on the subject. Introducing them to the benefits of building reuse and preservation during their education could be a crucial step in the ideas being accepted in the sustainability community.

Current preservation professionals are perhaps the toughest crowd to convince that the preservation field needs to try to befriend the sustainability and green building community. These are the people who have been out making sure that the character of our historic resources is kept intact. They have likely been on boards or committees who have been approached to try to introduce these new technologies to the structures that they care so much about. Because the people advocating for the introduction of these new green technologies gave little consideration to preservation in the past, many of these existing preservationists have had a bad introduction to the whole sustainability movement. Now that there are examples of sustainable projects that have succeeded in respecting the things that preservationist care so much about, like character and integrity, it is time to win them over. Preservationists are often accused of living in the past. If we want to show the country that we are actually thinking about the future, we must do just that.

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[109] Jillian Berman, "College Students Are Flocking to Sustainability Degrees, Careers," USAToday.com, http://www.usatoday.com/news/education/2009-08-02-sustainability-degrees_N.htm (accessed February 1, 2011).
[110] Ibid.

How do we expose these current preservationists to successful sustainable preservation. We are already off to a good start. It seems like everyday there is a new success story posted online somewhere. The National Trust's blog has dedicated a weekly segment to sustainability and provides both success stories and stories about new technologies that are being incorporated in historic buildings.[111] There are several other blogs dedicated to the topic too. Carla Bruni's site "The Green Preservationist"[112] does a great job exploring the current goings-on in the world of "green preservation." Exposure like that is priceless, but it is necessary to go further to ensure that the message is being received. State Historic Preservation Offices (SHPOs) could play a big role here. Using the momentum that the National Trust has gained, SHPOs across the country could start implementing education courses on sustainable preservation. Once the SHPOs are on board, the rest of the preservation world would more likely jump on as well.

Educating The Community

Beyond educating current and future preservation or sustainability professionals, education for the rest of the country is just as, if not more, important. The community ultimately drives what goes on when it comes to preservation, and making sure that citizens are educated in both preservation and sustainability is essential. In order to do this both SHPOs and local preservation organizations across the country are going to have to put in some work. Community workshops and charrettes could make great strides in getting across the message. Again, providing proof that you can make strides in sustainability using preservation as a key goal is more important that anything. Seeing is believing.

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[111] "Sustainability Round-Up: The Greenest Building Edition," PreservationNation, entry posted February 10, 2012, http://blog.preservationnation.org/2012/02/10/sustainability-round-up-the-greenest-building-edition/ (accessed February 20, 2012).

[112] Carla Bruni, "The Green Preservationist," The Green Preservationist, entry posted February 10, 2012, http://preservegreen.wordpress.com/ (accessed February 20, 2012).

One of the hardest things to do in order to make any progress in connecting sustainability and preservation is going to war with the false preconceived notions that go along with older buildings. People who do not know much about preservation often think that old buildings are simply energy hogs. This is almost always the first argument a preservation project is going to come up against. Knowing how to battle this false accusation is essential to winning anybody over.

Partnerships

In his book on historic preservation, Norman Tyler, points out that "the idea of partnering with like-minded organizations, agencies, and individuals to further the preservation cause is not a new one."[113] He points out that the act that gave preservation the most momentum, the Historic Preservation Act of 1966, only happened because of a partnership with the United States Conference of Mayors. Since then, the National Trust has been forming diverse partnerships with private corporations and federal and state agencies alike. These partnerships are essential to the progress that preservation has made, and is making, and in order to continue growing as a movement, it is time to form some new ones. Making connections with organizations such as the United States Green Building Council is the first step, but we must connect on a broader scale in order to make a larger impact.

[113] Norman Tyler, *Historic Preservation: An Introduction to Its History, Principles, and Practice*, 2nd ed. (New York: W.W. Norton & Company, 2009), 312.

CHAPTER 6

CASE STUDIES

This chapter introduces several cases where preservation and sustainability have successfully engaged. The first study is of the Emerson School, a building in Denver that was donated to the National Trust and is being used as a unique opportunity for the Trust to explore the ways in which preservation and sustainability can meet in a very public way. The second study, the Gerding Theater, is one of the most well known success stories of sustainable preservation. It was the first building on the National Register to achieve LEED Platinum status. Next, the Empire State Building represents the most famous union of preservation and sustainability. Lastly, representing a local case is the Hardman Farm in Nacoochee Valley, Georgia.

Emerson School

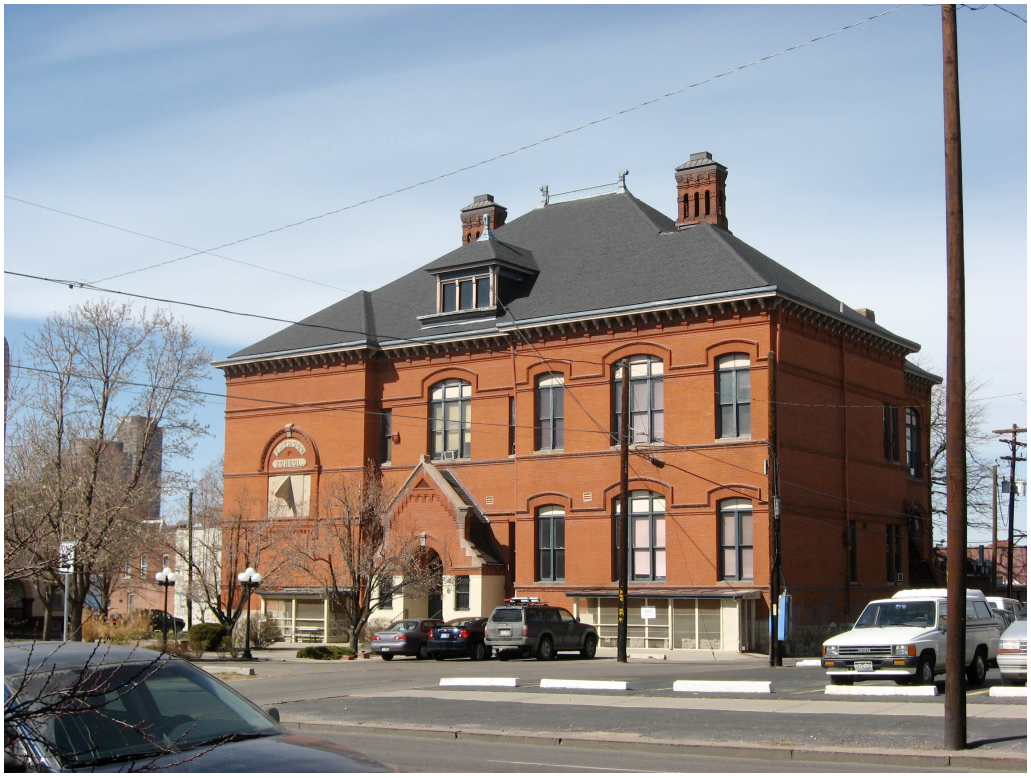

Figure 6.1 Emerson School Building, Denver (2009).[114]

Location: Denver, Colorado

Owner: The National Trust for Historic Preservation

Original Construction: 1885; addition 1917

Historic Designation: Individually listed as a Denver Landmark, 1984; National Register of Historic Places, 1997

Restoration/Renovation Completed: Expected 2012

Square Footage: 19,849 square feet

Recognition: Striving for LEED Gold

[114] Nyttend. *Emerson School, Denver*. 2009. Wikipedia. Accessed 16 April 2012. http://en.wikipedia.org/wiki/File:Emerson_School,_Denver.jpg.

Brief History

Robert Roeschlaub, who is widely recognized as Colorado's first master architect, designed the Emerson School in 1885. Roeschlaub is most well known for his school buildings, and the Emerson School is the oldest remaining one in Colorado. It is a two-story brick structure under a hipped roof. There is a large limestone sundial on the south façade that is believed to be the first of its kind in Colorado. The floor plan consists of four classrooms located around central hallways on both floors. Each classroom has a wall of large windows, which provide natural light and ventilation. In 1917 a one-story wing was added to the north side of the building. The addition includes several classrooms with fireplaces in each. The structure, including both original building and addition, was used as an elementary school from its construction until its close in 1979. After closing, the building was turned into a senior center, and later used by several other nonprofit organizations. The post-school uses altered the building by adding individual offices, a conference room in an original hallway, and an elevator. [115]

Sustainability

In 2010, the building was donated to the National Trust for Historic Preservation. This was partnered with a two million dollar endowment for the long-term maintenance of the building. Shortly after the building was donated, the National Trust decided to rehabilitate the structure as its Denver Office. They decided that it was also the perfect opportunity to show how older and historic buildings can be rehabilitated to achieve substantial, measurable reductions in

[115] "About the Emerson School Project," PreservationNation.org, http://www.preservationnation.org/information-center/sustainable-communities/sustainability/emerson-school-project/about.html (accessed February 1, 2012).

annual energy use and carbon emissions.[116] Given this opportunity to use the building as a model for success, they decided to publicize the project on a dedicated page on their website and hold an eco-charrette to gather information. They ended up establishing three main project goals:

1. Creating a new historic preservation center – Co-locating three of Colorado's leading historic preservation organizations will foster even greater cooperation among these partners and will provide a venue for joint educational events, fundraisers and public programs that will raise the visibility of historic preservation in the community.
2. Fostering neighborhood revitalization – The rehabilitation of the Emerson School represents a significant investment in Denver's East Colifax commercial district and the surrounding Capitol Hill neighborhood. We look forward to working with our preservation and neighborhood partners to encourage additional preservation-based community development in the area.
3. "Greening" a historic building – This LEED-certified project will demonstrate how older buildings can be upgraded to meet – or exceed – the highest standards for energy conservation. We will document and share our energy consumption strategies and techniques, as well as the results we achieve, so that others may learn from our experience.[117]

The goal that got the most attention, and is most relevant here, is the final one. The Trust knew from the beginning that they wanted to use this project as a model for success for how to "green" a historic building, but deciding on the best way to prove this was difficult. In January of 2011, the Trust posted a blog post titled "To LEED or Not to LEED?" The post was directed at

[116] Jim Lindberg, "To Leed or Not to Leed?" PreservationNation, entry posted January 31, 2011, http://blog.preservationnation.org/2011/01/31/to-leed-or-not-to-leed/ (accessed February 1, 2012).
[117] Ibid.

the Emerson School project. It stated that at a previous eco-charrette they had already decided to aim for some ambitious targets for energy consumption: a thirty to fifty percent reduction by 2012 and "net-zero" consumption[118] by 2030.[119] It followed this information by introducing the idea of using LEED certification on the building to give it credibility, but pointed out the high costs associated with the process (four to eleven percent of the project costs).[120] Next, the post mentioned a bright spot in this downfall of LEED – that "many of the "hard cost" expenses that might be necessary to gain LEED points are for thing that we will be doing no matter what.[121]" Despite this, the "soft costs" would still be significant, so they asked the following questions:

1. How important is LEED certification if we want the Emerson School to be taken seriously as a "green" building project and a national model? What level of LEED certification would we need to be taken seriously: Certified, Silver, Gold, or Platinum?
2. Should we skip the LEED certification and put our dollars and emphasis on energy performance improvements instead? Can this be another kind of national model?
3. Would the National Trust's decision not to LEED-certify a model "green rehabilitation" be comparable to a green building or environmental organization trying to tout a rehabilitation as a preservation model, even though they didn't think that the documentation for a National Register nomination or following the Secretary of the Interior's Standards was "worth it?"

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[118] Net-zero consumption means that the building would produce more energy than it used.
[119] Jim Lindberg, "To Leed or Not to Leed?" PreservationNation, entry posted January 31, 2011, http://blog.preservationnation.org/2011/01/31/to-leed-or-not-to-leed/ (accessed February 1, 2012).
[120] Ibid.
[121] Ibid.

4. Are there other, less expensive or more valuable green building rating systems that we should consider instead?[122]

The responses to those questions formed fairly evenly divided positions:

1. Those in favor of LEED certification praised the third party verification process and the importance of getting more historic buildings LEED certified to counter the argument that older structures waste energy and to show that the preservation community takes sustainability seriously.
2. Those against LEED claimed that it was too focused on documenting design solutions instead of actual results and pointed out that the cost were just too high.[123]

Ultimately the Trust decided to go forward with LEED certification of the building for several reasons. They decided that doing so would help lead LEED to continue to evolve toward acknowledging the sustainable benefits of retaining and reusing historic buildings. Also, tracking and analyzing the experience with LEED would enable them to better understand the process and how LEED works or does not work for historic buildings. The last reason that is mentioned is the same main reason that was recommended for forming a better relationship with the LEED system earlier in this thesis – credibility. LEED is the leader in certifying green buildings. In order to associate the preservation community with green buildings we must embrace it.

It was decided that LEED Gold would be the goal and work started in late 2011. The project involves $2.1 million in hard building costs and includes installing a geothermal HVAC system, repairing original wood windows, replacing inefficient light fixtures, and opening up the interior to restore passive ventilation and natural lighting schemes that had been abandoned over

[122] Ibid
[123] Ibid

the years.[124] Energy use is projected to be forty percent less than what is currently required by code. In order to reach the goal of being "net-zero" by 2030, the Trust plans on continuing to improve the performance of the building over time. They are looking to add photovoltaic panels when the cost of the panels comes down.[125]

Conclusion

The Emerson School is the ideal example of greening a historic building because the National Trust is doing it. The Trust is taking every step to make sure that they do everything right and taking opinions from everybody. The fact that they opened the discussion about whether to get LEED certified or not and after their research decided to aim for LEED goal shows that forming a better relationship with LEED and the United States Green Building Council is something that the Trust is interested in. This project is not done yet, but all projections point to a successful LEED Gold certification making it a successful model for the preservation community.

[124] Jim Lindberg, "Greening a Historic School," GreenBuildingPro.com, http://www.greenbuildingpro.com/articles/57-features/3273-greening-a-historic-school (accessed February 25, 2012).
[125] "Emerson School Hard Hat Tour Recap," DenverArchitecture.org, http://denverarchitecture.org/emerson-school-hard-hat-tour-recap (accessed February 25, 2012).

Gerding Theater

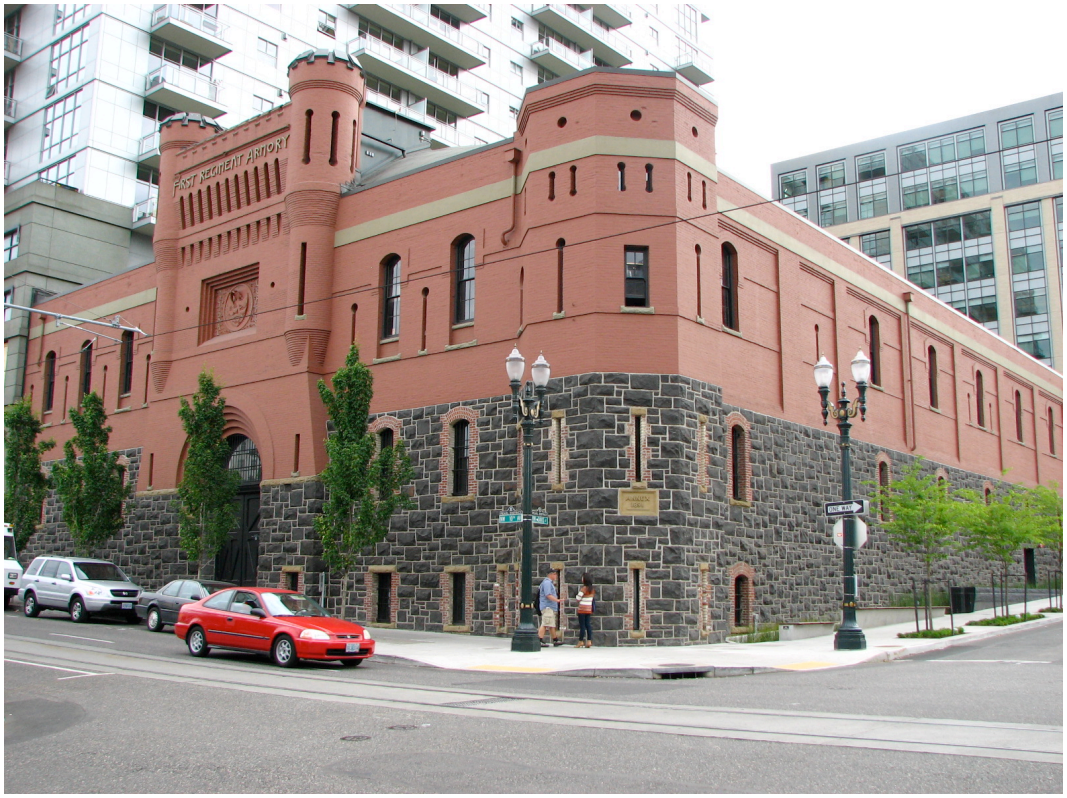

Figure 6.2 Gerding Theater, Portland (2008).[126]

Location: Portland, Oregon

Owner: Portland Historic Rehabilitation Fund

Original Construction: 1891

Historic Designation: National Register of Historic Places, 2004

Restoration/Renovation Completed: 2006

Square Footage: 55,000 square feet

Recognition: LEED Platinum; American Institute of Architects (AIA)/International Interior

[126] Werewombat. *First Regiment Armory – Gerding Theater – Portland Oregon*. 2008. Wikipedia. Accessed 16 April 2012. http://en.wikipedia.org/wiki/File:First_Regiment_Armory_-_Gerding_Theater_-_Portland_Oregon.jpg.

Design Association (IIDA) Interior Design Award 2007; AIA/Committee on the Environment (COTE) Top Ten Green Projects Honorable Mention 2007; Urban Land Institute Awards for Excellence 2007[127]

Brief History

What is now called the Gerding Theater started out as an armory built for the Oregon National Guard in 1891. In its early days it served as a drill hall and indoor firing range. Its thick walls, reinforced wooded doors, turrets, and crenellated parapets made it a unique building in Portland. By the mid-1890s, the building started to serve as a public hall because it could handle such large crowds. Events such as annual reunions, tributes to the dead, meeting and conventions, trade shows and exhibitions, as well as concerts often filled the large building.[128]

In 1918 Portland got another large building in the Municipal Auditorium, and the armory building lost its popularity. Amateur boxing was the main attraction of the building for the next decade. That stopped in 1928, when a Fire Marshall determined that the building was unsafe and closed it down. For the next four decades there were several proposals to replace the armory, but none panned out until 1968 when Blitz-Weinhard purchased the building.[129] They used the building to house kegs for several decades.

In 2000 a developer bought the building with the intention of turning it into mixed-use shops, condos, and offices, but every would-be tenant backed out.[130] Just as the developer was making demolition plans, the city's largest theater company came in and saved the building. The

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[127] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 115.
[128] "About the Armory," PCS.org, http://www.pcs.org/about-the-armory/#history (accessed February 25, 2012).
[129] Ibid.
[130] Brian Libby, "The Art of Compromise," MetropolisMag.com, http://www.metropolismag.com/story/20070110/the-art-of-compromise (accessed February 1, 2012).

only problem was that the theater company needed a space that was 55,000 square feet and the armory was only 20,000 square feet at the time.[131] In order to make the theater fit in the space the project team had to excavate thirty feet into the ground and figure out a way to brace the structure without altering the existing structure. They did so by building a concrete box inside the existing shell using two fourteen foot wide doors to get all the tools and materials inside.[132]

Sustainability

The theater company, Portland Center Stage, knew from the beginning that they wanted to follow Portland's reputation for being a sustainable city and make their new home as sustainable as possible.[133] They achieved this goal by striving for LEED Platinum certification. In order to do so, they developed strategies for each LEED category.

For the sustainable sites category the team achieved sustainability goals in a variety of ways. Because the building was already accessible by public transportation, it already had that benefit built in. Car pools and use of energy efficient vehicles are also promoted by the theater. It also accommodates employees or patrons who choose to bicycle or commute by foot with showers, changing areas, and bike racks. By excavating the site only on the interior without damaging the exterior and the rest of the site, the team further ensured the sustainability of site. Also on the exterior the team took advantage of pervious pavers that increase stormwater infiltration into the ground and keep it out of the sewer system, used native vegetation to minimize the need for irrigation (a process known as xeriscaping), and used landscape elements known as bioswales to remove pollution from runoff.

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[131] "Overview," USGBC.org, http://leedcasestudies.usgbc.org/overview.cfm?ProjectID=833 (accessed February 1, 2012).
[132] Ibid.
[133] "About the Armory," PCS.org, http://www.pcs.org/about-the-armory/#history (accessed February 25, 2012).

The use of pervious paving, xeriscaping, and bioswales also played a role in the water efficiency of the site. In addition to these features, the team implemented a 10,000 gallon underground cistern that harvests rainwater from the roof to be used for toilet flushing and urinals. This system cuts the stormwater entering the sewer system by twenty-six percent over a conventional system.[134] Ultra-low-flow plumbing fixtures and dual-flush toilets are also used in the building and provide a savings of eighty-eight percent in the demand of potable water.[135]

One of the most interesting features of the building comes in the energy and atmosphere category. Here, the team was able to connect to an offsite district chilled-water plant, which eliminated the need to install chillers on the site itself. Instead of these on-site chillers, the district energy approach allows multiple buildings to connect to one big system. This provides an opportunity to upgrade an entire district in one step. Systems like this are becoming increasingly popular and spurring a movement called the "Eco District" movement around the country.[136] Portland is one of a few cities pioneering the way for this movement, and having this building be a part of this is another reason that it is an important example of sustainable preservation.

In addition to the connection to a district energy source, the building also uses several onsite strategies to heat and cool the building. The building takes advantage of a chilled beam system. A small fan blows air past tubes of regionally chilled water to cool individual workstations throughout the building. This process provides efficient cooling and comfort. In order to heat the spaces in the structure, hot water tubes embedded in the flooring provide radiant heat. The existing thermal mass of the building, along with the new concrete floors and walls,

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[134] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 118.
[135] "Overview," USGBC.org, http://leedcasestudies.usgbc.org/overview.cfm?ProjectID=833 (accessed February 1, 2012).
[136] MetropolisMag.com "Preservation and Sustainability: The District Approach"

absorb heat gains and dampen temperature swings decreasing the need for heating and cooling in the structure.[137] In the actual theater part of the building there is an airflow cavity under seating risers and distribution vents under every other seat to maximize comfort. In order to ensure proper use of lighting, photosensors, occupancy sensors, and dimming switches are used.[138] The building also ensures proper use and maintenance with commissioning.

The materials and resources used and abandoned in the building reuse also contribute to its sustainability. Ninety-five percent of the construction waste was recycled. Both local and recycled materials were used where new material had to be brought in. Forty-five percent of the materials used were manufactured within 500 miles of the site. Twenty-five percent of the materials came from recycled sources.[139] The building also uses flyash concrete substitute, which is more sustainable than its alternative, Portland cement, because it is a byproduct material and does not require additional manufacturing.

To ensure indoor environmental quality skylights were added to light the administrative and lobby areas during the day. Many of the skylight and several of the windows on the building are operable to allow for fresh air and natural ventilation. Carbon dioxide monitors have been installed to ensure proper ventilation. The use of only low-volatile organic compound (VOC) materials and finishes reduces the chemicals put into the airstream of the building.

In addition to the features mentioned above, the Portland Theater Company also decided to implement an occupant-recycling program. Patrons have the option to leave playbills behind for reuse or recycling, while employees save misprints from the printer for use as notepads. A

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[137] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 118.
[138] "Overview," USGBC.org, http://leedcasestudies.usgbc.org/overview.cfm?ProjectID=833 (accessed February 1, 2012).
[139] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings* (Hoboken, NJ: John Wiley & Sons, Inc., 2010), 118.

green cleaning policy was also implemented. Cleaning crews use only environmentally sensitive cleaning products.[140]

Figure 6.3 Gerding Theater (Interior).[141]

Conclusion

The Gerding Theater is a very unique structure in a very unique place. Being located in Portland, a city that prides itself on its sustainability, provided an opportunity to show that a historic building can participate and contribute to this pride. It took a lot of creative minds to fit the theater in the old armory building, but in order to reuse our building stock and create a more sustainable future we are going to have to be creative. This building shows that it can be done, and it can be done sustainably. The fact that a project that was likened to "building a ship in a

[140] "Overview," USGBC.org, http://leedcasestudies.usgbc.org/overview.cfm?ProjectID=833 (accessed February 1, 2012).
[141] Hochstein, Miles. *Gerding Theater at the Armory, 2*. 2007. Portland Ground. Accessed 16 April 2012. http://www.portlandground.com/archives/2007/11/gerding_theater_at_the_ar.php

bottle[142]" could achieve LEED Platinum status should inspire us to aim to achieve such lofty goals for all of our historic buildings. It shows that preservation and sustainability can compromise and make it work. Hopefully owners of other historic buildings have taken notice.

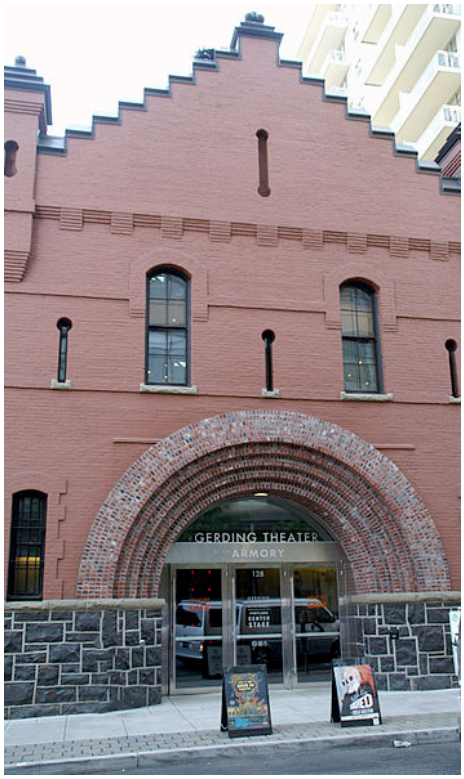

Figure 6.4 Gerding Theater (Front Doors).[143]

[142] Brian Libby, "The Art of Compromise," MetropolisMag.com, http://www.metropolismag.com/story/20070110/the-art-of-compromise (accessed February 1, 2012).
[143] Tedder. *Portland-Armory Portland-Oregon 2008-May*. 2008. Wikipedia. Accessed 16 April 2012. http://en.wikipedia.org/wiki/File:Portland-Armory_Portland-Oregon_2008-May.jpg

Empire State Building

Figure 6.5 Empire State Building, New York (2011).[144]

Location: New York, New York

Owner: Empire State Reality Trust

Original Construction: 1931

Historic Designation: New York City Landmark, 1981; Listed on State and National Register of Historic Places, 1982; National Historic Landmark, 1986[145]

Restoration/Renovation Completed: 2011

Square Footage: 2.85 million square feet [146]

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[144] Smithfl. *Empirestatebuildingfrombrooklynnewyork*. 2001. Wikipedia. Accessed 16 April 2012. http://en.wikipedia.org/wiki/File:Empirestatebuildingfrombrooklynnewyork.jpg

[145] "Historical Timeline," ESBNYC.com, http://www.esbnyc.com/esb_story_historical_timeline.asp (accessed February 1, 2012).

[146] "About ESB," ESBNYC.com, http://www.esbnyc.com/explore_esb_about_esb.asp (accessed February 1, 2012).

Recognition: LEED Gold for Existing Buildings

Brief History

The Empire State building was officially opened on May 1, 1931, when President Hoover pressed a button in Washington, DC, which turned on the building's lights.[147] That extraordinary start to the building's life would prove to be a trend for the rest of its life. It would stand as the tallest building in the world from its completion until 1972. In 1980 it was given its own zip code. A poll by the AIA in 2007 named the skyscraper "America's Favorite Architecture.[148]" These accolades celebrate the tremendous popularity of the building and speak of its importance to both the city of New York and the entire country. For this reason, when it was announced in 2009 that the building would start a sustainability program to reduce its carbon footprint and be more energy efficient, it became a global model for retrofitting existing buildings.

Sustainability

After deciding to upgrade the Empire State Building to be more sustainable, numbers were crunched, mechanical systems were analyzed, and calculations were checked and rechecked to come up with a conclusions that upgrading the ventilation system, the windows, and the chiller plant, along with several other things, would reduce the energy consumption of the building by thirty-eight percent. It would also decrease carbon dioxide emissions by 105,000 metric tons over a fifteen-year span, and save around $4.4 million annually allowing for a three-year payback of the implementation costs.[149] Some of the upgrades included a control system that automatically dims lighting levels and the retrofitting of 6,500 windows. The windows were

[147] "Historical Timeline," ESBNYC.com, http://www.esbnyc.com/esb_story_historical_timeline.asp (accessed February 1, 2012).
[148] Ibid.
[149] "Empire State Building Achieves Leed Gold Certification," SustainableBusiness.com, http://www.sustainablebusiness.com/index.cfm/go/news.display/id/22898 (accessed February 1, 2012).

done in a way that made them more sustainable, but reused the original window. This was done by breaking the seals of the old windows, inserting Mylar sheaths between the panes, and resealing them with krypton-argon gas inside. The film inside the window goes unnoticed, but acts as a heat mirror, blocking most of the sun's rays, reducing the need for air conditioning in the summer, and creating two pockets providing additional insulation, reducing heating loads required in the winter. On top of all of that, the windows are still operable, allowing for natural ventilation when necessary.[150]

In addition to retrofitting the windows, the radiators that are installed throughout the building also received some attention. Heat flow that was being lost due to some of the heat escaping and heating the outside of the building was redirected to the interior simply by adding insulated reflective barriers behind all of the radiator units in the building. Carbon dioxide sensors, upgraded air-handling units, and various other technologies were also added to the building.[151]

In January of 2011 the Empire State Building Company, the owners of the building, bought carbon offsets totaling fifty-five million kilowatt hours per year of wind energy. This offsets the energy use of the building and makes it carbon-neutral.[152]

Conclusion

The success of the Empire State Building to meet LEED Gold status is a huge success story for the preservation community. The building is the tallest and most well known building in

[150] Sudip Bose, "The Height of Sustainability," *Preservation Magazine*, March/April 2010, page nr. The Height of Sustainability.
[151] Ibid.
[152] "Empire State Building Achieves Leed Gold Certification," SustainableBusiness.com, http://www.sustainablebusiness.com/index.cfm/go/news.display/id/22898 (accessed February 1, 2012).

the United States to receive any LEED certification.[153] It is one of a small group of National Historic Landmarks to do so as well. The team behind the project took advantage of the existing building and the systems already in place instead of stripping the building and inserting all new systems. This ability to upgrade instead of replace allowed for significant monetary and energy savings and serves as an example that almost anything can reused and serve as an example of sustainability.

[153] Craig Bloomfield, "Empire State Building Achieves Leed Gold Certification," USGBC.org, http://www.usgbc.org/ShowFile.aspx?DocumentID=10266 (accessed February 1, 2012).

Hardman Farmhouse

Figure 6.6 Hardman Farmhouse, Georgia (2011).[154]

Location: Nacoochee Valley, Georgia

Owner: Georgia Department of Natural Resources

Original Construction: 1869

Historic Designation: Included in the Sautee and Nacoochee Valley National Register District

Restoration/Renovation Completed: 2010

Square Footage: 18 structures on 173 acres

Recognition: LEED Gold

[154] Hillyer, Jonathan. *The Farmhouse at Hardman Farm*. 2011. OpenBuildings.com. Accessed 16 April 2012. http://openbuildings.com/buildings/farmhouse-at-hardman-farm-profile-42878#!buildings-media/1

Brief History

The Hardman Farm sits on 173 acres just outside of Helen, Georgia. The farm consists of an Italianate farmhouse built in 1869 and twenty-three other farm buildings. The farm is named after its second owner, physician, entrepreneur, farmer and former Georgia Governor Lamertine Hardman.[155] Hardman originally used the farm for his summer retreat and to experiment with different farm techniques. The property remained in the Hardman family until 1998 when it was deeded to the State of Georgia to ensure its long-term preservation.[156] During the time that it remained in the family, the farm underwent very little change, making it a unique historic resource when the state received it. It provides a glimpse into the architecture and technology of the late 1800s and early 1900s and is used as an interpreted historic site.[157]

Sustainability

When the state decided to restore the farmhouse, the goal was to create a museum quality interior environment with tightly controlled temperature and humidity ranges. However, this was eventually deemed an inappropriate approach for the structure because it had never been climate controlled, and changing this could have an adverse effect on the structure and the pieces inside. Because of this, focus was put on the existing passive cooling system. The design engineer assigned to the project developed a three-dimensional computational fluid dynamics model to better understand the effectiveness of the system. Modeling the house in a whole building energy

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[155] "Historic Preservation Approach Characterizes 19th Century Italianate House Restoration at Georgia's Hardman Farm: LEED gold certified project "demonstrates that historic restoration and green building principles go hand in hand"," SoutheastGreen, http://www.southeastgreen.com/index.php/development-news-/5408-historic-preservation-approach-characterizes-19th-century-italianate-house-restoration-at-georgias-hardman-farm (accessed February 1, 2012).

[156] Susan Turner, "Historic Leed Renovation," Center for a Better Life, http://www.centerforabetterlife.com/eng/magazine/article_detail.lasso?id=283 (accessed February 1, 2012).

[157] Ibid.

simulation tool capable of calculating building energy usage utilizing annual weather data then tested the results of that model. The conclusion of these models was that the temperatures in the building would maintain at comfortable levels for most of the year and the passive cooling system would be effective enough for the use of the building.[158] In fact, it was found that the natural ventilation system of open doors and windows worked so well that there are only about forty hours a year when the interior temperature exceeds thermal comfort.[159] From here, the team decided on the goal of LEED Gold certification. In addition to the use of the natural ventilation system, points were given for existing features such as the large windows and use of local building materials.

Several new technologies were also implemented in the plan for the restoration. One of these was the under-floor hydronic heating system. This system uses water pipes, installed underneath the first floor and heated by a gas boiler, to heat the building. The building is also one of the first historic buildings in the country to take advantage of a solar panel system. This system provides a significant percentage of the energy used at the house. An underground cistern and low-flow plumbing fixtures were also installed at the house.[160]

Conclusion

The farmhouse at Hardman Farm is a very unique example of sustainable preservation. It sits on a large plot of land that was largely untouched for over a century. It shows that a historic house on a farm can achieve LEED certification without harming the character of the building or the site. The use of solar panels sounds extreme, but this project shows that they can be used in a way that does not take away from the historic resource.

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[158] Ibid.
[159] *Rambler*, Green Before Green Was Cool, Summer 2010, 10.
[160] Ibid.

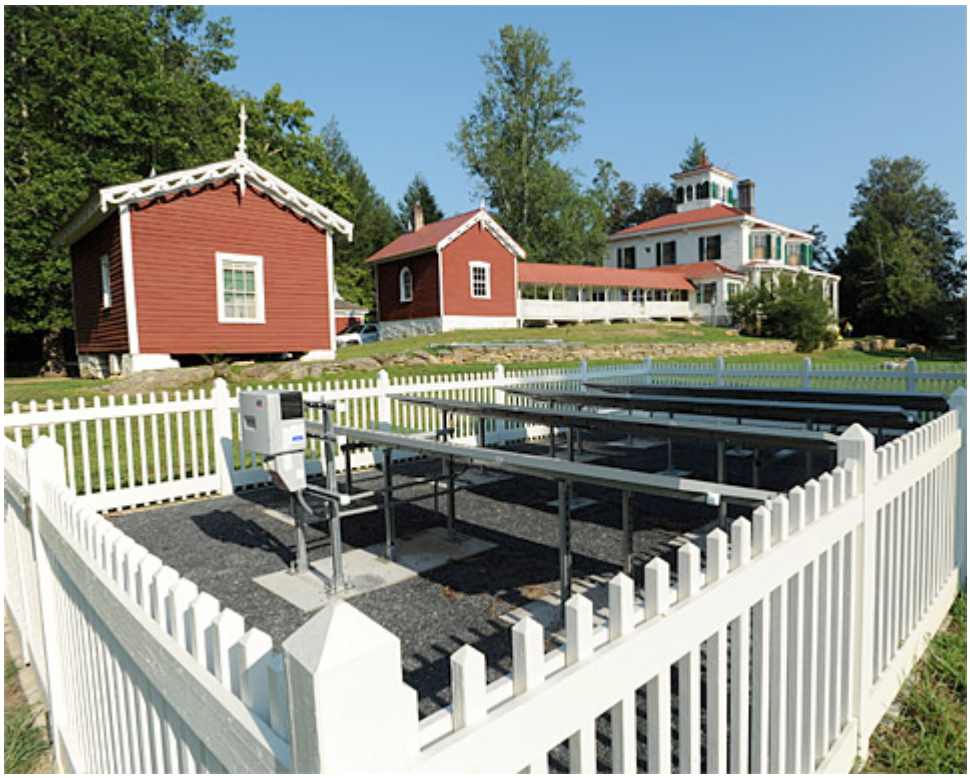

Figure 6.7 Hardman Farm (Solar Power).[161]

[161] Kirkland, Diane. *Hardman Farms*. 2012. Lord, Aeck, Sargent Architecture. Accessed 16 April 2012. http://www.lordaecksargent.com/portfolio-sustainability/featured_projects/energy/photovoltaic_solar_power

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

Discussions about sustainability are not going to go away. We have dug ourselves into a hole filled with greenhouse gasses and we have to get out. Fortunately for preservation, it is becoming more apparent that we are not going to be able to build our way out of this challenge. We must look at reusing what we have the best that we can. This directly points to the fact that preservation must be included in any plan of action for a more sustainable future.

Preservation and sustainability have a long history together that too often goes unmentioned in discussions of each. They both have similar goals of protecting the past and the current so that they may be enjoyed by the future. It has been shown through looking at embodied energy, avoided impacts, and life-cycle assessment, that it is in our best interest to look at reuse and rehabilitation as a large part of any strategy for a sustainable future. There are also many design aspects of historic structure that make them inherently sustainable. By bringing these features back to the forefront of any discussion about the energy use in historic buildings, we are making even more strides towards a sustainable future.

Based on the findings of this thesis, three crucial moves are recommended for the preservation community:

1. Form a partnership with LEED and the USGBC. The explosion of green building rating systems in the past two decades has shown that the public is interested in knowing that the buildings that they inhabit are environmentally friendly and more energy efficient than they have been in the past. The steady climb in the number of buildings assessed by the systems shows that

they are here to stay and are going to be a part of the future. In order for preservation to move closer to the forefront of the green building and sustainability movement, it is going to be necessary to make sure that these rating systems are giving historic buildings the credit that they deserve for being sustainable. The leader in green building rating systems, LEED, has shown that it will work with historic buildings and that it is willing to work with preservation professionals to make sure that they are correctly assessed and given credit for their energy efficiency and sustainability. By forming a partnership with LEED, the preservation movement would show that it is serious about its future and helping make a more sustainable planet.

2. Make sure that preservation has a place in any green building codes implemented by governments. The recent trend in green codes has been prescriptive based, which does not work well with historic buildings. By advocating the use of outcome-based green building codes, preservation can assure that it does not get left out of any coding. Currently outcome-based coding is being tested successfully in Seattle, which will hopefully inspire interest nationwide.

3. Improve preservation education by ensuring that sustainability in included in any curriculum. Making large strides towards getting the preservation foot in the sustainability door will only happen if preservation professionals are equipped with the knowledge necessary to do so. This means that sustainability must become a priority in preservation programs both on the education level and the professional level. Currently on the education level programs are beginning to make an attempt at including sustainability in their curriculum, but there is still a long way to go. It is hard to standardize this process because preservation is taught in so many different types of schools and each program tends to focus its approach towards whatever type of school they are located in. Regardless of the difference in the programs, it is imperative that future preservation professionals are given the tools that they need to at least defend historic

buildings when sustainability and energy use are used against them. On the current professional side, both the National Trust and SHPOs are making attempts to educate employees and other preservation professionals about sustainability. The National Trust has a section of their site dedicated solely to sustainable preservation. They have also put a focus on it at recent national gatherings and have published dozens of informational booklets and studies on the subject. Several SHPOs have followed the lead of the National Trust and have begun to incorporate sustainability on their websites, provide pamphlets on the topic, and promote the use of LEED or other rating systems to commissions in their state.

Based on the information gathered in this thesis it is obvious that preservation deserves to be mentioned in the same sentence with sustainability and indeed is a critical component toward achieving a sustainable society. The ultimate goal of a more sustainable planet is gaining momentum as our society realizes that we are running out of time to make changes. This hope of a sustainable future is going to rely on preservation and the current built environment more so than any fancy new green construction. It is imperative that the two movements get together now and help each other towards this ultimate goal.

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