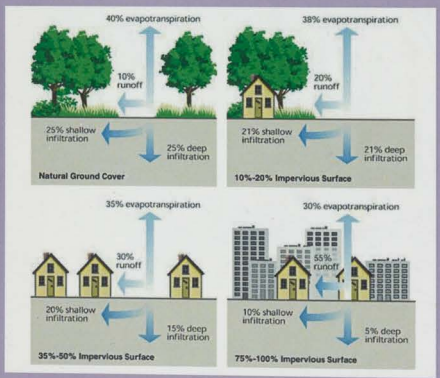
# Green Preservation:

## A Guidebook for Owners of Historic Buildings

By Leesa Gratreak

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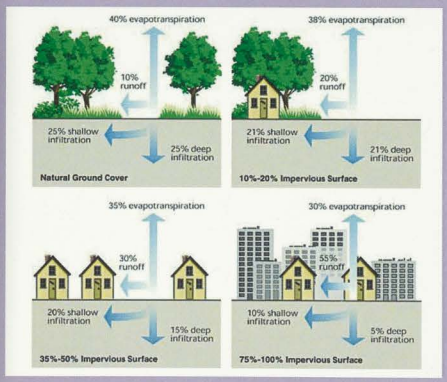


By: Leesa Gratreak
A Terminal Project Presented to the Department of Historic Preservation at the University of Oregon
in partial fulfillment of the requirements for the degree of Master of Historic Preservation
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Cover Photos Clockwise: The Cambridge City Hall Annex, Cambridge, MA, Graphic showing variety of vinyl products, Graphic showing water infiltration as it is effected by impermeable pavement, 800 19th Street, Des Moines, IA.
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University of Oregon Historic Preservation Program

Terminal Project Approval Page

Student: Leesa Gratreak

Title: Green Preservation

This Terminal Project has been accepted and approved in partial fulfillment of the requirements for the Master of Science degree in the Historic Preservation Program by:

Committee Chairperson: Christopher S Bell Date: 6.7.12

Committee Member: Sheri Stuart Date: 6-8-12

Committee Member: _____ Date: _____

Degree awarded: Month, Year June, 2012

I would like to dedicate this book to my
Mom and Dad for their support and love.

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# Introduction:

**i. Executive summary**

Statements like "These windows are too old", "I need to build a new structure if I want it to be efficient", and "as long as it is LEED certified it must be a sustainable project" illustrate this point: There is a disconnect between preservationists and building owners when dealing with issues of sustainability. The health of our planet, and the people living on it, is by far one of the most discussed issues in the field of architecture today. 'Green' building standards and alternative energy sources are being incorporated in nearly all new-construction projects, and emission outputs are being monitored in increasingly more municipalities. Why then can't these ideas and technologies be more regularly used in existing structures? The optimistic news is they can and should be.

There are many sources available on how to increase energy efficiency, but very few target the issue of how to integrate these systems and technologies into existing structures, especially if a priority of the project is to maintain historic integrity. The goal of this guidebook is to guide building owners on increasing sustainability while also promoting and relating it to historic preservation. All too often, misconceptions arise about the efficiency of historic structures and their ability to be rehabilitated. This rehabilitation is not only 'green'; it can also be economically stimulating and a powerful driving force for local and nation-wide action and pride.

Throughout this guide you will find references to case studies from around the country. Many of these are from the National Main Street program, and all of them show tangible examples of sustainability being incorporated in re-development projects. These examples are meant to aid the reader in understanding the applicability of new technologies, while gaining insight into how the projects performed after implementation.

# Introduction

**ii. Background**

"As champions of wise stewardship of our legacy from the past, preservationists are particularly adept at thinking about the long-term survivability of buildings and how they can be carefully maintained, innovatively reused, and thoughtfully preserved for future generations to enjoy- tasks that represent the very essence of sustainability"

-Richard Moe, in the forward to Jean Carroon's book "Sustainable Preservation: Greening Existing Buildings".

The beginnings of the modern historic preservation movement grew out of the environmental and social revolution of the 1960s. This was made law with the passing of the National Historic Preservation Act of 1966, which defined what was historic and how those historic structures should be treated and protected. This differed greatly from the origins of the preservation movement, which is most often associated with the Mount Vernon Ladies Association's efforts to save the childhood home of our first President. The movement as it evolved in the middle of the 20th Century began to include a broad spectrum of architecture and cultures, and steered away from classifying only the oldest, and most prestigious, buildings as 'important'.

This move in the 1960s came during a time when American's began seeing entire historic neighborhoods, often in lower-income communities, being torn down in the name of urban renewal. This movement paralleled the passing of the Department of Transportation Act of 1966, which too came out during a time of growing angst surrounding the destruction of buildings and towns for the sake of roads. The passing of these two pieces of legislation helped to secure preservation as a component of all federally funded projects, and helped to integrate preservation into all levels of governmental planning.

The sustainability movement, as it evolved in the middle of the 20th Century as well, began to take a similar approach by creating legislation to protect our natural environment. A milestone, which still directs much of the federal government's actions related to the environment, is the National Environmental Policy Act of 1969. This act provided a nation-wide framework for dealing with environmental issues and assured that all branches of government consider environmental impacts prior to the undertaking of major federal projects.

It is not a coincidence that these two movements began to evolve and develop at the same time. Preservation and environmental awareness had both gone from romantic notions to nation-wide movements that had been able to prove their importance on a nation-wide level.

# Introduction

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# Introduction

No longer did preservation remain a hobby for wealthy, affluent socialites looking for a connection to their genealogical past, and gone were the days when only the most elite in society had the time and influence to look at the environment as a valuable asset. For this reason, the two are able to come together under legal protection and be used simultaneously in a single development project.

During the 1973 Oil Embargo, it became increasingly important to both environmentalists and preservationists that older buildings receive updates to their energy efficiency. Weatherization of existing structures spread across the country and exterior storm windows were used in growing numbers. Many new technologies were experimented with and buildings across the country received varying levels of adaptation. Though this was necessary for the continuation of the preservation movement (as can be seen today, avoiding the prominence of global energy issues often leads to demolition or drastic alteration), it did cause many buildings to be altered beyond the necessary measures, and many times with materials which themselves were not very sustainable and have since already needed replacement.

As the environmental and preservation movements continued to develop and evolve, the two never fully took advantage of their ability to work together, and both remained in their separate worlds dealing with the same issues. One example of this occurred in the 1970s when solar panel requests for inclusion on historic properties were denied by the planning and historic review board. Instead of working with the building owner to find a less-intrusive way to include the alternative energy source, the project was simply denied. At the same time, there were not yet written design standards to aid individuals in balancing project needs. This period created a lot of hostility between preservationists and homeowners and woefully created many misconceptions about the possible efficiency of existing structures that continue to linger in the minds of those affected by historic review denial and perceived elitism.

Though the two movements came from a mutual desire to take care of aspects of the human world that affect our safety, happiness, and economic security, it took a great deal of time for the dialogue to occur on a national level. One of biggest steps to stimulating that interdisciplinary dialogue has been the creation of National Trust Preservation Briefs and Guidelines. One in particular, "Adapting Historic District Guidelines for Solar and Other Green Technologies" from 2009, is the exact direction the field needs to move, and is moving, to ensure preservation is included in long-range planning. Review boards do not simply deny projects, instead they find ways to mitigate, creatively implement, and accept re-development projects that will aid in the longevity of the existing structure. This is not to say that preservation needs

to accept a less important place in the planning process, it simply means that preservation projects that include the introduction of new technologies which do not significantly reduce the integrity of the structure can be acceptable. By allowing the building to adapt and grow, preservation as a profession and a community development tool will continue to grow as well.

There is an increasing awareness that working with existing buildings, materials and infrastructure is sustainable, cost effective, and good for the environment. Our world today has shown us that the issues surrounding the health of our environment are not avoidable. Issues of climate change, resource depletion, and harmful emissions are significantly affected by construction and development. In the US, buildings (including construction, demolition, and redevelopment) account for 40% of non-industrial solid waste, which equals 136 million tons of debris each year. The easiest way to reduce that number is to work with existing building materials. The energy it took to construct every historic building is an asset that has already been spent. To ignore the value of existing buildings would be both short sighted and unsustainable.

Through guidelines, research, and experimentation preservation will continue to incorporate new technologies, while respecting and learning from the past.

### iii. The Main Street Program

The importance the National and State Main Street programs have on economic development and adaptive reuse using historic structures is enormous. The goal of this section is to explain the Main Street program to aid in understanding many of the case studies that will be found throughout this guide.

The goal of the Main Street movement is to revitalize and transform historic downtowns and traditional commercial areas, link together businesses to create partnerships and local involvement, and provide nationwide and local support for restoration and rehabilitation projects. These goals are reached using the Main Street Four-Point Approach ® which is a unique preservation-based economic development tool that leverages local assists (historic, cultural and architectural resources) to promote revitalization and enhance community pride. It lays a foundation for local initiatives to take place that will have lasting effects on the community as a whole.

1) **Organization:** This involves building partnerships among the various groups that have a stake in the local economy and traditional commercial district. Partnerships include volunteer collaboration (often with the help of a paid program manager), and a board of directors (which helps in the long range planning of community wide projects and events). Representation is needed from a wide range of community members for development plans to have a lasting impact on the local economy. Also, involving all interested parties will help build consensus, identify sources of funding, and sites for projects, and volunteers for promotion and work parties. This allows for work to be divided up to avoid duplication of effort.

2) **Promotion:** the goal of this step is to restore and enhance community pride. This will improve consumer and investor confidence in commercial areas. Many historic commercial areas have been wrongly stereotyped as slums from poorly implemented urban renewal projects from the middle of the 20$^{th}$ century, issues related to economic recessions, and city shifts in population and density. By sending a positive message that a commercial district is safe, fun, and active, interest in development will increase. By promoting a business district's unique character, building owners may learn the value it can have on the community as a whole. It can also include specific business promotions or events to stimulate tourism, private investment, and new business attraction.

3) **Design:** this step is focused on getting the business district into its best physical shape. This includes making streets safer and more attractive, enhancing and bringing attention to the character defining details of your district (building elements, storefront windows, signs, public amenities like benches, lighting and plantings), and making efforts to reuse underutilized spaces (such as the second floor of a commercial building on a main street).

4) **Economic Restructuring:** the goal of this step is to strengthen existing economic assets while diversifying the economic base as a whole. This includes retaining successful businesses, providing a balanced mix of commercial businesses and residential units, attracting new businesses that the market can support, and sharpening the competitiveness and merchandising skills of business owners. This also includes putting underutilized properties back into a useful state, and finding uses that are compatible with the demographics and goals of the area.

Case studies can be found throughout this guide that will include work done by the Main Street program.

More information on the Main Street program, including steps to becoming a Main Street community, can be found at: http://www.preservationnation.org/main-street/

**iv. How to use this guide**

This guide is intended to educate owners of historic buildings on sustainability issues as they relate to historic structures. This is not a 'how-to' book, and all re-development projects should be planned in conjunction with professional planning and historic research to better understand the history and design of each building.

There are three main sections in this book, representing a holistic approach to sustainability: *environmental, economic, and social sustainability*.

The *environmental* section is meant to provide information on key issues, terms, technologies, and green energy sources. The specific needs of your building, climate, budget, and intended use will vary. In addition, local restrictions, district guidelines, and the authority that local governing bodies have over some protected structures will vary as well. All redevelopment projects should include consultation with the local jurisdiction of your state historic preservation office (SHPO) and/or local tribal historic preservation office (THPO) as applicable. More information on contacting local SHPOs and THPOs can be found at: http://www.nps.gov/nr/shpolist.htm

The *economic* section is meant to be a guide on incentives, economic development tools, and facts about property values as they relate to historic structures. Once again, incentives, tax credits, grants, and property values will vary by location, building type, local and national historic designation, and other factors. Your local state historic preservation office should be contacted for clarification on all issues related to eligibility and availability of funding and tax credits. In addition, consult a tax professional before making decisions that will affect tax credits, freezes, deductions and other tax related possibilities.

The *social* section provides case studies and examples that are meant to give ideas, inspiration, and guidance. The needs of your local community and building will vary.

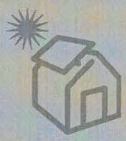
## Introduction

Throughout this guide, symbols and informational boxes will be used to signal key facts and terms, case studies, and sources (including specific individuals, additional books, and online sources). These tools will help the reader navigate the information, understand the issues, and find the next step to learning more.

This symbol will signal key facts and terms

This symbol will highlight key professionals to consult

This symbol will highlight key online sources



This symbol will highlight case studies

This symbol will highlight key books, journals and publications

# Introduction

**TERMS:**

**Historic Character:** All those visual aspects and physical features that comprise the appearance of historic buildings. Character-defining elements include the overall shape of the building, its materials, craftsmanship, decorative details, interior spaces and features, as well as the various aspects of its site and environment.

**Historic Preservation:** The act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction.

**Integrity:** the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric period.

Note: *Integrity* differs from *condition* in that it is measuring the extent that historic character has been maintained through the continued existence of defining characteristics. *Condition* refers to the current state of those characteristics. Poor *condition* does not necessarily eliminate the ability of a building to be designated as historic (designation will be discussed in the economics section), but poor *integrity* very well might.

**Rehabilitation:** The act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural aesthetic.

**Restoration:** is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.

# Introduction

TERMS:

**State Historic Preservation Office (SHPO):** (National Park Service Definition) State Historic Preservation Officers (SHPO) play a critical role carrying out many responsibilities in historic preservation. Surveying, evaluating and nominating significant historic buildings, sites, structures, districts and objects to the National Register is one such key activity. To help find out if a historic place meets the National Register criteria and how the nomination process works in your state, contact the appropriate SHPO office for assistance.

**Sustainability:** Meeting the needs of the present without compromising the ability of future generations to meet their own needs. This is the definition first cited by the United Nations in 1986.

# CHAPTER 1: Environmental Sustainability

Environmental sustainability is crucial for many reasons. The health of our planet , and frankly the continuation of human-kind, is dependent on the quality of our air, water, flora, and fauna. In addition, sustainable re-development practices that enhance the environmental sustainability of existing buildings can save money on energy bills and construction projects, while also creating well-paid skilled jobs. The buildings in which people live, work, and play have the ability to be efficient, beautiful, well functioning, and have a low-impact on the environments in which they exist.

The goal of this chapter is to inform the reader on current trends, terms, concerns, technologies and case studies on how to proceed on possible re-development projects.

**Rating Systems:**

As the desire for 'green' development projects became more prevalent worldwide, it became increasingly more important that projects claiming to be 'green' could provide valid proof of their claims. Before the creation of such rating systems, projects were more often worried about fulfilling legislative requirements as they applied to the environment (clean air, water, etc.). It was not until LEED certification took off in the US that people began saying "but is it *certified*?"

**LEED** (Leadership in Energy and Environmental Design):

This is perhaps the most talked about and discussed 'green' rating system in the US. The U.S. Green Building Council established the rating system in 1998. The rating system process works through an accumulation of points through environmentally friendly and beneficial choices made during the construction process, and through changes in the building's ongoing maintenance. These choices involve site location and existing infrastructure, energy use and creation, water management and treatment, encouraging alternative modes of transportation, encouraging the reuse of existing building materials and many others. There are multiple systems that can be used during different projects. The system focused on in this guide will be the "LEED Reference Guide for Green Building Operations and Maintenance", which is your guide to developing a LEED certified project with an existing building. Having the ability to become certified without creating a completely new project is incredibly important to the field of preservation as it increases the possible net-worth of existing buildings. You will find a guide to applying each credit, and how they can be integrated into existing buildings in the Appendix of this guidebook.

# CHAPTER 1: Environmental Sustainability

**Rating Systems**

**BREEAM** (the Building Research Establishment (BRE) Environmental Assessment Method:

This assessment tool was created in the UK in 1990, and in many ways helped influence the creation of LEED in the US. This method is tailored to fit local needs, and includes having an accredited assessor create a list of criteria for your specific project. Next, the report is submitted to the BRE to see if the project passes, and to what degree (good/very good/excellent/outstanding). This is very different from the LEED process.

**Green Globes™:**

Green Globes™ a web based tool developed in Canada in 2002, is similar to LEED in that points are awarded for planning choices taken during the development process. It is less expensive, and does not hold projects accountable for non applicable changes and thus it can be used on a case by case basis instead of applying the same points for every type of project. Since its release in the US in 2005, this tool has been in direct competition with the LEED rating system, and is preferred by some over LEED. The tool includes a series of online questionnaires, customized to meet each projects' specific goals.

**The Living Building Challenge:**

First appearing in 2006, the Living Building Challenge came from the combined efforts of the US Green Building Council and the Canada Green Building Challenge. Together they constitute the Cascadia Region Green Building Council. The bold challenge is for buildings to generate all of their own energy with renewable sources, while capturing and treating all their own water, and using resources efficiently.

**Energy Star©:**

Created with the goal of reducing greenhouse gas emissions, the Energy Star© label became a nation-wide movement introduced by the Environmental Protection Agency in 1992. The label is used to identify household appliances, electronics, HVAC systems, building supplies (insulation, flooring, etc), and even entire houses that have been proven to be energy efficient and thus good for the environment. Projects nation-wide have used this labeling system as a guide to re-development projects and renovations to enhance the performance of existing buildings.

Sources: for this section:

"LEED Reference Guide for Green Building Operations and Maintenance", US Green Building Council, Washington DC: 2009.

"Understanding Green Building Guidelines: for Students and Young Professionals", Traci Rose Rider, WW Norton: New York, 2009.

"USGBC LEED", US Green Building Council, Accessed 1/25/12, Updated 2011. http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

"The Practical Building Rating System", Green Globes, Accessed 1/30/12, Updated 2011. http://www.greenglobes.com/

"About Energy Star", Energy Star, Accessed 1/30/12, Updated 2010. http://www.energystar.gov/index.cfm?c=about.ab_index

# CHAPTER 1: Environmental Sustainability

**Building and Construction Impacts on the Environment**

The following statistics, from Jean Caroon's "Greening Existing Buildings", demonstrate the severe impact construction, demolition, and building operations have on our environment and energy consumption.

In the US, all buildings combined account for the following:

- 37% of primary energy use
- 68% of all electricity use
- 60% of nonfood/fuel raw materials use
- 40% of nonindustrial solid waste or 136 million tons of construction and demolition debris per year
- 31% of mercury in municipal solid waste
- 12% of potable water use
- 36 billion gallons of water use per day
- 20% loss of potable water in many urban systems due to leakage
- 38% of all carbon dioxide emissions
- 49% of all sulfur dioxide emissions
- 25% of all nitrous oxide emissions
- 10% of particulate matter emissions (dust, dirt, and other physical particles found in our air)

**TERMS:**

**Btu:** British thermal unit, about 1055 joules, or the energy needed to heat one pound of water (.454 kg) from 39° to 40° at a constant pressure.

**Embodied Energy:** The energy required to produce a product from start to finish. This includes extraction of raw materials, manufacturing and otherwise altering of materials, transportation of materials to the final site destination, and introduction into its final location. This is a key component when understanding the importance of existing buildings and materials. They often hold a high amount of embodied energy, and often contain materials that would be too resource heavy to extract and manufacture today. Embodied energy is measured in Btu/lb.

Source:

"Sustainable Preservation: Greening Existing Buildings", Jean Carroon, John Wiley and Sons: Hoboken, 2010.

# CHAPTER 1: Environmental Sustainability

**Terms**

**Embodied Carbon:** This is very similar to embodied energy, except that it is measuring the specific amount of carbon used through each step of the production cycle. This measurement is important because of the key role carbon plays in the degradation of the ozone layer through increased emissions of toxic carbon dioxide.

**Carbon Neutrality:** The goal of living in such a way that does not create any carbon dioxide emissions. This is done by balancing the amount of carbon dioxide released on an annual basis with an equal or increased amount of carbon-emission-free renewable energy, either purchased or produced on-site.

**Life-Cycle Assessment:** This term is used to describe the energy and environmental implications of a given material from creation to destruction. It takes into account energy and material inputs and releases, and the environmental impacts associated with the identified inputs, in order to make an informed decision about the 'sustainability' of a given material.

**Passive Survivability:** Relates to the ability of design features in a building to function when modern systems and energy sources fail. It depends on the buildings ability to continue functioning in the event of an emergency. This is often much easier for historic buildings, which often have passive heating and cooling systems already integrated into them.

**Smart Growth:** This is an urban planning tool that encourages mixed-use, compact, walkable, bike-friendly design to help create more healthy, enjoyable and attractive cities. Smart Growth is transit oriented and works to limit sprawl through the integration of modern innovations in transportation, design, and energy use and production.

**Zero Net Energy:** This is an integrated strategy used to look at the design, construction, and operations of a building. The goal, zero emissions, is reached through a series of choices that alter the buildings design, energy consumption, and material choices. Since some energy use is unavoidable, energy creation (often in the form of solar or wind energy) is used to offset the building's affect on its environment.

# CHAPTER 1: Environmental Sustainability

**Existing Conditions:**

Often overlooked are the inherent environmental efficiencies already present in existing buildings. Many times design features have been obscured to the point where their intended use is no longer being used to the fullest extent possible, and other times building owners don't even know that these features are there. In fact, buildings constructed before 1920 are, on average, more energy efficient than any other decade of construction until the first decade of the 21st century (This is cited in Jane Turville's fim "*The Greenest Building*"). Even now, historic buildings efficiencies are often comparable, if not better, than many new construction projects, and perform much better than buildings from the mid-20th century until 2000.

Historic structures were often built with the localized climate of the site in mind, and thus with strong consideration of where trees and bushes should be planted (which provided shade during the summer and a windbreak during the winter), and which way specific rooms were oriented according to the movement of the sun.

In addition, existing awnings, infrastructure, skylights, transoms (windows found above doors, often found in downtown commercial buildings), sidelights (found around historic doors), high ceilings and fans (used to aid in ventilation), and double hung windows (windows that can open from the top down or bottom up, allowing for ventilation year round) all contribute to the built-in energy efficiency of historic buildings. These features speak to the passive survivability of historic buildings. In addition, the thermal massing provided by many historic materials, including brick, can be used to more efficiently retain heat and radiate it through the building.

**Passive nature of historic buildings:**

- Daylighting: large windows, light wells, glass transoms and sidelights, prism glass (refract light back into spaces), etc.
- Ventilation: natural movement of air was often incorporated into historic buildings because energy production was either non-existent of very expensive. Windows and doors promoted cross-ventilation, high ceilings, roof vents, double-hung windows, etc.
- Water: many historic structures were designed with water storage tanks.
- Historic Materials: brick, concrete, and other dense building materials used in historic construction can retain heat collected during the day and radiate it through the building at night.

# CHAPTER 1: Environmental Sustainability

**Existing Conditions**

**The Cambridge City Hall Annex:**

Source: http://www.panoramio.com/photo/37337525

Heralded as the oldest building to receive LEED certification (Gold) at the time in 2005, the 1871 Massachusetts building quickly became a model for preservation planning. Many obscured elements were restored, including the discovery of long-since painted over skylights. Windows were returned to an operable state, with the introduction of low-emissivity glass. The brick was restored, and interior circulation areas were maintained. Also, the building's existing central location (conveniently located on a mass transit route) led to the building being a great candidate for restoration work. The design won many awards, and shows how existing buildings can be updated and maintained to extend their lives while meeting the desired energy use reduction that is often touted with new construction.

# CHAPTER 1: Environmental Sustainability

**Existing Conditions**

**The Cambridge City Hall Annex:**

Historic materials, including old-growth wood and masonry, are durable materials that tend to have very long life cycles. In addition, historic materials are more likely to be repairable compared to modern construction materials. For example, if a single pane of glass or single piece of wood on a historic window breaks, it can be replaced. If any portion of a newer vinyl window breaks the entire unit ends up in the landfill (later in this book will be a detailed analysis of the efficiency of historic wood windows). Not only can these materials be replaced, but the materials themselves are more often than not local, which requires less transportation costs and promotes local business.

Local materials, reparability, and local craftsmen all make existing buildings more sustainable, while also creating important economic incentives (which will be covered in the chapter on economics).


Sources for this section:

"Cambridge City Hall Annex." Oikos: Green Building Source. 13 Feb 2004. Iris Communications Inc. 3 Mar 2009 <http://www.oikos.com/library showcase/cambridge/index.html>.

Flint, Anthony. "Green Meets History in Annex." The Boston Globe 22 Feb 2004.

**Water and Site: Treatment**

The need to limit buildings' impacts on the world's water supply is shown by the number of people living without clean water in many parts of the world (including the US). An example of this is found below. In addition, water treatment on-site can help reduce the cost of water treatment after it has reached rivers and streams, and can help limit the impact of wastewater on fish, plants, and other animals.

Facts:

◊ 3.9 trillion gallons of water are consumed in the United States per month.
◊ The average American uses 176 gallons of water per day compared to 5 gallons of water the average African family uses each day.
◊ An estimated 2.4 billion people lack adequate sanitation and 1.1 billion people are without access to safe water
◊ 90 percent of wastewater in developing countries is discharged into rivers and streams without any treatment.
◊ There are 1.6 million deaths per year attributed to dirty water and poor sanitation.
◊ From 1994-2004, diarrhea related to unsanitary water killed more children than all the people lost to armed conflict since WWII.
◊ At any one time, it is estimated that half the world's hospital beds are occupied with patients suffering from waterborne diseases.
◊ The average distance that women in developing countries walk to collect water per day is four miles and the average weight that women carry on their heads is approximately 44 pounds.
◊ Over 40 billion work hours are lost each year in Africa to the need to fetch drinking water.

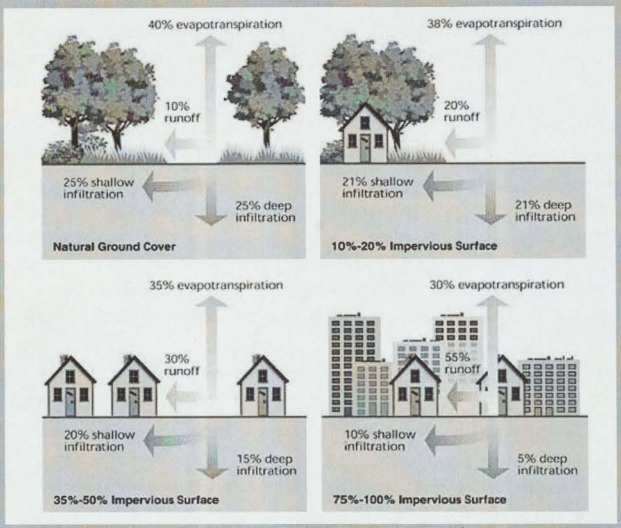
Source: http://www.waterinfo.org/resources/water-facts

**Pavement and Permeable Surfaces:**

The extreme rise in impermeable surfaces (those through which water cannot travel) that occurred after the introduction of the automobile in America led to a rise in water run-off, streambed erosion, flooding, water treatment needs and expenses, and many other deteriorating environmental effects. Paving previously unpaved areas forces water that would have filtered into the ground, allowing for natural filtration and temporary holding before entering streams and rivers, to run directly into storm drains and to water sources.

**Water and Site: Treatment**

**Pavement and Permeable Surfaces:**




Source: Federal Interagency Stream Restoration Working Group

This graphic illustrates the effects paving previously impervious surfaces has on water infiltration. Evapotranspiration is the combination of evaporation (water returning from the earth's surface to the air), and transpiration (water returning from plants to the air after it has been absorbed by the plant). Runoff is water that does not get absorbed in any way by the earth, plants, or the sun and which moves in the path of least resistance until meeting with a water source. Infiltration is the ability of water to be absorbed into the soil of the earth, and is important for the recharge of groundwater needed to sustain plants, filter to streams and maintain a healthy hydrological cycle (movement of water from earth to sky and back again).

What is key when looking at the image is the drastic difference in run-off as surfaces become increasingly more paved. Run-off contains pollutants, floods rivers, and at peak times can erode streambeds. These effects can have enormous economic repercussions on local water treatment costs and streambed restoration.

**Water and Site: Treatment**

**Pavement and Permeable Surfaces:**

Replacing impervious surfaces with those that do allow for water infiltration can reduce run-off while allowing the natural water treatment cycle to occur. This puts less pressure on water treatment facilities and floodplains.

Several permeable surfaces are currently available for many types of needs (parking, roads, bike paths, etc.). Materials include pervious concrete, plastic grid systems, porous asphalt, and permeable interlocking concrete pavers. The common denominator in each case is a large aggregate base with gaps between its members. It is important to assess the needs of the site before choosing a permeable surface. A key element to keep in mind is the carrying capacity you will need the surface to maintain as the effectiveness of each material, the ability to fulfill the needs of the site, and price will all vary. This requires matching materials with use.

"The Green Studio Handbook", Alison Kwok and Walter Grondzik, Burlington: Elsevier, 2011.

**TABLE:**

| Permeable Paver: | Best Used For: |
|---|---|
| Plastic grid systems | Pedestrian or light traffic loads. Prefabricated plastic lattice structure that can be filled with rock aggregate, soil and grass, or ground cover. Lattice hold in place, while fill maintains lattice form. |
| Porous asphalt pavement | Roads and parking lots. Pavement that contains no small aggregate pieces, has substantial voids, and allows water to infiltrate through. |
| Porous block pavement systems | Roads, parking lots, sidewalks, and driveways. Modular, interlocking brick, stone, or concrete assembled on site that allows water to seep below through channels. Usually, there is an underlying aggregate base or sand bedding. |
| Porous Portland cement concrete | Roads, parking lots, sidewalks, and driveways. Differs from normal Portland cement in that fine particles (sand, and small rocks) are left out of the usual mixture, leaving voids that allow for drainage. |

**Water and Site: Treatment**

**Pavement: The Heat Island Affect**

The Heat Island Affect is a phenomenon that occurs in urban areas where concrete and other impermeable surfaces make up a majority of the land cover in an area. The affect is that the air temperature in these areas tends to be higher than in the surrounding open/rural land (on average 6-8 degrees). Temperatures are also increased by the trapping of heat between buildings in urban areas. Together, they produce a haze of water heavy particles that lead to smog, health problems, and increased air conditioning costs. When hot air is trapped, and dark surfaces (pavement and roofs) absorb heat, air cannot efficiently be cooled by the natural process of ground water cooling and normal wind patterns.

Many factors can be employed to mitigate the Heat Island Affect. These include: permeable surfaces, using light-reflective roofing materials, 'green roofs' (discussed more shortly), and increasing the use of plantings for shade.

More information on light-reflective roofing materials can be found at: http://www.energystar.gov/index.cfmfuseaction=find_a_product.showProductGroup&pgw_code=RO

It is important, when dealing with historic properties to take into account the carrying capacity of the roof (including its ability to support changes and new materials), and the character defining features of your building before any alterations are made that could result in injury to the physical property or its integrity.

Sources for permeable pavers:

"The Green Studio Handbook", Alison Kwok and Walter Grondzik, Burlington: Elsevier, 2011.

"Pervious Concrete Pavement", National Ready Mixed Concrete Association, Accessed 1/30/12, Updated 2011. http://www.perviouspavement.org/

**Water and Site: Treatment**

**Bioretention and Biofiltration**

In addition to permeable surfaces, there are also multiple ways of retaining and treating water on-site to limit the overall affect your building has on water waste, health, and movement.

Bioretention and biofiltration:

These terms refer to the gathering and treating of stormwater prior to releasing it into the earth and water systems. Water is collected and stored while plants are used to filter the water as it is slowly released. This treatment comes in many forms including: rainwater gardens, grass channels, and wet and dry bioswales. The uniting factor is that there is (often) a sunken grade, lined with plants, and a bed of permeable soil, all working to slow the flow of water.

Rainwater gardens are easy to incorporate into small areas of land, where large scale infrastructural changes are not desired, and can aid in the treatment of stormwater from paved surfaces and roofs. The size, planting choices, and attention to aesthetics will vary the cost, but implementation does not require hiring a professional and many 'how-to' guides are available on-line.

**A good source for more information on Rain Gardens can be found at:**

https://

Grass channels can easily be used in place of drainage ditches already in place. The key changes are that the sides of the ditch become flattened to provide greater sur face area for run-off, and the incor poration of plantings is made. Again, this is a very low cost op tion, that can be incorporated into a small area or existing ditch.

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

**Water and Site: Treatment**

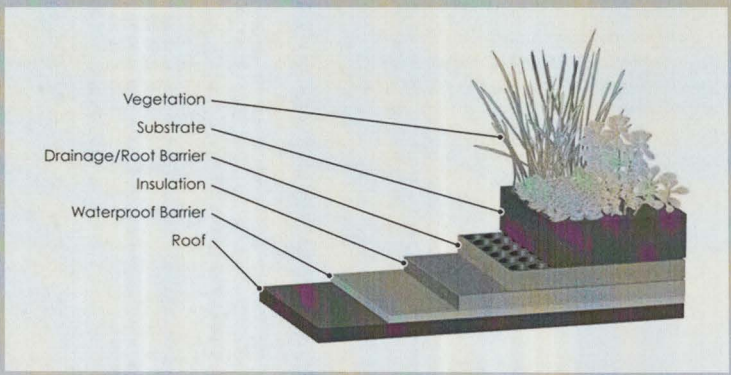
**Bioretention Swales:**

**Bioretention and Biofiltration**

Dry swales are similar to grass channels in that they collect and treat water, but they are also designed to keep the surface fairly dry. There is generally a thick permeable soil channel that rests below ground and a very low-sloping channel above. At the bottom of the swale, a perforated pipe rests in a bed of rock. From a safety perspective, dry swales may be preferred in areas where standing water could pose a threat to youth or animals.

Wet swales are linear catchment ditches that temporarily store water in a shallow pool. They require less intensive infrastructural work than dry swales since they do not require the deep, sub-basin holding area because water is held at the surface. Wet swales can be used in a fairly small area, but clearance is necessary for the low-sloped sides required for delayed infiltration.

**Green Roofs**:




Source: http://www.greensulate.com/green_roofs.php

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

**Water and Site: Treatment**

**Green Roofs:**

The image on the previous page demonstrates the components that make up a typical green roof. These include the roof itself (which must be checked for structural integrity before work is done), a waterproof barrier, and insulating barrier, a drainage barrier, the substrate that the vegetation is anchored to and from which it absorbs moisture, and the vegetation itself (which can vary greatly on the intended use).

Green roofs are one way to mitigate the Heat Island Affect (discussed on page 11); they are also helpful in retaining and treating water run-off. In addition, they provide a usable green space on the top of your building.

**Montgomery Ward Catalogue Building in Baltimore, Maryland:**


This previously abandoned building, built in 1925, was recently turned into the State of Maryland's Department of the Environment. Renovations included making many updates to efficiency, which incorporated adding a green roof. Deciding to go with a less intense green roof (meaning no larger plantings or trees were used), required very little change to the roof physical structure, and is incredibly low-maintenance by design. Projects similar to this can be seen nation-wide, and are typical of many government-funded projects being planned currently. Costs were lowered by choosing a less intensive planting height (mostly grasses and small shrubs), while maintaining the character of the low-sloped roof. In some cases, denser, taller plantings could be suitable. Factors aiding in the decision of density include roof structure and pitch, rainfall, visibility from street level, and the desired (or undesired) ability for people to use the green space.

Source: Emory Knoll Farms for Architecture Week, http://www.architectureweek.com/cgi-bin/awimage?dir=2003/0409&article=building_1-1.html&image=12115_image_2.jpg

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

**Water and Site: Treatment**

**Sewer and waste options**

The importance of reducing potable water use is emphasized in LEED certification standards which award points for low-flow fixtures and other water saving devices including compostable toilets and rainwater reuse. These options are both good for water conservation purposes and for reducing your water bill. A detailed look at applying those credits can be found in the appendix section under 'Applying LEED credits to existing buildings'.

Before taking drastic measures to alter your existing building, make sure that internal updates (plumbing, water heaters, Energy Star© appliances) are taken into account first. One option for internally updating your building is by integrating fixtures that will limit water use and waste by -products.

**Low-flow Fixtures:** These fixtures, including toilets, faucets, and showers, have the ability to lower your water bill, while maintaining standards of cleanliness important to clients and building owners.

**Portland, Oregon Veterans Affairs Medical Hospital:**

**The following changes were made in regards to water use after rehabilitation:**

Water use changes:

- 348 toilets from 3-4 gallons-per-flush (gpf) to 1.6 gpf
- 37 urinals from 2-3 gpf to waterless devices
- 590 faucets from 3.5-5 gallons-per-minute (gpm) to 1.5-2 gpm laminar flow
- 110 showerheads from 2.5-4 gpm to 1 gpm

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

**Water and Site: Treatment**

**Sewer and waste options**

**Portland, Oregon Veterans Affairs Medical Hospital:**

| Item | Number of Items | Days of Use per Year | Average Use per Day | Water Saved per Unit/Flush | Total Savings per Year (Gallons) |
|---|---|---|---|---|---|
| Toilets | 348 | 260 | 6 | 2 | 1,085,760 |
| Waterless Urinals | 37 | 260 | 20 | 1 | 192,400 |
| Faucets | 590 | 260 | 3 | 0.7 | 322,140 |
| Showers | 110 | 260 | 2 | 0.75 | 42,900 |
| Total Facility | | | | | 1,643,200 |

| Item | Gallons of Water Saved per Year | Cost per Gallon of Water & Sewer | Total Savings per Year |
|---|---|---|---|
| Water | 1,643,200 | $0.0028 | $4,600.00 |
| Sewer | 1,643,200 | $0.0089 | $14,625.00 |
| Total | | | $19,225.00 |

Source: US Department of Energy, http://www1.eere.energy.gov/femp/program/watere fficiency_portland.html

Integration of efficient toilets, waterless urinal, low-flow faucets, and low-flow showers combined for a total of water savings of 1,643,200 gallons per year. This cost savings, which included fewer costs associated with water use and with sewage treatment, was $19,225.00 per year. This means that the project is estimated to have a payback period of 2.12 years.

Though results vary, the integration of one or more of these systems into an existing building should result in a savings in water bills. It is important to do a cost benefit analysis before making alterations with high initial costs.

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

### Water and Site: Treatment

### Sewer and waste options

**Composting Toilets:** Using composting toilets can reduce potable water usage, while treating human waste on-site. Much like historic septic systems used in rural and developing areas across the globe, composting toilets rely on aerobic bacteria to break down waste. Considerations need to be taken into account for the design and implementation of these systems in existing buildings since some excavation and alteration to existing floors is inevitable. Two options are available for both commercial and residential use:

**Self-contained units:** These require maintenance and cleaning at more regular intervals, including the removal of humus build up that results from the breakdown process.

**Units with a remote, continuous composting tank:** This system requires less frequent maintenance and cleaning, but also requires greater structural change to the building as piping between units, and the holding tank itself, will need to be integrated into the existing building. An understanding of your existing site for location choices (basements, non-historic additions, elevations less important for visual aesthetics) should be taken into account when deciding on placement of this more space-intensive option.

The following chart is meant to demonstrate typical use and dimensions for the two options described.

| Type | Uses/Day | Length In. (cm) | Width In. (cm) | Height In. (cm) |
|---|---|---|---|---|
| Self-contained | 6 | 25 (64) | 33 (84) | 25 (64) |
| Remote tank | 9 | 44 (112) | 26 (66) | 27 (68) |
| Remote tank | 12 | 69 (175) | 26 (66) | 30 (76) |
| Remote tank | 80 | 115 (292) | 62 (158) | 64 (162) |
| Remote tank | 100 | 115 (292) | 62 (158) | 89 (226) |

The greater the demand on the system, the greater the tank will grow in size, thus creating greater alteration to occur to the existing building.

Source: Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

**Water and Site: Treatment**

**Sewer and waste options**

**Harris Center for Conservation Education, Hancock, NH:**

This redevelopment project, completed in 2003, integrated composting toilets to successfully turn human waste into fertilizer. They were able to avoid high construction costs and site disruption that would have come from integrating a newer plumbing system (saving money), while also preventing harmful nitrates from reaching groundwater (saving the environment), which was happening with the existing septic system. In addition to using composting toilets, the project also included using low-flow fixtures and low-water-use dishwashers.

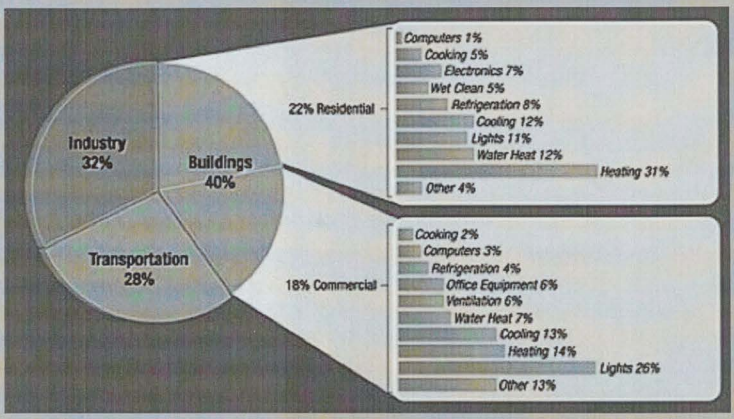
This project was successful for many reasons: it allowed the historic 1913 building to remain in viable use (reducing the chance of it being demolished and losing all embodied energy value), it reduced the amount of water being used in the building, and it was able to integrate these features at the same time as updating the overall system. This option may not be your highest priority if your building has recently had plumbing alterations that have not hit a payback period yet (the cost of implementation being covered through eventual water or energy savings).

Sources for this section:

"Harris Center Conservation Education." U.S. Department of Energy. http://buildingdata.energy.gov/content/harris-center-conservation-education-0.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007

**Energy Use**




Source: http://www.jetsongreen.com/2009/08/breaking-down-building-energy-use.html

The above graphic is interesting for two reasons. First, buildings account for 40% of energy use in the U.S. Second, and perhaps most importantly, there are currently ways to make all of the major energy consuming components in businesses and homes more efficient.

For purposes of this book, the focus on energy use will be directed towards commercial buildings, but the same concepts (and many of the design choices) could also be implemented in residential development.

Updating the internal and external features of existing buildings will save energy, money, and help the U.S. eliminate its dependence on fossil fuels, which are harmful to the environment and becoming increasingly more difficult to sustain and find.

**Energy Use**

In this section, lighting, heating, and cooling will be addressed, with water heating, office equipment, and appliances being discussed in the section on building functions and utilities. Implementing these ideas into existing buildings has significant implications:

- Historic structures are often targeted for removal because of misconceptions about efficiency.
- Character defining features (windows, doors, siding, etc.), often become targets for removal first, before ideas of upgrading systems within the building.
- Maintaining a historic building in place, while making periodic updates over time, is both environmentally and economically efficient. Maintenance promotes job growth, while significant changes to the existing structure often have extremely long pay back periods and promote less job creation on average. The employment benefits of preservation will be further discussed in the economics chapter.

Once again, it is important to highlight the priority of understanding the current design of your structure, and how energy saving practices were originally built into the design process.

Some questions to consider

- How does air naturally move through the building? Have windows been obscured near the ceiling level that originally would have promoted the natural flow of air?
- What is happening at the ceiling level? Did the building originally have a fan system or vents in the ceiling that would take hot air to the roof? How many of these features could be utilized today if uncovered and restored?
- Were heating sources originally located near materials with a denser thermal mass (ex. brick or stone)? If so, how can the circulation of the interior space be used to promote the integration of those materials today? Studies have shown that materials with denser thermal mass, particularly brick, are able to retain heat that is emitted through an energy source and slowly release it back into the building.

## Energy Use

### Lighting

Lighting in historic buildings creates many difficulties. The use of the building may have changed, thus creating a disconnect between the placement of fixtures historically and where they need to be placed today. Ceiling heights may have changed, obscuring once beneficial overhead lighting and altering how outdoor light reflects back into the room.

**Lighting and Daylighting:**

There are many levels of alteration that can be made to update a historic lighting system. Some are less intrusive, others require greater initial investment and would require greater physical change.

**Light bulbs:** Perhaps the most obvious, and cheapest, adaptation is to change out light bulbs. It is highly recommended that Energy Star© light bulbs are considered, as they are required to meet very specific requirements. They must:

- ◊ Save about $6 a year in electricity costs and can save more than $40 over its lifetime
- ◊ Meet strict performance requirements that are tested and certified by a third party
- ◊ Use about 75% less energy than a traditional incandescent bulb and last at least 6 times longer
- ◊ Produce about 75% less heat, so it's safer to operate and can cut energy costs associated with home cooling

The Energy Star ©Website: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=LB

The Energy Star ©website can provide information on different products, prices, business locations, and more related to bulbs, lights, and hundreds of other products and materials.

Energy Star© bulbs are not only efficient (they use less electricity), they also last longer, and produce less heat. All of this adds up to financial savings, while also lessening the affect that buildings have on the environment. Nationwide, there is a movement away from incandescent bulbs towards LEDs and CFLs.

### Energy Use

#### Lighting

**CFLs:** CFLs Originally qualified for the Energy Star© label back in 1999. Compact Fluorescent Light bulbs work differently from incandescent bulbs. Instead of producing an electric current that runs through a filament wire (which in turns heats it and produces the light affect that we see), CFLs run their electric current through a tube containing argon and a small amount of mercury. Ultraviolet light is produced from this, which excites the bulbs interior phosphor coating and emits visible light.

**LEDs:** LEDs, or light-emitting diodes, are small in size and produce light from the movement of electrons through a semiconductor material. Often they are used in clusters in larger lamps, and alone do not emit a strong amount of light. LEDs qualified for the Energy Star© label in 2005, and have since been considered an exciting area of study for an extensive collection of uses.

In addition to updating bulbs, integrating motion sensors and light controls (dimming, timers, etc.) can also help make the lighting in existing buildings more efficient. Sufficient time needs to be spent on planning for the needs of your specific building which may include: use, hours of operation, safety, aesthetics, and more.

One consideration should be taken into account when altering light bulbs: some historic properties, particularly those with historic designation and/or fairly historically intact interiors, could be altered by changing out bulbs. The hue of the bulb, brightness, shape, and size can all affect how colors in the room, paintings, rugs, and other interior features look. This has the possibility of changing the mood and character of a space. This may be an issue in a property where the character affects its ability to function, in which case discretion should be advised. Antique and interior décor shops, bed and breakfasts, art galleries, historic house/building museums, and others depend on continuity of feeling and place. This does not mean that bulbs cannot be replaced, but that care needs to be taken to ensure that efficient lighting is balanced with the aesthetics of the original bulbs.

Sources for this section:

"Learn About CFLs." U.S. Department of Energy. http://www.energystar.gov/index.cfm?c=cfls.pr_cfls_about#how_work.

"Learn About LEDs." U.S. Department of Energy. http://www.energystar.gov/index.cfm?c=lighting.pr_what_are#what_are.

**Energy Use**

**Lighting**

**Daylighting:**

Daylight is free, attractive, and easy to manipulate through a room. It can help boost employee moral through an often-desired connection to the outdoors, and can lessen the need to depend on electricity as a lighting source. Daylight is often diffused and produces less direct heat than sunlight. Though heat may very well be desired during the winter months, as was described earlier site and plantings can affect sunlight's ability to add heat, during the summer it may be desired to block direct sunlight and redirect it as daylight.

**Daylight zoning:** The goal of daylight zoning is to group activities in a space that have similar lighting requirements, thus effectively using daylight at different times of the day. The use of the space, when it is used, where in the building it is located, and its orientation are all important factors to consider. The basic idea is that rooms located closest to sources of daylight (windows, skylights, light wells, etc) should contain activities that need more light. The further you recede into the space, the less important light should be for use of the space. Closets, bathrooms, and other rooms not commonly used throughout the day are good candidates for interior placement.

- **Toplighting:** This refers to utilizing the roof as a source of light. This can be done in many ways: Light wells (which project light down from the roof into some sort of funnel source like a stair well or internal courtyard).
- Skylights, or a section of the roof that has been filled with a light passing material.
- Sawtooth roof arrangements. These are commonly found on early commercial and industrial buildings and can provide a great amount of both light and circulation.


Sawtooth Roof Example:

Acme Machine Co Building in Fresno, CA

Source: http://archop.org/tag/architecture/

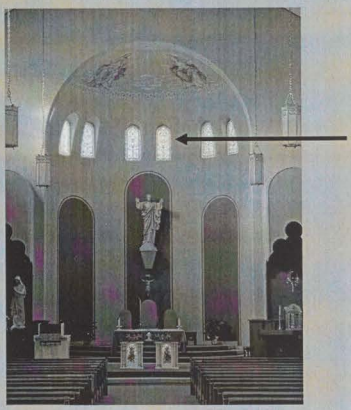
**Energy Use**

**Lighting**

**Daylighting:**

**Clerestory windows:** Found historically in medieval churches, this design features also has the ability to bring in light and serve as a circulation device. Clerestory windows emit light from an additional story's height without having a functioning additional level.

Source: http://www.nwjoinery.com/planbook/h_salt_clerestory.htm



http://www.romeofthewest.com/2007_10_01_archive.html

**Sidelighting:** This is the light that comes through at the wall level. Sidelighting can be projected further into a room using light shelves, which allows for decreased electricity consumption while limiting glare from sunlight. Sidelighting can also be used to connect interior and exterior spaces visually, which enhances interior atmosphere. Often in historic structures, all or a portion of the sidelighting has been obscured by building alterations. This could mean that a transom window has been covered by a modern material or that a historic window has been filled with brick or painted over. This often happens when uses change. It is important to see the full potential for lighting your structure before adding additional lighting, or creating new windows.

**Energy Use**

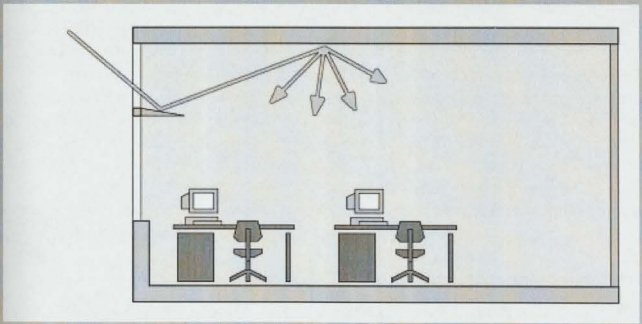
**Lighting**

**Daylighting:**

**Light shelves:** Used in conjunction with sidlighting, light shelves can be a valuable tool for maximizing the reach of natural light into a building. Light shelves allow for further projection while diffusing the light that enters for a more attractive and comfortable overall lighting scheme. A glass shelf is added to the wall unit, at the upper portion of the window, which allows for the catchment and dispersing of light. Rooms with high ceilings, particularly with reflective white ceilings, work best for helping the light reflect into the room. In addition, the angle at which the shelf is placed, the orientation of the window, and keeping the glass clean to maximize effectiveness all need to be taken into account.

Note: Light shelves can be used on the interior, exterior, or both.

Example:



Source: http://www.vuw.ac.nz/architecture-onlineteaching/toolkit/tutorials/7main_fra.html

**Energy Use**

**Lighting**

**Daylighting:**

**Shading:** Shading can also be used with sidelighting to reduce heat gains from solar radiation. Shading blocks direct summer solar rays while allowing lower angle winter rays that provide heat gain during the winter. Shading already exists on many historic structures, or may have at one point. Historic photos can be used to see if awnings had originally been used to get ideas for how awnings could be designed for use today. There is a good chance that if awnings were part of the historic, original design they served some benefit. In addition, historically accurate shading techniques will add to the value of your building from added aesthetic value. Shading can also be achieved through plantings, roof overhangs, screening in portions of outdoor space, and many other options. Your climate, building orientation, design choices, materials, and angle of shading device will all greatly alter individual performance.

**Lighting Controls:** Increasingly more available in all building construction and rehabilitation projects is the ability to personalize lighting controls to meet the needs of building occupants. This may mean having automated shades, designed to lower for specific events, or at certain times of the day, or having automated dimmers programmed for the same purpose. This technology allows for personalized control and use, while also using less electricity and thus saving money. The case study on the following page shows how lighting controls can be used in an existing historic building.

**Alison Kwok's book, shown below, is a valuable source for understanding passive lighting options.**

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Energy Use**

**Lighting**

**Hotel Bethlehem, Bethlehem, Pennsylvania:**

The Hotel Bethlehem, like many large historic structures in historic downtowns, had to keep up with technological advancements to remain economically viable. This meant using large meeting rooms differently, and updating electrical systems to accommodate video and other electronic presentations. Some altering of the windows was necessary to achieve the desired interior affect. At the same time, there was a desire to maintain the historic integrity of the building which is greatly admired for its large historic windows.

Technological advancements included introducing low-voltage automatic interior shades, touch pad electronic controls, and the ability to create designated settings for specific event types. The affect was that the space became easier to use, while maintaining historic character and materials. Work was done by the Lutron Electronics Company, which provides many energy efficiency improvement options for existing buildings.

These historic wood windows help define the historic character of the building, and added to both its historic and economic viability. The alterations made on the interior to allow for increased efficiency and control of the interior space were done with great care to maintain their integrity.

Source: www.lutron.com/Residential-Commercial-Solutions/SolApp/Hospitality/Hotel/ Bethlehem/Pages/HotelBethlehem.aspx

**Energy Use**

**Heating**

As was previously discussed, heating can be a significant contributor to energy use in buildings. This contribution is directly linked to each buildings climate, type (including materials and construction techniques), building use, and level of adaptation that has already been done to the existing heating system. Since existing conditions will vary by project, the goal of this section is to show multiple options for heating, in increasing order of complexity and cost.

**Direct Solar Gain:**

Direct solar gain is achieved through the absorbing of solar heat into a thermal mass (often brick or other masonry materials) that will then release heat into the building over an extended period of time. Insulation, tightness of air sealing around windows and doors, and interior and exterior storm windows can all help maximize the effectiveness of collecting solar heat. Solar heat is best captured from the south facing wall, and is transferred into the building through effective glazing (window glass). Effective glazing would have a lower U-factor* than glazing on wall sections that do not receive as much solar heat or are on west facing walls. Partnered with a well-designed shading system, solar gain can be extremely cost effective.

Note: U-factor is the overall measure of heat transfer, or the measure of the thermal conductance of a building material. It is expressed as Btu/h ft². Generally a higher U-factor means that the material is less likely to allow cold air to infiltrate into a building and to allow warm air produced on the interior to escape out. U-factor will be discussed in greater depth in the section about windows.

Many issues arise while trying to employ this option. Buildings may be erected adjacent to an existing building, causing the ability to absorb heat to be minimal. In addition, the building use may have changed, which creates the desire for portions of the building to be heated that originally had not been planned as such. It is important to understand where the most heat is absorbed to help guides efforts to effectively use the space. This can be done through electronic heat sensing.

**Energy Use**

**Heating**

**Isolated solar gain:**

This system collects and stores energy from the sun in a separate space often used as living space. An example is a sunroom or greenroom attached to a building. These spaces block direct solar rays from entering into the bulk of the structure by isolating the heat. Vents can be used at the upper sections of walls to help radiate the heat into the rest of the building, and at the lower section to allow for cooler air to travel into the space. This creates a circulation pattern and allows for multiple temperature controlled zones for different intended uses. Many historic structures have rooms like these built onto them, and in many occasions porches and balconies have been sensitively adjusted to create such spaces. Porches, patios, and balconies are often character defining features on historic buildings. Because of this, it is important to understand the impacts enclosing them would have on the character of the structure. Secondary elevations and non-historic porches would be good candidates to consider first, before altering others.

**Air and Water Heating:**

**Instantaneous Water Heaters:** Much like the name would imply instantaneous water heaters do not use the traditional method of heating water and storing it for eventual use. Instead they heat water immediately, when it is required. This allows for energy savings because energy is not continuously being consumed to keep the water warm. Individual water heating units need to be installed near each hot water source, and fuel types can vary from propane and natural gas to solar and geothermal energy (energy extracted from heat below the earth's surface that is used to heat and cool buildings). The payback period for installing such a system will vary depending on the project, your projected annual use, and the type of system and fuel type chosen. Typically, they pay for themselves over a relatively short period of time.

The following two heating devices require increased infrastructure investment, but are effective in lowering electricity costs. The first looks at using heat from the sun (which is different from solar panels, which will be discussed later), and the other looks at extracting heat from below the earth's surface.

Sources for this section:

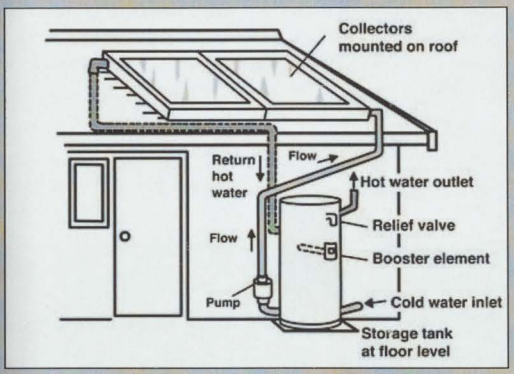
"Energy Savers." U.S. Department of Energy. http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12820.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Energy Use

#### Heating

**Active Solar Thermal Energy Systems:** These systems use heat from the sun to both heat indoor spaces and heat water. Often utilized for domestic use, these systems can also be used for commercial properties that do not require high volumes of hot water.




Source: Commonwealth of Australia: http://www.yourhome.gov.au/technical/fs65.html

The components of this system include a flat plate solar heat collector, often mounted on a roof, a pumping system that brings water to the heat collector and takes warm water away, a holding container, and a water source . These can be relatively inexpensive, but their effectiveness has great potential depending on the water use needs of the building.

**Geothermal Well/ Ground Source Heat Pump:** Geothermal wells use the earth's mass along with vapor compression to create both hot air in the winter and cool air in the summer. This system requires excavation, and thus would be less appropriate for a site with limited space. In addition, it must be used in a climate where ground temperatures stay relatively consistent at 55-65˚ F.

Sources for this section:

"Energy Savers." U.S. Department of Energy. http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12820.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Energy Use

#### Heating

**Geothermal Well/ Ground Source Heat Pump:**

Components of this system include a vapor compression cycle (which turns the energy from the earth into either warm or cool air), an air or water loop that is below ground, and a pumping system to get the water from the loop to the compressor. Excavation, installation, and maintenance for this system is the most complex of the options described, but it does have the ability to reduce energy consumption and lower energy bills.

Sources for this section:

"Energy Savers." U.S. Department of Energy. http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12820.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Energy Use

#### Cooling

Cooling, too, has the ability to consume a large amount of electricity and resources in order to maintain internal building environments suitable to human taste. Ground source pumps can also be used for cooling, but are fairly expensive and space consuming. The following options are in increasing order of expense and complexity. Costs and effectiveness will vary by project, and thus many factors (including climate, budget, use, and site restrictions) need to be taken into account before implementing any project.

**Passive Options: Cross and stack ventilation**

**Cross Ventilation:**

Perhaps the oldest known form of temperature control in warm climates is cross ventilation. Used in warm climates for thousands of years, cross ventilation is the movement of air through a space, coming in one source and out another. For this system to be effective, there needs to be a temperature differential between indoor and outdoor air. For example, cross ventilation will only cool a room if the air outside is cooler than the air inside. Other variables include airflow intensity and the location of ventilating units (vents placed higher up on walls will more effectively release air, but will also limit the benefits of the breeze effect to the area above people's heads). Many historic structures were designed with cross ventilation in mind, though later additions such as additional windows or additional interior walls may have diminished their effectiveness. Care should be taken to maximize the effectiveness of existing ventilation systems before altering historic fabric and creating new windows.

**Stack Ventilation:**

This cooling system takes advantage of natural temperature stratification. Hot air that is pushed by cool air (aided by cross ventilation) is naturally pulled up to the highest point in a structure. As air gets warmer, it becomes less moist and rises. When cool air comes in to the room to replace the warm air it forces it to move upward. Once again, many historic structures, particularly early industrial and manufacturing facilities, incorporated this design feature.

Sources for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

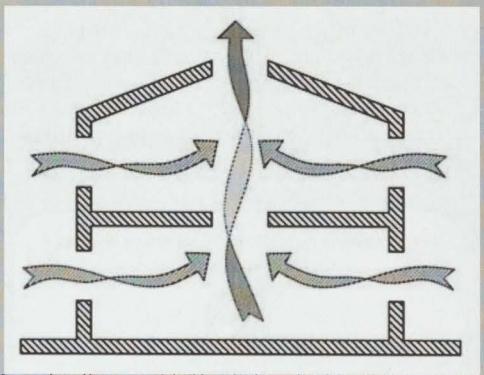
Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Energy Use**

**Cooling**

Stack Ventilation can also be integrated into an existing structure through minor to moderate altering of the interior space. This alteration is not recommended for interiors with high levels of existing integrity, but could be integrated into a development plan that is working with an interior that has already been altered.

Higher stacks, which protrude a greater distance from the roof plane, will be even more effective at drawing out warm air but will also cause greater obstruction to the original roof plane and could affect the building's integrity. Another option for increasing effectiveness is for the stacks to be made of a glass so that the heat absorption of the stack increases the flow of air. Glass stacks would also create less of a visual impact on the roof plane.



Source: http://www.sustainbuilder.ir/pg/pages/Stack%20ventilation%202.htm

Sources for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Energy Use**

**Cooling**

**Infrastructural Changes**

**Energy Star© Air Conditioners:**

According to Energy Star© recommendations, replacing an air conditioning unit that is over 12 years old with a new Energy Star© system can lower your cooling costs by up to 30%. Units must be at least 10% more efficient than non-qualifying units to qualify for the label. The level of effectiveness and efficiency varies between units. Often, new units have additional energy saving features including timers for automatic shut-off and digital displays with customizable features. Updating an air conditioning unit to meet Energy Star© specifications is highly recommended.

**Earth Cooling Tubes:**

In this system, air is cooled by being drawn below the earth, pulled through a very long tube, and emitted through the floor or wall system of a building. The goal is to reduce the amount of pressure on an existing cooling system. It does not replace the need for a supporting system for cooling. This tool can be effective for relieving pressure on existing systems, but is expensive to implement, requires maintenance, and requires excavation (which can be very expensive and alter historic fabric).

A valuable source for information on energy efficient air conditioning units:

http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12460

Sources for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

"Energy Savers." U.S. Department of Energy. http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12460.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Water and Site: Collection and Use

As was discussed in the previous chapter on water and site treatment, the impacts buildings have on potable water worldwide are astonishing. Impacts on water contamination, streambed erosion, and flooding from run-off have the ability to be eased by both water treatment and water catchment.

Some of the ideas proposed already have the ability to be integrated into water catchment. For example, green roofs can integrate water catchment. This catchment could be filtered and cleaned for reuse in the building (either for potable or non-potable uses), or also can be collected to provide a watering system for all plantings on site. There are differences between what types of water are suitable for different uses, and the types of systems that can provide for your individual needs. This section covers personal water use.

**Water catchment**

Regulations on reusing water in a building vary by jurisdiction. Contacting local jurisdictions is fundamental for understanding your unique situation. For example, reusing water run-off for landscape irrigation may be more acceptable than reusing it for indoor water use (dish cleaning, showering, and lavatories).

**Water reuse**

**Rainwater** is water that has been collected on-site from precipitation. This water has a greater possibility of being reused for potable circumstances and is much cleaner than grey or black water. The quality of your rainwater is a key factor in its ability to be re-used internally in your building, but irrigation options are always available.

The definition of the following water sources varies state to state, the below definitions are for the State of Oregon:

**Greywater** is wastewater generated from domestic activities (showers, bathroom sinks, washing machines, and kitchen sinks). It can be reused in irrigation, but may not be reused for human consumption. This form of domestic run-off is easier to clean than blackwater as it contains fewer pathogens and less nitrogen.

Sources for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Water and Site: Collection and Use

**Blackwater** is wastewater generated by human waste (toilets, garbage water, and water contaminated by diaper waste). It can be reused in irrigation, but not for human consumption. This form of domestic run-off is more difficult to treat and clean, and thus the demands your landscaping has on water consumption should be taken into account before implementing a costly blackwater treatment system. In many cases with existing buildings, using roof water catchment, along with greywater catchment will be sufficient for landscaping needs.

**Potable water** is water that will be, or has the ability to be, consumed by humans (drinking water, sink water, dishwasher water, and shower water).

**Non-potable water** is water that will not be used in cooking, drinking, etc. (toilet water, irrigation water).

A general rule to follow is that the more contaminated the water is, the limited its uses become. Again, you should check with local regulations to learn what types of water are allowed to be used for different uses.

**Examples:**

**State of Oregon**

Source: http://www.deq.state.or.us/wq/reuse/graywater.htm

The Oregon Department of Environmental Quality- Water Reuse Program allows for three tiers of permitting for different activities to be undertaken with the water. The tiers are based on total water use, and there are associated fees. There are many additional regulations regarding details like setbacks, and treatment and monitoring requirements. Understanding this permitting process, and the subject limitations of your project, is important before further work can be done.

**State of Montana**

Source: http://data.opi.mt.gov/bills/mca/75/5/75-5-326.htm

Montana Legislative Code: requires that greywater be utilized solely for irrigation purposes, but that the plants being watered are not allowed to be consumed by humans. In addition, they require that re-used greywater may not be located within a flood plain.

Sources for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Water and Site: Collection and Use

### Rainwater Harvesting

The process of catching rainwater and using it for human needs was employed in ancient Rome, and continues to be an important system for irrigation in many parts of the world today. Systems vary in their complexity and implementation costs, but all of them have the ability to limit run-off while saving money on your water bill. The scale of the catchment system can be broken into two types:

- **Roof catchment:** These systems are smaller, easier to implement and maintain, and require very minimal physical change to the character of the building.
- **Land form catchment:** These systems are larger, more expensive to implement and maintain, and require more drastic change to the site and historic character. One benefit is that they can collect large amounts of water for irrigation and agriculture.

The scale, materials, integration of additional systems (bioswales, retention ponds), and landscape detailing will affect the cost of the project greatly.

**System components include:** catchment, conveyance (downspout or ditch), purification, storage, and final distribution.

A valuable source for all aspects of building systems upgrades can be found in the following book:

Kwok, Alison G., and Walter T. Grondzik. *The Green Stu dio Handbook: Environmental Strategies for Sche matic Design*. Oxford: Architectural, 2007.

Sources for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Water and Site: Collection and Use**

Examples of rainwater harvesting can be found all over the world. Below are a few that have worked exceptionally well with a historic building.

**Rainwater catchment used for agriculture in Texas:**

In this scenario, the only source of ground water was located 1200 ft below the ground, making it economically unfeasible to conduct agricultural work with ground source water. Instead, capitalizing on the fact that Texas receives an average of 32" of rain per year, a rain catchment and agricultural watering system was put in place. In addition, since rainfall in the area tends to come in strong bursts with long periods of dryness, the catchment system allows rainwater to be more evenly distributed to the property over time.

An existing, historic barn had a rain catchment system installed on its roof that brings water to a 10,000 gallon cistern on site. This allows this historic barn to serve two functions, adding to its overall value.

For more information please visit: http://www.homestead-historic-buildings.com/rainwater.html

**Rain Catchment and Adaptive Building Reuse:**

**The Historic Seaholm Power Plant in Austin, Texas**

In this scenario, Seaholm Power, planning Professor Kent Butler, and the City of Austin are working together to plan and design a rainwater catchment system to be used as part of the rehabilitation of the former Seaholm Power Plant.

The design is expected to meet the outdoor water demands for the entire 7.8-acre site involved with site irrigation. The partnership is a win for the City (who pays the water bill for the City owned utility provider), and for private development of the successful adaptive reuse project.

For more information please visit: http://soa.utexas.edu/csd/research/rainwater-catchment

### Increasing efficiency

Changes can be made to aspects of your building's envelope (walls, windows, and roofs) that will increase efficiency while maintaining important aspects of the building's character.

Before making drastic changes that may alter the integrity of your building, make sure you understand where gaps currently exist, where heat is currently being lost, and how materials can be incorporated into your existing building. It cannot be overstated that sealing, insulating, and maintaining the existing building envelope must be the first step before systems upgrades are made. By doing this, it will ensure that systems upgrades are not made that are unnecessary or more expensive than what would have been needed to operate the building once demands on the system have been lessened. The first step in doing this is testing the current envelope

**Air infiltration tests (Blower Door Tests)** were developed to test the airtightness of a building. Airtightness directly affects a building's ability to keep heat in during the winter and cool air in during the summer. Understanding your buildings ability to hold in air will help lower heating and cooling bills, while maintaining the character of your building.

The components of this test include mounting a powerful fan (blower) to the frame of an exterior door, pulling the air out of the building (make sure all windows are shut to increase accuracy), and measuring the amount of air that is pulled into the building through leaky windows, doors, and crawl spaces. A smoke pencil can be used to detect exact points of leakage, without leaving permanent marks. These two techniques together will aid in better understanding your building's current condition, but don't give much information on how the building acts on a more extended basis. Understanding your building's long-term leakage issues can be done with a PFT test.

**Perflourocarbon tracer (PFT) gas tests** which can be used in addition to blower tests, release a small amount of colorless, odorless gas into the building. Next, a small device is left in the room to test the concentration of the gas that is left. This allows for a better understanding of the building's infiltration rate over time, while not being the best source for understanding exact leakage point like the blower door test.

Ideally , both tests would be done, but if restrictions are made financially, the test choice should be based off the needs of the building.

- Do you already know that the building has issues with leaking and need to know where they are coming from? - Blower door test.
- Do you need to know if leaks exist or to what extent leaks have increased over time? - PFT test.

### Increasing efficiency

**Infrared thermography:**

Infrared thermography is a non-intrusive technique that allows you to visually inspect areas of heat and coolness through the use of infrared video and still cameras. This allows for very precise mapping of problem areas that can be targeted for increased sealing and other airtightness techniques. This technique can be used while a blower door test is being conducted. Black streaks will appear in the film indicating areas where air is both lost and brought into the envelope. In addition, the camera can pick up abnormally hot electrical connectors and components, allowing the technique to be used to increase efficiency within the building, including inefficient electrically powered building components, as well.

For example, imaging may show that cool air is entering under a window sill, from the locking mechanism of a door, from inadequate insulation, or from around electrical outlets. Knowing where issues are will allow you to move forward with implementing strategies. Making costly changes without understanding where resources are needed most can be an expensive exercise, and targeting funds will allow for maximum cost-benefit.

**Blower Door Tests**: http://www.energysavers.gov/your_home/energy_audits/index.cfm/mytopic=11190

**PFT Gas Tests**: http://www.energysavers.gov/your_home/energy_audits/index.cfm/mytopic=11210

**Infrared Thermography**:

Application of Infrared Thermography for the Investigation of Historic Structures:

http://www.sciencedirect.com/science/article/pii/S1296207403001110

This article outlines the effectiveness of thermography for understanding the density and condition of existing building materials. This information can be used for directing both energy efficiency improvements, and improvements to the existing building materials. Both of which will add to the life of the building, thus putting less demand on natural resources. For example, thermography can be used to find issues in the mortar of brick walls, which will aid in both preserving the historic fabric and making it tighter.

**Increasing efficiency**

**Building components**

"National Trust for Historic Preservation: Green Home Tips"

http://www.preservationnation.org/magazine/2008/january-february/green-home-tips.html

This is a helpful guide for understanding key points within buildings that can lead to presumed inefficiency. Many times, making changes to the existing fabric can lead to greater efficiency with minimal capital investment.

Tips from the above source include:

- Maintaining windows and doors to avoid air infiltration, while also avoiding highly toxic vinyl (described in more depth in the following section on windows).
- Painting walls a lighter color so as to reflect light and heat better (or perhaps darker in cold climates).
- Insulating attics, basements, and crawlspaces.
- Installing fireplace draft covers, attic door covers, and dryer vent seals. An open dampener in a fireplace can increase energy costs by 30%.
- Planting evergreen trees on the north and west sides of a building to block winter winds, and leafier trees on the south and west sides to provide shade during the summer.

**Insulation:**

Choices, when it comes to insulation, are numerous and can seem overwhelming at first, including what material to choose, where to install them, and how to install them. These are all important factors that can affect the historic character of your building.

Insulation is ranked based on R-values (the measure of thermal resistance- the opposite of thermal conductance). Your desired R-value will aid in determining material choices and affect price. R-values vary by product and brand, and thus must be requested information before any work is done.

**Increasing efficiency**

**Building components**

**Insulation:**

**Materials and installation:**

Material choice depends on your climate, budget, and the extent to which you would like to maintain the historic character of your building's interior. As a rule of thumb, the more intact an interior is, the less-intrusive the method should be for insulating.

Introducing insulation into an existing building not originally insulated can create issues with mold, as the natural flow of moisture through and out of a building has been altered. Thus, the integration of insulation in some historic properties can eventually cause structural issues when mold and trapped moisture become imbedded in structural wood and other natural materials. In addition, increasing moisture capacity in walls can also invite pests including termites. Thus, it is recommended that new insulation introduced into an existing structure be placed in attics first, and that adding insulation into existing walls be used as a last resort.

Bob Yapp, historic preservation technology specialist.

Bob Yapp, a historic preservation specialist, believes that insulating walls can cause serious issues related to moisture and costs more than the savings is worth. He gives the example of spending $4,000 to add wall insulation saving $200 a year on energy savings, which means 20 year payback period. Instead, he recommends sealing existing air gaps and insulating attic spaces.

For more information on Bob Yapp, please see: http://bobyapp.com/blog/2009/06/myths-about-insulating-old-house-walls

Sources for this section:

Yapp, Bob. "Myths About Insulating Old House Walls." http://bobyapp.com/blog/2009/06/myths-about-insulating-old-house-walls.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Increasing efficiency**

**Building components**

**Insulation:**

**Materials and installation:**

**If you do choose to insulate your existing walls, this is the best option:**

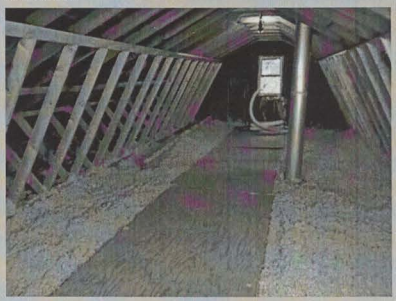
***Spray-in/Cavity-fill insulation:*** this technique involves making small holes in the existing wall between each stud and filling the vertical passages with foam. Once the fill is in place, minor plaster and patch work is needed to eliminate the evidence that work was ever done. To increase environmental benefits, there are spray-in materials that use 25% soy, but these products have also been found to be slightly less efficient. Your choice of fill material will depend on climate, and budget.

**Attics and crawlspaces:** According to the National Trust, about 20% of energy costs come from heat loss in these areas. Heat rises, and without adequate insulation, that heat will escape through attic spaces and out the roof. In addition, many attic spaces were originally left unfinished and thus provide ample options for air infiltration.

Insulating attic spaces options include:

***Cellulose insulation:*** is made of recycled newsprint, Sprayed on damp, and installed as a loose fill. The finished product is not very neat, but for attic spaces not intended for personal use it can be a cost effective and environmentally friendly choice.

Many do-it-yourself guides are available on instaling cellulose insulation. It can be done without the use of professionals, though safety precautions must be taken to ensure respiration, hand, and eye safety.



Source: http://www.diynetwork.com/how-to/how-to-install-blown-in-cellulose-insulation/index.html
According to the source, this project would take one day and cost between $250-$500.

Sources for this section:

Yapp, Bob. "Myths About Insulating Old House Walls." http://bobyapp.com/blog/2009/06/myths-about-insulating-old-house-walls.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Increasing efficiency**

**Building components**

**Insulation:**

**Materials and installation:**

**Attics and crawlspaces:**

***Fibrous batt and board insulation:*** this is perhaps the most common material for attic insulation, is most often pink, and can be rolled over interior surfaces to create an insulated layer. The cost for this material is low, the implementation is very easy, and again installation can be done without the help of a professional (using the recommended safety equipment of gloves, respirator, and safety glasses). One downside to this material is that it is not very environmentally friendly and contains phenol formaldehyde as a binder. Though not the most toxic choice, this should be taken into consideration. This material is often seen as a 'quick fix' but the environmental impacts must also be taken into consideration.

***Cotton insulation:*** a far more environmentally friendly choice that uses 85% recycled denim fiber saturated in a flame retardant. The major downfall for this material is that it is more expensive to install since it requires a professional. Utilizing materials such as these will add to the cost of the project, but the overall effects on global sustainability will be greater than using more toxic insulation with the same thermal properties.

***Cementitious foam:*** is both very efficient and provides a more environmentally friendly alternative because it does not contain harmful CFC (chlorofluorocarbon) or HCFC (hydrochlorofluorocarbon), like many other insulation types. The downfall is the price, which is higher than insulation containing CFC and HCFC.

**An additional option, used in masonry units**

***Perlite:*** is a siliceous rock that can be poured into cavities between masonry units. Naturally fire-retardant, this choice creates almost no pollution during manufacturing and poses only limited health issues during installation (which can be alleviated by using recommended respirator masks). Perlite can also be used in attics and basements, but its liquid state before setting limits its ability to be useful in vertical application.

Sources for this section:

Yapp, Bob. "Myths About Insulating Old House Walls." http://bobyapp.com/blog/2009/06/myths-about-insulating-old-house-walls.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Increasing efficiency**

**Building components**

**Chimney and fireplace:** in addition to providing a good seal to chimney dampeners, it may also be advised to add glass doors in front of exposed fireplaces to help retain more of the heat from the fire while keeping cooler air from the inside from pushing the warm out directly out the chimney. This is considered the best way to increase the efficiency of existing fireplaces. The downfall is that glass doors and screens can alter the historic character of the fireplace, and thus discretion is advised. In some occasions, for example when turning a residential building into a restaurant, store, or lodging, the need to cover the fireplace for safety reasons already exists and thus this could be incorporated to increase efficiency and safety.

More information on glass fireplace doors:

**The New York Times**

http://www.nytimes.com/2003/12/28/realestate/your-home-putting-a-fireplace-to-work.html?pagewanted=all

**Doors:** similar to windows (which will be dealt with in greater detail in the following segment), doors will often benefit from weather-stripping, sealing around glass panes, and exterior storm coverage. These exterior storm covers are very similar to window storms and come in many varieties. The extent to that a storm door will increase efficiency will depend on the extent sealing was improved, along with the percentage of the door that is glass. Modern doors are often already insulated. Adding a storm door to a modern door would not create much savings and may potentially have a high payback period.

A guide to both weather stripping and storm doors can be found, again, through the Energy Star© website:

**Weather stripping:** http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11280

**Storm doors:** http://www.energysavers.gov/your_home/windows_doors_skylights/index.cfm/mytopic=13630

Sources for this section:

Yapp, Bob. "Myths About Insulating Old House Walls." http://bobyapp.com/blog/2009/06/myths-about-insulating-old-house-walls.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

**Increasing efficiency**

**Windows: a case of misconception**

Perhaps the most misunderstood element in historic buildings when it comes to sustainability are the wood windows. A quick internet search on the subject will bring you to a plethora of sites claiming to save hundreds on your energy bill if you replace your windows with new vinyl ones. What is often not disclosed is:

**the long payback period of those windows, the short life span of vinyl windows compared to wood windows, and the toxicity of vinyl. In addition, altering your historic wood windows will forever change the character and integrity of your building. In fact, removing your windows could lead to immediate disqualification from historic designation, tax incentives, and more.**

The goal of this section is to break down misconceptions that many have about the efficiency, performance, cost, and longevity of both vinyl and wood windows.

**Terms:**

**Storm Windows:** Interior or exterior glass or plastic panels (generally in a wood or metal frame) that are fitted within the existing frame of the window to create additional thermal protective support. These do not alter the existing window, but rather provide an additional buffer to wind and cold.

**U-factor:** A measure of the rate of heat loss through a material or assembly. For windows, the U-factor is typically stated for the entire window product. The lower the U-factor, the lower the heat loss and the higher the efficiency.

**Window Frame:** The fixed outer portion of the window that holds the window sashes.

**Window Sash:** The portion of the window that holds the glass and is generally operated by pulling it up or down.

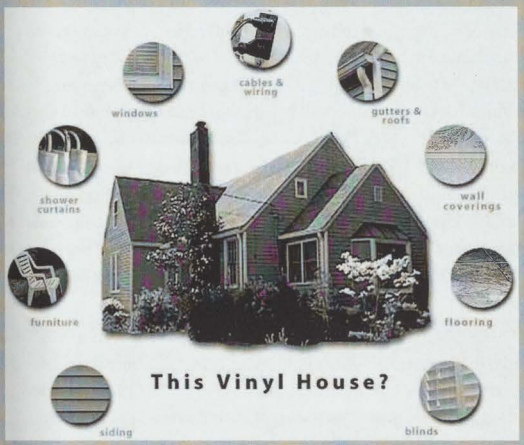
**Increasing efficiency**

**Windows: a case of misconception**

**Vinyl:**

**Toxicity of Vinyl:**

Vinyl is cheap, easy to replace, and can be made into just about anything (the graphic below is used to show the prolific use of vinyl in many aspects of modern home building and renovation). What you may not know is that vinyl is also extremely toxic.




Source: http://www.greenpeace.org/usa/en/news-and-blogs/news/how-to-find-and-avoid-toxic-vi/

The figure above, and facts on the following page come from Green Peace, the largest independent direct-action environmental organization in the world.

For more information please see: http://www.greenpeace.org/usa/en/news-and-blogs/news/how-to-find-and-avoid-toxic-vi/

**Increasing efficiency**

**Windows: a case of misconception**

**Vinyl:**

**Toxicity of Vinyl:**

When vinyl (PVC) burns hydrogen chloride gas (known to cause skin burns and long term respiratory damage) and dioxin (found to cause cancer and reproductive disorders) are formed. This is harmful to both occupants and firefighters. In addition, about 100 other different toxic compounds are produced. Because PVC is resistant to burning, and doesn't have to be in flames to set off chemicals, hydrogen chloride gas can be let into the air for long periods of time before visible signs of fire. PVC fires also produce hundreds of thousands of times more dioxin than other commercial building materials including wood and other plastics. Dioxin persists in soil for long periods of time and a single PVC fire can have severe health consequences.

FACT: Firemen called to the scene of a fire involving vinyl building materials must wear special respiratory masks to protect from the highly toxic chemical substances released when PVC burns.

FACT: A large PVC fire in Hamilton, Ontario in 1997 caused millions of taxpayer dollars to clean up, and contamination is expected to persist for decades.

- PVC can release toxic chemicals even when in a stable state (not burned). Vinyl flooring can release chemical softeners called phthalates (associated with increases in asthma), lead additives in vinyl blinds can cause lead poisoning in some children, toxic glues have been found that are used in fitting PVC pipes, and some studies suggest that toxic chemicals can leach out of PVC pipes.
- During production, vinyl and its components (vinyl chloride monomer and ethyl dichloride) release hundreds of thousands of pounds of toxic chemicals into the environment. Poorer communities in Louisiana and Texas often become the site of such production facilities.
- Though manufacturers claim the material is recyclable, less than 1% of post-consumer PVC is recycled in the U.S. In addition, PVC is the largest source of chlorine (needed for dioxin production) in municipal waste incinerators.

Source for this section:

"How to Find and Avoid Toxic Vinyl." Green Peace. http://www.greenpeace.org/usa/en/news-and-blogs/news/how-to-find-and-avoid-toxic-vi/

**Increasing efficiency**

**Windows: a case of misconception**

**Vinyl:**

Information for these facts came from an independent third-party investigator who had collected information from dozens of sources. This information can be found at: http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

**Maladaptivity of Vinyl:**

- Vinyl windows can warp, twist, bow, crack, turn brittle, fade, and discolor under sunlight. Warping and twisting causes materials surrounding windows to crack, exposing the entire wall system to the elements and potentially causing thousands of dollars in damage. Fading from sunlight causes white vinyl windows to turn yellow, and vinyl cannot be painted. When exposed to cold, vinyl windows often form hairline cracks. When this occurs, the entire window must be replaced.
- PVC softens and warps at 158°, a temperature easily reached on a warm, sunny day on a wall with southern exposure. If there are exterior shutters or blinds, heat can be trapped even easier.
- According to the Germany EPA, the average lifetime of a PVC window is 15 years. Window failure and leaks can occur in as little as 1-4 years, making all claims of efficiency void as soon as air can infiltrate.
- Numerous governmental, private, and commercial reports outline the many reasons why vinyl windows become inefficient quickly. These facts are often left out by the salesmen in the 3 billion dollar a year vinyl window industry. The end result is that only those profiting from the sale of these windows are likely to promote them.
- In a study by the Canadian Center for Energy Technology, monitoring the long term performance of vinyl windows found a 136% increase in air leakage. PVC windows not reinforced with additional metal framing (which does not come with most models) lack rigidity, have a high coefficient of expansion, and are thus subject to distortion.
- In 1998, the Ireland Department of Energy passed an initiative to eliminate the use of all PVC in windows and doors.

Source for this section:

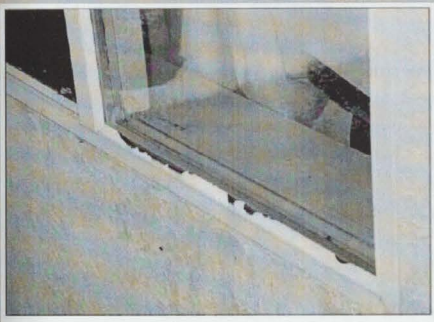
"Vinyl Window Facts." Vinylwindowfacts.org. http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

**Increasing efficiency**

**Windows: a case of misconception**

**Vinyl:**

**Maladaptivity of Vinyl: *EXAMPLES***



Vinyl framed window after a brief hail storm.

Source: http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

Warped vinyl window after two summers.

Source: http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

Source for this section:

"Vinyl Window Facts." Vinylwindowfacts.org. http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

**Increasing efficiency**

**Windows: a case of misconception**

**Vinyl:**

**Maladaptivity of Vinyl: *EXAMPLES***

Vinyl framed "replacement" windows being removed after only four years of use. Twisted frames on a southwest exposure.

Source: http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

**Wood windows:**

Wood windows are repairable, often with both the materials and jobs being located locally, and with proper maintenance can last over a hundred years or more. Historic wood windows were often made from old growth or second-generation wood, have a high embodied energy, and should be preserved as a limited resource. In addition, keeping windows in place requires less energy usage from making new windows, and shipping them to the location.

Historic wood windows add to the historic integrity of your building, and replacing them should be the last option considered. This section will outline multiple options that should be considered first, define critical terms, and provide a cost analysis of the options available.

Source for this section:

"Vinyl Window Facts." Vinylwindowfacts.org. http://www.vinyl-windows.org/Vinyl-Window-Facts.htm

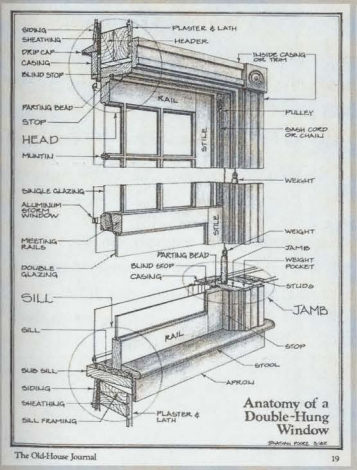
**Increasing efficiency**

**Windows: a case of misconception**

**Wood windows:**

**Repair:**

Repairing your old windows is often the most economic choice. Depending on the extent of the damage to the existing windows, the cost of repair will vary. The four wood members that surround the glass, rails horizontally and stiles vertically, can be taken apart to remove, repair, and replace the glass. Every component of wood windows can be taken apart, analyzed, and put back. Many professionals are available across the country who know how to work on these windows. The money spent hiring a professional and buying local materials, while avoiding purchasing vinyl windows, is money that will remain within your local economy. There are many 'how- to' guides for understanding how to repair windows. Many people are able to make the smaller repairs by them-selves. Larger repairs, like replacing a rope pulley system from inside the window jamb, may be more difficult and require a professional your first time. The key is that once you know how to fix them, you can do it yourself the next time.




Source: Old House Journal

The rails, stiles, and muntins pictured at left come together with an interlocking system of notches, grooves, and a number of pegs, nails, and other fastening devices. Individual windows will vary, along with the extent they have already been altered, but in many cases pieces can be removed, repaired, and replaced. In addition, many historic windows that operate on rope and pulley systems can be repaired by removing a portion of the jamb and evaluating the weight system. In many cases when windows are inoperable it is assumed that replacing them will be cheaper than investigating the problem and finding the right repair method. This is not the case if the wood itself is still in good condition, and should be considered only if repairs are not feasible.

**Increasing efficiency**

**Windows: a case of misconception**

**Wood windows:**

**Repair:**

**Amy McAuley**

**Amy McAuley**, the owner and operator of **Oculus Fine Carpentry in Portland, Oregon** works all over the State of Oregon doing restoration, repair, and replacement work on historic wood windows. She is considered by many to be a leader in the field of preservation repair and has worked on projects ranging from the Pioneer Courthouse in Portland, Oregon to the Historic Poultry Building on the Oregon State Fairgrounds in Salem, Oregon. Currently, her company has been contracted to repair the historic wood windows on the Cottage Grove Armory Building (discussed in more detail on page 116) in Cottage Grove, Oregon. Professionals like Amy maintain a high standard of excellence, have great pride in their work, and naturally utilize local materials and employees.

In addition, Amy's work is incredibly sustainable for two reasons. First, wood windows are repaired, keeping less waste out of landfills and creating less demand on vinyl window production. Second, Amy works completely 'off the grid' doing all work by hand, and requiring no electricity to run her hand tools. This is how work was done historically, and through her we see quality craftsmanship is being kept alive today.

For more information on Amy McAuley and Oculus (including recent projects) visit their website at: http://oculuswindow.blogspot.com/

**This is only one example of a professional doing rehabilitation work on wood windows, and the State Historic Preservation Office provides training periodically to allow building owners to do the work themselves. A full analysis of professionals and resources in your area is advised before hiring contractors or beginning a project.**

**Increasing efficiency**

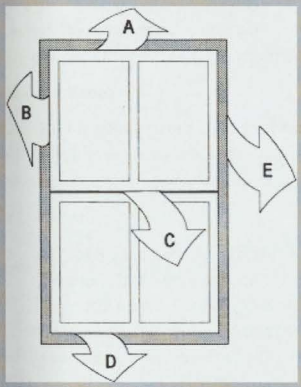
**Windows: a case of misconception**

**Wood windows:**

**Sealing:**

Properly sealing your windows can greatly increase efficiency, can easily be done without the help of a professional, and requires low initial costs that have a short payback period.

**Common areas of air leakage:**




**A** - air infiltration through the head junction

**B** - air infiltration through the sash/jamb junction

**C** - air infiltration through the meeting rail

**D** - air infiltration through the sill junction

**E** - air infiltration through and around the jamb from the rough opening

Source: www.ncptt.nps.gov/PDFfiles/1996-08.pdf

A key thing to keep in mind is that wood and glass shrink and expand with changes in temperature (like all other buildings materials), and that they need maintenance from time to time to adjust the seals between areas where materials come together. Historic windows have already shrank and expanded quite a bit, since the most movement comes from the first 20 or so years of their life, so finding gaps now and filling them will allow for a secure fit that will not need maintenance again for 10-20 years. By simply finding gaps and filling them with a removable weather stripping, you allow for future maintenance to be done. When you replace your historic windows, maintenance is no longer an option and you will be required to replace them again in a relatively short period of time (on average 15 years) if you truly want them to be efficient.

All building materials have different thermal coefficients, or rates at which they shrink and expand due to changes in temperature. These thermal changes require historic materials to be adjusted periodically, and this period adjustment includes adjusting for changing sealant needs. Expansion will depend on the type of wood, and how long it has been in the building.

**Increasing efficiency**

**Windows: a case of misconception**

**Wood windows:**

**Additional Rehabilitation Measures:**

- **Storms:**

Storm windows can be added to either the interior or exterior of existing windows. The process includes measuring the opening of the existing frame, creating a wood or metal frame that will fit within that space, adding weather stripping to that frame, and filling it with either glass or plastic. There are many options and styles available. Some include operable screens, and many are designed to blend with the existing window frame.

- **Low-E coating:**

Low-E (Emissivity) coating is a thin chemical film that can be added to existing windows on the existing glass to improve heat loss/gain performance. The film adds a very small change to the existing glass color, and allows clear sight to remain through the glass.

- **Re-glazing:**

Though not the recommended option for glass that is still in good working condition, re-glazing (or replacing just the glass portion of the window) can add to the windows efficiency if the new glass is double paned. Double panes allow for an additional gap of insulation protecting the interior pane from cold and wind that comes in contact with the outer pane. The larger the gap between panes, the greater the efficiency is increased. This is why storm windows come more highly recommended, since the gap between panes is often about 2 full inches, allowing for greater insulation from exterior cold.

This option was used on the University of Oregon campus in Eugene, Oregon in Fenton Hall, historically the original library for the University. Fenton had all of its windows carefully removed, glazing replaced with double-paned glass, and then had them re-installed in the building. When asked why this time consuming task was chosen over simply replacing the windows, a representative from the University said "you just can't buy quality like this today." In addition, re-using the existing frames allows for the University to repair portions of the window in the future (which will save thousands over time compared to replacing windows every time one breaks).

**Increasing efficiency**

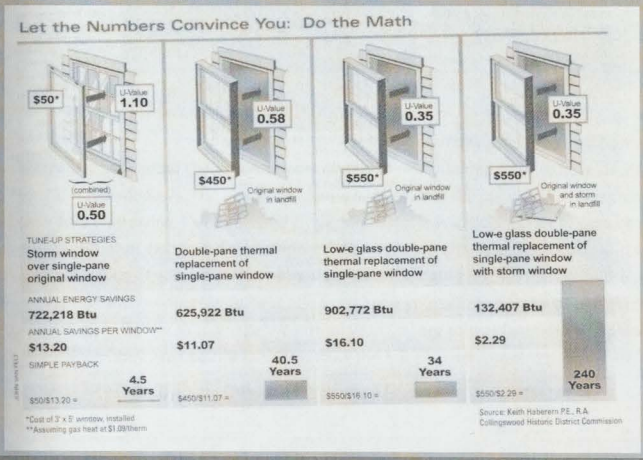
**Windows: a case of misconception**

**Wood windows:**

**Cost Analysis:**

There are many graphics and case studies available to compare the price of replacing windows with repairing them and/or adding storm windows. There are a few points to keep in mind:

- New windows, unless your existing windows need almost every part repaired, will always cost more. That cost, even if efficiency is increased, will take a very long time to recapture.
- Restored windows (properly sealed) and storm windows used together can provide the same level of efficiency as brand new windows for less cost. In addition, that efficiency will be easier to maintain in the long term, and the replacement windows will likely need to be replaced again 15 years from installation.
- There are many low-impact options for upgrading your existing windows, with a wide variety of prices. Your specific situation, and the integrity and condition of your existing windows will vary, and thus it is very important to have an initial condition assessment. Your local State Historic Preservation Office (SHPO) is a great tool for finding professionals in your area who are qualified to work on historic structures.




Source: http://blog.timesunion.com/holland/this-message-brought-to-you-by-the-letter-%E2%80%9Cw%E2%80%9D/131/#comments

**Increasing efficiency**

**Windows: a case of misconception**

**Wood windows:**

**Cost Analysis:**

The graphic on the previous page is perhaps one of the most distributed comparison models available for understanding the cost of each option. It was put together by Old House Journal in 2007, and can be used to illustrate some key facts:

- Storm windows can have a payback period of less than 5 years, whereas new windows can easily take 30-40 years.
- Replacing a window that already has storms fitted to it with a new window can take 240 years to pay back after taking into consideration savings in energy costs.
- Though single paned windows are not very efficient (U-value or 1.10 versus .58 for double paned), simply adding an additional layer of glass (the storm window) can give an equivalent, and slightly better, value of U-value .50.

In summation, vinyl windows are toxic, expensive, short lived, and greatly alter the historic character of your building. Alteration to existing windows, which allow for local materials and professionals, provides more local tax revenue and provides for additional repairs to be done in the future. The reparability of historic windows is a key component in the value and routine maintenance should be chosen over replacement.

Below is a link to an interesting case study. The owner of a historic home decided to blog about the process of deciding if they should repair or replace their historic wood windows. The process is clearly laid out, and the conclusions they came to are very interesting. Not only did they decide that it would be cheaper to restore their windows, they also found a new appreciation for their character, longevity, and solid construction. If you are still not sure if repair is the right choice, investigate the process that this building owner went through, try it yourself, and come to an informed conclusion. Do not simply take the information you are told at face value, and do not buy vinyl before understanding the full environmental impact.

Case Study: http://www.houseinprogress.net/archives/001507.html

**Increasing efficiency**

**Windows: a case of misconception**

**Sources for this section:**

Historic Chicago Bungalow Association. "Windows: Cost & Savings of Window Rehab Choices." Bungalow Brief 12 (2006): 1.

James, Brad, Andrew Shapiro, Steve Flanders and Dr. David Hemenway. "Testing the Energy Performance of Wood Windows in Cold Climates." A Report to the State of Vermont Division for Historic Preservation. 30 August, 1996. www.ncptt.nps.gov/PDFfiles/1996-08.pdf.

Mattinson, Bill, Ross DePaola, and Dariush Arasteh. "What Should I do About My Windows?" Home Energy July/Aug (2002): 24-31.

Myers, John H. "Preservation Brief 9: The Repair of Historic Wooden Windows." National Park Service Preservation Briefs. Washington D.C.: 1981.

Sedovic, Walter, and Jill H. Gotthelf. "What Replacement Windows Can't Replace: The Real Cost of Removing Historic Windows." APT Bulletin: Journal of Preservation Technology 36.4 (2005):25-29.

"The Truth about Windows - Historic Wood Windows & Storm Windows vs Replacement Windows." Old House Guys. Accessed February 23, 2012. Updated 2011. http://oldhouseguy.com/windows.php.

Yagid, Rob. "Should Your Old Wood Windows be Saved?" Fine Home Building. April/May 2010, pg. 40-43.

### Energy Production

#### Fossil Fuels: a Need for Change

The need for an independence from fossil fuels has strong environmental, political, social, and economic implications. The facts are building that the United States, and many other countries, will need to transition into different realms of energy production to sufficiently power our nation at a reasonable and sustainable rate. This has been seen in an increase in alternative energy jobs, increased installation of solar panels, and tax credits promoting the integration alternative energy production into homes and businesses.

The following excerpt from Jean Carroon's "Sustainable Preservation" helps explain the importance of the issue:

> "In the United States, buildings are responsible for 41 percent of all energy consumed, and they produce 37 percent of all U.S. greenhouse gas emissions. Rarely mentioned in the discussion of greenhouse gas emissions from buildings in the U.S. is the fact that the majority of them (75 percent) come from the purchase of electricity, which is often generated from coal in inefficient plants that release byproducts such as mercury and carbon dioxide. The most effective ways to reduce greenhouse gas emissions from buildings are to reduce electricity usage and switch to electricity, whether from microgeneration or the grid, that originates in more efficient and/or largely carbon-free generation (page 169)."

The last section of that quote gets to the point of this section: energy production. What Carroon and others promote is a cleaner production of energy, not just lessening our use. Previous section of this guide have discussed lessening energy use, and this one will look at how to implement energy generation practices into your existing building.

Source for this section:

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

### Energy Production

#### Solar: Terms

**Solar (photovoltaic) Power:** produces electricity through the direct conversion of incident solar radiation. The PV cell provides a direct current (DC) output that can be used to power DC loads, be stored in a battery system, or can be converted to alternate current (AC) to power AC loads or be fed to an electrical grid.

PV power has the ability to be used on site, stored, or transferred to another site if you are connected to a greater electrical grid. In addition, PV panels come in three forms:

**Mono-crystalline Panels:** These are made from a large crystal of silicon. They are the most efficient and the most expensive panels in use today. Where available square footage for solar collection is an issue, they have the maximum solar gain per square foot. These panels are very imposing and become a primary, visible feature on the roof plane.

**Key terms:** highest cost, largest size, most energy production, most imposing physically on the roof plane.

**Poly-crystalline Panels:** These are manufactured using multiple silicon crystals and are the most commonly used type. They are less efficient, but they are also less expensive, and are easier to place on multi-angled roofs. These can be more easily broken up to keep them from becoming the primary focus of the roof.

**Key terms:** adaptive to multi-angled roofs, most common, less expensive while also being less efficient, less imposing on the physical roof plane.

**Amorphous Silicon 'Thin Film' Panels:** These can be manufactured using silicon, copper indium diselenide (CIS) or cadmium telluride (CdTe). They can be made very thin and flexible, which allows them to be more easily integrated into existing buildings and building materials. This form is also cheaper, but tend to be even less efficient. These panels can be integrated into existing buildings by means of shaping them like normal roof tiles and layering them to look like the original tiling on the roof. This allows for a greater blend with the buildings surroundings. When used in this way they are called building-integrated PV (BIPV) products, and many options are available to mimic tiles, building facades, or the glazing for skylights.

**Key terms:** least expensive, least efficient, easiest to blend into existing buildings, easily altered and shaped to the needs of the roof plane.

### Energy Production

#### Solar

Care needs to be taken to ensure that the original roofing material and roof line are considered before choosing a panel type. Changing roofing materials, angles, and projections can have an impact on the buildings overall integrity. In addition, many historic districts have guidelines for how PV technologies should be integrated in individualized situations. Some factors that need to be taken into account include:

**The elevation chosen:** does it obscure important character defining features?

**The angle chosen:** depending on your individual geographic location, the angle will vary for maximized energy collection placement. This angle choice will also affect the visibility of the panel at the street level, and from different points on the building's site.

**Panel choice:** depending on the amount of energy you expect to gain from the panels (PV technicians will be able to give you an estimate on how much energy you will gain), you should take into account the imposing nature of the mono-crystalline panels and see if poly-crystalline of 'thin film' could be a more economic option for your individual needs. Less expensive panels may be able to fit individual energy needs, saving money over time.

**Comprehensive planning:** integrating solar panels should be part of a comprehensive plan that first looks at ways to make your building more efficient (better sealing, Energy Star© appliances, Energy Star© water fixtures), before purchasing a panel system based on current energy usage. This will allow you to maximize the efficiency of the system that you chose, and avoid buying panels that produce more energy than you will need.

**For example, if an energy assessment is done showing that a certain amount of energy will be needed on site and the amount of energy needed is reduced shortly after, the payback of the more costly panels will be greater than if less costly panels were purchased as part of a comprehensive plan.**

**What economic incentives are available in your area?** : tax credits are one well known incentive, but you can also use third-party investing. Third-party financing, in which an entity finances, owns, and operates the system, is a mechanism for installing a PV system for little or no capital and is most often utilized for commercial- or utility-scale systems. These mechanisms include: Power Purchase Agreements (PPAs), Energy Savings Performance Contracts (ESPCs), and Utility Energy Services Contracts (UESCs). This allows for initial costs to be waved, while also capturing the benefits of reduced energy costs.

### Energy Production

#### Solar

Two very important documents have come out over the past few years that have shed light on the impact historic buildings can have on solar energy production:

Technical Report:

This document looks at the many factors that must be considered before implementing PV panels on a historic structure.

Buddenborg, A., E. Hotchkiss, A. Kandt, J. Lindberg, and A. Walker. "Implementing Solar PV Projects on Historic Buildings and in His toric Districts." National Renewable Energy Laboratory. Septem ber 2011.

Guidelines:

This publication and online resource was developed by the National Trust to aid in the implementation of 'green' technologies in historic structures.

Kooles, Kimberly. National Trust for Historic Preservation. "Adapting Historic District Guidelines for Solar and Other Green Technolo gies." 2009. http://www.preservationnation.org/issues/ sustainability/solar-panels/additional-resources/NTHP-Forum-Article-2009-Solar-and-HD.pdf

Sources for this section:

Buddenborg, A., E. Hotchkiss, A. Kandt, J. Lindberg, and A. Walker. "Implementing Solar PV Projects on Historic Buildings and in Historic Dis tricts." National Renewable Energy Laboratory. September 2011.

Kooles, Kimberly. National Trust for Historic Preservation. "Adapting Historic District Guidelines for Solar and Other Green Technologies." 2009. http://www.preservationnation.org/issues/sustainability/solar-panels/additional-resources/NTHP-Forum-Article-2009-Solar-and-HD.pdf

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

### Energy Production

#### Wind

**Wind Turbines:** are devices that convert kinetic energy into electric energy. Rotating blades (rotors) capture wind and the resulting movement is connected to a generator that converts it into energy (while also inverting the DC energy into AC). The amount of energy that is available from this source depends greatly on the amount of wind in your area. A detailed analysis of wind conditions in your area should be taken into account before integrating in this technology. Turbines require more maintenance than solar panels, and thus can be more expensive in the long run. Costs, sizes, and energy outputs vary by turbine and location.

> Before deciding to integrate turbines into a historic structure, you should first take into consideration how they will affect the integrity of the building. Much like solar panels, it is recommended that ground source options are looked at first (not physically connected to the building), then secondary elevations and additions.

#### Water

**Microhydro Turbines:** these work very similarly to wind turbines except they use the natural flow of water instead of the flow of air. The ability for this option to be feasible depends entirely on the existing site. A consistent source of flowing water is a requirement.

Water is delivered to the turbine using a pipe from a water source, the blades of the turbine spin, and energy is converted and stored. Though initial investment may be high, depending greatly on the site conditions, this can be a reliable, efficient, and clean alternative to fossil fuels.

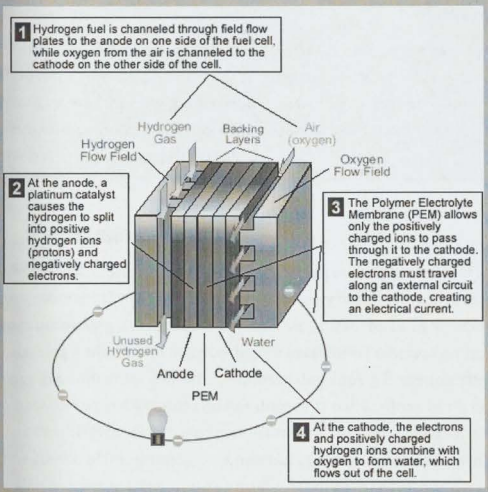
#### Hydrogen fuel cells

**Hydrogen Fuel Cells:** create energy through an electrochemical reaction between hydrogen and oxygen.

The visual on the following page can be used to better understand this rather complex process.

**Energy Production**

**Hydrogen fuel cells**




Source: http://www.fueleconomy.gov/feg/fcv_pem.shtml

An excerpt from Alison Kwok's "Green Studio Handbook" is also helpful:

"A fuel cell can be seen as three parts- an anode side, a cathode side, and a membrane that divided the two. Hydrogen gas enters the anode side of the fuel cell and reacts with a platinum catalyst, which divides the hydrogen atom into a proton and an electron. Both the proton and electron travel to the cathode side of the fuel cell, but via different routes. The proton passes directly through the membrane to the cathode, while the electron travels through a connecting electrical circuit, providing electrical energy on its journey to the cathode. Once reunited in the cathode, the electron, the proton, and an oxygen atom combine to create potable water and heat. If the heat is utilized (say through cogeneration) the fuel cell can reach overall levels of efficiency that far surpass technologies reliant on the combustion of fossil fuels and other hydrocarbons (249)."

The end result is a clean, renewable energy that can create both electricity and water. The only downside to this system is the requirement for space and a relatively high capital investment. There are many sizes, colors, and options available, and your choice will have to be tailored to your specific needs and site. Though this technology is often discussed in relation to cars, it can be used in commercial settings to provide energy, water, and hot water to a site.

Source for this section:

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

# CHAPTER 2: Economic Sustainability

Economic stimulation and preservation are a natural match. Not only does the physical preservation of buildings create jobs and increase the value of properties, the re-development of an area also stimulates new businesses that make lasting jobs. In addition, materials and jobs are more often local, which allows for more of the money spent to remain local and support the local tax base.

Preservation is also a local economic boost because of the money spent working with the existing infrastructure and existing building materials. This saves time and money extracting new materials, transporting them to the site, and installing them into place. In addition, continued maintenance insures that more money spent goes towards labor costs than material costs, which also helps keep profits local.

Donovan Rypkema

A very important source for information on the economic benefits of historic preservation is Donovan D. Rypkema. Rypkema, perhaps the most well-known and recognized name in preservation economics today, has spent the last 25+ years promoting the rehabilitation of historic structures as an economic development tool and job stimulator. After receiving a Masters of Science degree in Historic Preservation from Columbia University, Rypkema worked for numerous governmental and private firms in developing economic stimulation plans for historic sites across the country. He has worked in 49 states and has dozens of publications to his name. Today, Rypkema is the head of PlaceEconomics, a Washington, D.C. based real estate and economic development consulting firm. His publications can be used as a source of information on a number of topics related to the economic sustainability of historic structures, and he also teaches masters courses on the economics of historic preservation at the University of Pennsylvania.

**More information on Rypkema can be found at:** http://www.placeeconomics.com/about-us/who-we-are

Work from Donovan Rypkema includes (along with dozens of others):

Rypkema, Donovan. "Evaluating the Downtown Real Estate Opportunity". National Trust for Historic Preservation: 1987.

Rypkema, Donovan. "Profitting from the Past: The Impact of Historic Preservation on the North Carolina Economy." Preservation North Carolina, 1998.

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

Rypkema, Donovan. "Virginia's Economy and Historic Preservation: The Impact of Preservation on Jobs, Business, and Community". National Trust for Historic Preservation: 1996.

**Existing infrastructure**

Using an existing site has many economic benefits. Infrastructure is already in place, saving a community additional investment cost. Plumbing, sewage, sidewalk, parking lot, and landscaping improvements are generally less extensive with the existing in place, thus saving money. In addition, many historic properties are along transit lines and other major arterial routes that allow for good visibility to potential clients.

Continuing to extend public services further into outlying areas puts a financial burden on local economies to pay for new streets, sewer systems, electricity lines, and more. This eventually translates to more schools, more fire stations, and a greater strain on available land for agricultural uses. Thus, using a site that already has many tax supported and paid for components in place will lessen the burden on tax paying citizens and the environment.

**Incentives**

Before beginning any preservation redevelopment project, it is important to know all stake holders involved, make sure feasibility is assessed based on available funds and incentives, and to contact a tax consultant before making decisions that may affect the historic standing of your structure. Many factors will affect the feasibility of a project, including market forces, the ability of a property to be listed on the National Register of historic places (described in more depth later), and the current condition of the structure.

It is highly recommended that a full *pro forma*, outlining the costs and benefits of a potential project, be generated to guide projects. You can estimate the total financial gain by comparing the total costs of the project (including the cost of financing, the lost revenue from temporary building closures, and operating costs after the project is finished) and the benefits (including projected rents that will be charged, tax incentive benefits, grants, and the amount of square footage that will be gained from the rehabilitation project). In addition, financial institutions are more likely to fund a project that is well thought out with projected expenses. This may even help secure a better loan amount or rate.

**Incentives**

Rypkema, Donovan. "The Economics of Rehabilitation." Washington D.C.: National Trust for Historic Preservation, 1991.

This National Trust publication is helpful for outlining a *pro forma* to be used for estimating the total costs and benefits of a rehabilitation project. Things included in a *pro forma* are:

- Capital costs: acquisition of the property, demolition, and construction costs.
- Operating income: rent (square footage and price per square foot), vacancy (% expected and total money lost), rentable square feet, and net gross ratio- the percent of the total square footage that will be rentable (excludes lobby space, hallways, etc.).
- Operating expenses: these include promotions, security, maintenance, and many other site dependent factors.
- Financing: value of the property, capitalization rate (rate that expresses the relationship between what a property generates in net revenues and what it is worth- this is determined by an independent appraiser), loan details (loan-to-value ratio offered from bank, loan amount, interest rate, length of loan, and the annual payment on the loan), all available incentives (tax credits, grants, etc.) the amount of additional investor cash required after the loan, the investors return rate (rate showing how much investors will make yearly compared to what they invested), and the total cash flow expected.

Preservation projects should be sought out that promote private investment. The more investment a community has in a project, the more likely stakeholders are to be fully committed. Public investment from tax incentives and grants should be used as leverage to encourage additional investors. The incentives that have been put in place through governmental participation were meant to make preservation projects more feasible, and have allowed many large development firms to foster historic redevelopment.

**Incentives**

Venerable Properties (Art Demuro), Portland, Oregon.

Venerable Properties, a company based in Portland, Oregon is a development firm that specializes in historic redevelopment. Guided by President Art Demuro, notable projects include the Ladd Carriage House and White Stag Block (both in Portland, Oregon). The company has been able to prove, numerous times, that preservation can be profitable and used to help revitalize historic properties. Before each project, the project team at Venerable completes a *pro forma* analysis that includes looking at all possible incentives related to the redevelopment of each property.

Source: http://venerableproperties.com/listings/properties-for-lease/skidmore-block/

This is an example of a redevelopment project that Venerable has been involved in. The Skidmore Block, located in the heart of Old Town Portland, now houses the University of Oregon's Portland campus as the anchor tenant while many small businesses call the building complex home.

# CHAPTER 2: Economic Sustainability

**Incentives**

This section is meant to outline possible incentives that can be used by a wide variety of projects. Each situation will be different and results cannot be typified. In addition, some incentives depend on the property's ability to be listed in the National Register of Historic Places. Listing in the register comes with no federal restrictions on the use of your property, but may restrict what you can do on a state or city wide level. Consultation with your local State Historic Preservation Office (SHPO) will aid in better understanding National Register designation in your area, and all of the incentives and restrictions involved. In the appendix of this guide, you will find a guide to nominating a property to the National Register, along with a guide to the Secretary of the Interior's Standards for Rehabilitation. In many situations with incentives that involve federal funding, these standards must be followed to receive economic benefits. Incentives will be clearly marked in situations where National Register Designation and/or rehabilitation standards are required to be undertaken, as these require additional planning, stakeholder compliance, and regulatory action.

**Loans**

Many loans may be available for preservation rehabilitation projects. Traditional bank loans, revolving loans, and community supported loan programs may all be available.

Revolving loans are pool of money set aside for a specific purpose that have varied terms and amounts depending on the situation.

Local loan programs may be promoted by community organizations. Often, these loans are meant to stimulate development in an area, and may have specific requirements depending on the terms of the loan. Make sure to look for community advocacy groups in your area that support preservation and redevelopment efforts.

New Jersey:

A good example of this is the New Jersey Historic Trust which offers grant funding, bond funding, emergency grants and loans, a revolving loan program, and an easement program (talked about more in the 'easements' section).

Information about these programs can be found at: http://www.nj.gov/dep/hpo/3preserve/preserve.htm

## Incentives

### Tax Incentives: Federal and State

Tax incentives will vary by location and situation. The goal of this guide is to show a collection of options that are available at both the state and national level that were created to promote preservation efforts. The federal tax incentives will apply in most situations, and the state level incentives are shown for the State of Oregon. In other states, you should consult the local State Historic Preservation Office (SHPO) for a full list of tax incentive opportunities.

***Tax Credit:*** a deduction to the total amount that a tax payer owes in taxes. They can be used by a non-tax paying entity (i.e. A non-profit organization) for preservation purposes through their ability to be sold to tax paying businesses, like banks and other investment houses with large tax liabilities.

### Federal Tax Incentives

Federal Historic Preservation Tax Incentive: 20% Credit

This incentive is administered by the National Park Service through a partnership between the Internal Revenue Service and local SHPOs.

**The adjusted basis is the depreciated value of the building, not including land value, when the project starts**

Requirements:

- Income producing properties (it cannot be used for private residences).

- Substantial projects totaling costs of at least $5,000 or the adjusted basis of the property.

- The property must be a building. The credit cannot be used for monuments, bridges, and other historic resources not considered buildings.

The goal of this tax credit is to promote private investment in preservation projects that allow for the continued use and increased economic value of historic properties.

The project must be a Certified Rehabilitation Project of a Certified Historic Structure.

- Certified Rehabilitation: a certified rehabilitation project means that work done meets the Secretary of the Interior's Standards for Rehabilitation, found in the appendix of this guide. Projects that meet these standards take care to preserve character defining features, and require the maintaining of as much original material and craftsmanship as possible. Each situation will be different, and it is important to consult your local SHPO with your preliminary design ideas to learn if they are likely to be accepted.

**Incentives**

**Tax Incentives: Federal and State**

**Federal Tax Incentives**

Federal Historic Preservation Tax Incentive: 20% Credit

- Certified Historic Structures: the structure must be either individually listed on the National Register, or listed as a contributing structure in an historic district. Preliminary determination of eligibility can be acquired from the SHPO in your area to help determine the feasibility of designation. Details on applying for National Register designation are available in the appendix of this guide.

The credit applies for a total deduction in taxes owed that totals 20% of the total rehabilitation expenses. Not every expense that occurs during the rehabilitation process will qualify for inclusion in this total.

Eligible Expenses:

-Walls
-Partitions
-Floors
-Ceilings
-Permanent coverings, such as paneling or tiles
-Windows and doors
-Components of central air conditioning or heating systems
-Plumbing and plumbing fixtures
-Electrical wiring and lighting fixtures
-Chimneys
-Stairs
-Escalators, elevators, sprinkler systems, fire escapes
-Other components related to the operation or maintenance
of the building

Non-Eligible Expenses:

-Appliances
-Cabinets
-Carpeting (if tacked in place and not glued)
-Decks (not part of original building)
-Demolition costs (removal of a building on property site)
-New construction costs or enlargement costs (increase in total volume)
-Fencing
-Feasibility studies
-Financing fees
-Furniture
-Landscaping
-Leasing expenses
-Outdoor lighting remote from building
-Parking lot
-Paving
-Planters
-Porches and porticos (not part of the original building)
-Retaining walls
-Sidewalks
-Signage
-Storm sewer construction costs
-Window treatments (i.e. blinds)

**Incentives**

**Tax Incentives: Federal and State**

**Federal Tax Incentives**

Federal Historic Preservation Tax Incentive: 20% Credit

A basic rule of thumb can be used: changes that are not permanent, exterior to the structure, or not original to the structure are less likely to apply to the credit. Consultation with the local SHPO will help with deciding which costs will apply to the credit.

In addition, there is a three part application to receive the credit, and it is **highly** recommended that work not begin until the first part of the application has been received and approved by the Secretary of the Interior. There is a fee associated with applying that differs depending on the size of the project.

More information on this option, including how to apply, can be found at: http://www.nps.gov/hps/tps/tax/incentives/essentials_1.htm

Federal Historic Preservation Tax Incentive: 10% Credit

This tax credit program is administered by the same governing bodies, and is meant to promote preservation work on historic structures that may not meet approval to be listed on the National Register.

Requirements:

- The building must have been built before 1936.

- It must be a non-residential site (but can be a hotel or bed and breakfast).

- The project must also total costs of at least $5,000 or be equal to the pre-rehab costs of acquiring the property.

Along with these requirements, three additional conditions must be met:

- At least 50% of the building's external walls existing at the time the rehabilitation began must remain in place as external walls at the work's conclusion, and
- at least 75% of the building's existing external walls must remain in place as either external or internal walls, and
- at least 75% of the building's internal structural framework must remain in place.

**Incentives**

**Tax Incentives: Federal and State**

**Federal Tax Incentives**

Federal Historic Preservation Tax Incentive: 10% Credit

These being the only restrictions in the design process, the Secretary of the Interior's Standards for Rehabilitation do not apply here, allows for more options in the design process. It is a tradeoff though, because less money is saved for taxation purposes. What is good about this tax credit is that it provides an option for historic structures that do not qualify for the National Register but which would like to earn some credit for maintaining historic character and materials.

New Market Tax Credit (NMTC):

This tax credit program is administered by the U.S. Department of Treasury and is meant to encourage projects that benefit low-income populations.

Facts:

- The program uses federal tax credits equaling 39 percent of the total investment allocated over a seven-year period.

- These investments are made to spur community and economic revitalization.

- The NMTC statute requires that investments be located in census tracts where the individual poverty rate is at least 20 percent or where median family income does not exceed 80 percent of the area median.

For more information on this tax credit please visit: http://nmtccoalition.org/

Low Income Housing Tax Credit (LIHTC): (Explained in greater detail in the section "Incentives for low-income housing" in chapter 3)

This tax credit program is administered by the U.S. Department of Housing and Urban Development (HUD).

Requirements:

- The project must involve a residential rental property.

- The property must meet income restriction thresholds for at least 30 years.

- The credit applies to rehabilitation costs of an existing building.

**Incentives**

**Tax Incentives: Federal and State**

**Federal Tax Incentives**

Low Income Housing Tax Credit (LIHTC): (Explained in greater detail in the section "Incentives for low-income housing" in chapter 3)

How it works:

- Federal housing tax credits are awarded to developers of qualified projects. Developers then sell these credits to investors to raise capital (or equity) for their projects, which reduces the debt that the developer would otherwise have to borrow.

- Provided the property maintains compliance with the program requirements, investors receive a dollar-for-dollar credit against their Federal tax liability each year over a period of 10 years. The amount of the annual credit is based on the amount invested in the affordable housing.

For more information on this tax credit please visit: http://www.hud.gov/offices/cpd/affordablehousing/training/web/lihtc/basics/

**State Tax Incentives**

This section is showing the conditions in the State of Oregon, and local SHPOs should be contacted for information about additional tax incentives available in your area.

In addition, there are many incentives available at the local level that you will need to search for locally. In the appendix of this guide you will find additional local incentives for the City of Portland, Oregon, which can be used as a guide for finding incentives in your area.

Special Assessment of Historic Property

This taxation program is administered by the Oregon State Historic Preservation Office (SHPO) and is meant to provide support towards rehabilitation projects.

Requirements:

- The property must be listed in the National Register of Historic Places or within a designated historic district. A preliminary designation can be gained through the SHPO, but designation needs to be in place within 2 years of beginning the program.

- The property must have a preservation plan that establishes rehabilitation work for a 10 year period.

**Incentives**

**Tax Incentives: Federal and State**

**State Tax Incentives**

Special Assessment of Historic Property

- A small plaque must be placed on the building that explains that it is in the program. The plaques are silver and state the name of the property and generally the year it was built.

How it works:

- It provides for a 10-year property assessment 'freeze' that keeps the property tax rate for the property at the pre-rehabilitation level. This means that improvements made to the property related to the rehabilitation will not increase property taxes to be paid for 10 years.

- An approval process is required, and consultation from the beginning that shows exactly what work will be done is necessary with the Oregon SHPO. The SHPO is able to work with property owners to both gain designation (if properties are eligible), and apply for the Special Assessment program.

- There is also a small fee for utilizing the program equal to 1/10 of 1% (0.001) of the assessed value of the property.

For more information on this program please visit: http://www.oregon.gov/OPRD/HCD/SHPO/tax_assessment.shtml

**Other State Incentives**

LEED Track Incentives

This program, administered by the Energy Trust of Oregon, is meant to provide cash incentives for LEED projects.

Requirements:

- The project must be served by (receive power from) Portland General Electric (PGE) or Pacific Power to receive incentives for electric measures and NW Natural or Cascade Natural Gas to receive incentives for gas measures.

- The project must pay or plan to pay the public purpose charge.

- The project site must be located in Oregon.

-The project must be new construction, an addition to an existing structure or a major renovation to an existing structure.

The public purpose charge is a small fee collected by PGE from all electricity consumers that is used to serve many public purposes including the promotion of renewable energy sources, and weatherizing low-income housing.

**Incentives**

**Other State Incentives**

LEED Track Incentives

- The project must be a commercial, industrial, manufacturing or institutional building.

**Eligible building types include:**

-office, retail, healthcare and hospitals, warehouse or storage, restaurant, manufacturing, grocery, hotels and motels, public and private schools or colleges, mixed-use, high-rise multifamily residential (more than 3 stories) and parking garages.

In addition, owners must submit a completed copy of the Project Enrollment Application form prior to applying for incentives, which can be found at the following website.

For more information on this program please visit: http://energytrust.org/business/incentives/other-businesses/new-construction/custom/leed/

This incentive, and the one listed below can be used together to maximize the benefit when rehabilitating a historic building. LEED incentives can often be used in the rehabilitation of historic structures, and should not be seen as solely a tool for new construction.

Custom Track Initiative

This program is also administered by the Energy Trust of Oregon, and is meant to encourage building system upgrades that go beyond Oregon's minimum code requirements.

Requirements:

- Cash incentives of up to $500,000 are available for building system upgrades that are more efficient than those installed to meet minimum Oregon code requirements

- The same building types are eligible as with the LEED Track

- The project team must present a projected first year electric and gas savings report showing expected outcomes

For more information please visit: energytrust.org/library/forms/NBE_PG_CustomTrack_TechGuidelines.pdf

**Incentives**

**Grants**

**Nationwide:**

Save America's Treasures

This grant program is administered by the National Park Service through the Historic Preservation Grants Division and is meant to provide protection for properties of national significance.

Requirements:

- Properties of national significance are either listed as National Landmarks or listed in the National Register as having national significance one of the options for significance when nominating).

- For collections and objects, significance is determined by the National Endowment for the Arts, the National Endowment for the Humanities, or the Institute of Museum and Library Services.

- It is applicable only to certain rehabilitation costs. Costs must be associated with large-scale physical preservation work and may not include new construction, condition assessments, and other planning or maintenance work.

- The request must be for at least $125,000 and can be for no more than $700,000.

- The request requires a dollar-for-dollar non-federal match. This can include cash, equipment use, or supplies.

- The application is competitive and is open to federal, state, local, and tribal government entities, and non-profit organizations.

- Applicable to: intellectual and cultural artifacts, collections, documents, sculpture, and works of art. Along with historic structures and sites: historic districts, sites, buildings, structures, and objects.

- Availability of this grant depends on the current fiscal year.

For more information please visit: http://www.nps.gov/history/hps/treasures/

**Incentives**

**Grants**

**Statewide:**

Preserving Oregon Grant

This grant program, administered by the Oregon State Historic Preservation Office (SHPO), is meant to aid in rehabilitation work involving National Register properties.

Requirements:

- The grant requires a match and can be for up to $20,000.

- The grant applies to properties in the National Register or listed within a National Register historic district. It also applies to significant work contributing toward identifying, preserving and/or interpreting archaeological sites.

For more information please visit: http://www.oregonheritage.org/OPRD/HCD/FINASST/grants.shtml#Grant_Planning___Admin_

Cultural Development Grant

This grant, administered by the Oregon Cultural Trust, provides grants for the preservation of cultural heritage.

Requirements:

- The grant is available to non-profit organizations.

- Funds are applicable towards certain rehabilitation costs.

Goals of the grant:

- protect and stabilize Oregon's cultural resources;
- expand public awareness of, quality of, access to and participation in culture in Oregon; and
- ensure that Oregon's cultural resources are strong and dynamic contributors to Oregon's communities and quality of life.

For more information please visit: http://www.culturaltrust.org/grants/development-grants

**Incentives**

Easements

Preservation Easement: The following definition comes from the National Trust for Historic Preservation:

> A private legal right given by the owner of a property to a qualified nonprofit organization or governmental entity for the purpose of protecting a property's conservation and preservation values. Conservation easements are used to protect land that has outdoor recreational value, natural environmental value (including natural habitat), open space (including farmland, forest land, and land with scenic value), or land that has historic, architectural, or archaeological significance. Preservation easements are conservation easements whose principal purpose is to protect a property with historic, architectural, or archaeological significance, although the easement may also protect natural land values as part of a property's historic setting.

The property owner continues to own the property and is able to transfer a specific set of rights related to the property to a non-profit who becomes the properties steward. This transference of rights, which generally restrict the owner from demolition and severe alteration, equates to federal tax credits being awarded to the building owner. The owner is required to comply with the restrictions agreed upon with the easement and the easement holder is required to maintain their side of the agreement as well. This usually requires that they assess the condition of the property periodically to make sure alterations haven't been made and work doesn't need to be done to protect the property.

Example in Oregon:

Historic Preservation League of Oregon (HPLO) Conservation Easements

Requirements:

- Each easement is negotiated individually, and each is tailored to the situation and needs of both parties.

- There is an application process, application fee ($150) and easement processing fee (depends on the appraised value of the land).

# CHAPTER 2: Economic Sustainability

**Incentives**

**Easements**

Historic Preservation League of Oregon (HPLO) Conservation Easements

- There is also a suggested donation after the easement goes through to help provide for on-going maintenance of the property. This too is tax deductable.

Steps to the donation process include:

1. Complete the Conservation Easement Application form, including photographs to document the property and its historic elements.

2. Schedule a meeting with an HPLO representative to tour and inspect the property, and discuss the specifics of what elements will be protected.

3. If the owner plans to take the IRS income tax deduction for the value of the easement, a qualified appraiser is engaged to establish the easement's value.

4. The application is reviewed by the HPLO Easement Committee. Upon acceptance into the HPLO easement program a legal contract is drawn. The HPLO provides a standard contract that is customized to reflect the donor's wishes. It is recommended that donors engage legal council to represent them in this step of the process.

When the contract is signed and the processing fee received, it is recorded with the county.

For more information please visit: http://www.historicpreservationleague.org/easementsProcess.php

**Regulatory relief**

Regulatory Relief: zoning and code regulations allow for more flexibility, and relief from some requirements when rehabilitating a historic resource. The amount of relief depends on the municipality and often allow for character defining features to be saved that otherwise would not meet standards.

Examples of this may be the height or material choice of a handrail, or allowing for a residential use to be placed in a building regularly zoned for commercial.

**Incentives**

**Regulatory relief**

**Examples in the State of Oregon:**

Additional Density, and Changes of Use

This regulatory relief is administered by the City of Portland, Oregon Bureau of Planning and Sustainability. Applicability depends on the individual project, and the City should be contacted before rehabilitation work is begun.

How it works:

- This allows for a change of density or use for local historic and conservation landmarks.

- This is only applicable to certain properties and zoning regulations.

Examples include:

- **Transfer of density or floor area ratio (FAR).** Allows unused development potential on a site with a local landmark to be transferred or sold to another site. (Discussed at depth in Appendix C)

- **Additional density in single-dwelling zones.** Allows local landmarks in single-dwelling zones to be used as multi-dwelling structures.

- **Additional density in multi-dwelling zones.** Allows additional dwelling units in local landmarks and contributing properties in historic districts, with no maximum density.

- **Exemption from minimum housing density requirements.** Eliminates minimum housing density requirements in local landmarks and contributing properties in historic districts.

- **Daycare in residential zones.** Waives the requirement for a conditional use review for daycare uses in local landmarks and contributing properties in historic districts in residential zones.

- **Nonresidential uses in the RH, R1, and R2 zones.** Allows nonresidential uses, such as retail, office and others, in a local landmark or contributing property in a historic district, if the structure has not been in residential use. Requires a land use review to minimize potential impacts on nearby residences.

- **Nonresidential uses in the RX zone.** Allows nonresidential uses, such as retail, office and others, in a local landmark or contributing property in a historic district. Requires a land use review to minimize potential impacts on nearby residences.

**Incentives**

**Regulatory relief**

**Examples in the State of Oregon:**

Additional Density, and Changes of Use

- **Conditional uses in residential, commercial, and employment zones.** Allows requests for land uses in a landmark or contributing property in a historic district that are only allowed through a conditional use review to be processed through a Type II procedure instead of a Type III procedure.

- **Commercial allowances in Central City industrial zones.** Allows office and retail uses in individual National Register properties and contributing properties in National Register historic districts in zones where non-industrial uses are otherwise more restricted.

- **Commercial allowances in employment and industrial zones.** Increases allowances for office and retail uses in historic landmarks in areas where non-industrial use allowances are otherwise more restricted.

- **Increased maximum parking ratios for historic properties in the Central City.** Increases the maximum parking ratio for individual National Register buildings and contributing buildings in National Register historic districts in the Central City Core Parking Area.

**Commercial allowances in the Guild's Lake Industrial Sanctuary District.** Increases allowances for office and retail uses in historic landmarks in an area where non-industrial use allowances are otherwise more restricted.

Relaxed Seismic Upgrade Requirements

Also available are relaxed seismic upgrade requirements. This allows for historic buildings to avoid extremely expensive upgrades that could cause rehabilitation work to be unfeasible and lead to the demolition of the structure. Cases are site and situation dependant.

For more information on all Portland historic resource zoning code incentives please visit: http://www.portlandonline.com/bps/index.cfm?a=133692&c=39750#build_code_provision

**Incentives**

National Trust Incentives

Intervention/Emergency Money

This funding is administered by the National Trust and is awarded in emergency situations when immediate and unanticipated work is needed to save a historic structure.

Requirements:

- Funding is restricted to non-profit organizations and public agencies

- Unlike most National Trust grant money, this program does not require a cash match.

- If you would like to know if funding is available for your building, fill out an inquiry questionnaire and the National Trust grants office will contact you.

For more information and to fill out a questionnaire please visit: http://www.preservationnation.org/resources/find-funding/interventionemergency.html

National Trust Community Investment Corporation (NTCIC):

This is the mission of the NTCIC:

"The National Trust Community Investment Corporation (NTCIC) makes equity investments in real estate projects that qualify for federal and state Historic, Low-Income Housing (LIHTC) and New Markets (NMTC) Tax Credits. NTCIC works with a wide variety of property owners including for-profit developers, nonprofit organizations and local governments. Its focus is on projects that have a high economic impact on the surrounding community."

Source: http://ntcicfunds.com/about/

The NTCIC can be used as a resource for funding by brokering tax credits and providing additional small deals funding. The above link can be used to find more information on contacting the NTCIC.

# CHAPTER 2: Economic Sustainability

**Housing Values**

Historic designation can add value to your property. This could mean that it is within a National Register historic district or that it was nominated individually to the National Register. Even though listing in a district will limit what you are allowed to do with your property, those limitations are also seen as protection from value-reducing actions to your property and others in the district. A great deal depends on the historic district guidelines for alterations and demolitions. In a great number of cases, the property owner sees the extra protection as securing the character of the building and the neighborhood. Value is placed on character and cultural identity, and people are likely to pay more for a building that has unique, character defining features.

**Facts about historic structure property values:**

The following information comes from "The Economics of Historic Preservation" by Donovan Rypkema (listed at the end of this section under sources).

- The appreciation rates for downtown historic buildings often outperform the market as a whole: appreciation rates for renovated historic buildings is substantially greater than the rates for new construction and unrestored historic properties.

- Generally properties within historic districts appreciate much faster than values in the community as a whole.

- No credible study has demonstrated that historic districts reduce property values, in all cases the rates were either comparable with other buildings in the area or appreciated more.

The following excerpt comes from an interesting article which looked at the average value of historic homes in the Sacramento, CA area from 1990 to 1994.

Though the study was looking solely at residential properties, these findings are still significant.

Clark, David. "Historic Property Districts and Home Sale Prices: Evidence from the Sacramento Housing Market". Review of Regional Studies, vol. 27 no. 1, 1997

"The results suggest that HPDs (Historic Preservation Districts) exert a net positive influence on housing prices. This indicates that the effect of positive 'authenticity' and 'upkeep' externalities outweigh the higher costs, due to onerous rules, of property improvement within an HPD. The combined effect of these externalities yields sale prices up to 17.32 percent higher for an average-aged house within a preservation area."

# CHAPTER 2: Economic Sustainability

**Housing Values**

Clark, David. "Historic Property Districts and Home Sale Prices: Evidence from the Sacramento Housing Market". Review of Regional Studies, vol. 27 no. 1, 1997

- Many residential properties become commercial properties: bed and breakfasts, mixed use residential and commercial, restaurants, or small clothing or antique stores for example.

-The 'costs' mentioned above, which relate directly to limiting changes to the building, were still outweighed by the value of authenticity. This means that authenticity has value. That value exists in commercial properties as well, and can help with attracting customers.

Another interesting study looks at how tax deductions applied to historic properties can increase their value, even when changes to the exterior of the building are very limited. This information comes from the University of San Diego, and is analyzing the effects of the Mills Act (1972). This act restricts exterior alterations while providing valuable tax incentives. The study was based on information collected between 2000 and 2006.

For more information on the Mills Act, created to promote the preservation and maintenance of historic structures that qualify for the program please visit: http://www.anaheim.net/article.asp?id=2048

Narwold, Andrew, Jonathon Sandy, Charles Tu. "Historic Designation and Residential Property Values". *International Real Estate Review 2008*, vol. 11 no. 1

The article had some substantial findings:

- Historic designation resulted in a 16% increase in housing values
- Tax savings on houses covered by the Mills Act ranged from 40 to 80 percent, with an average savings of 49 percent. What was discovered was that even with restrictions on the property, incentives were strong enough to outweigh the costs. This shows that historic properties have inherent value, and that value will vary based on local incentives and other market conditions.

# CHAPTER 2: Economic Sustainability

**Housing Values**

**The value of historic properties builds on many variables:**

-Character defining features and the level of integrity maintained in the building

-Location: historic districts tend to be in the oldest parts of towns, where many attractions, shops, and businesses are already located

-Incentives: these add value to the property by decreasing taxes, and increasing protection on the property and surrounding area

Sources for this section:

Clark, David. "Historic Property Districts and Home Sale Prices: Evidence from the Sacramento Housing Market". Review of Regional Studies, vol. 27 no. 1, 1997

Narwold, Andrew, Jonathon Sandy, Charles Tu. "Historic Designation and Residential Property Values". *International Real Estate Review 2008*, vol. 11 no. 1

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

# CHAPTER 2: Economic Sustainability

**Job Stimulation**

**Jobs, materials and taxes: the local connection**

Preservation projects tend to be more labor intensive than materials intensive. This allows for a greater portion of the projects budget to be used for paying employees. As a result, money stays local from increased tax revenue. When materials are purchased, they are more likely to come from a local source. This is both economically sustainable and environmentally sustainable, as more local materials require less energy to bring to the site.

The effects of preservation work on job creation and local tax revenue have been well documented.

One example comes from the State of Washington, which outlines the economic effects of preservation work in its 2006 summary report:

Washington Department of Archaeology and Historic Preservation. "The Economic Benefits of Historic Preservation in Washington State: Summary Report." 2006.

The report outlines three types of impacts that preservation can have on local economies:

- Direct Impacts: Those generated directly from preservation activity. This includes the materials for a rehabilitation project and the gas and lodging for a heritage tourist (explained in greater detail in the next section of this chapter). These impacts have what is called a 'multiplier effect' as every activity involving preservation will undoubtedly affect other areas of business through travel and construction.

- Indirect Impacts: Those generated from spending on goods and services by industries that produce the items purchased for the historic preservation activity. For example, replacement wood pieces for rehabilitation work are purchased from a mill (direct impact), but they had to first be purchased from a lumber yard (indirect impact). These tend to have far reaching effects on the local economy, and enhance preservations' role as an economic stimulator.

**Job Stimulation**

**Jobs, materials and taxes: the local connection**

- Induced Impacts: These include expenditures made by the households of workers involved either directly or indirectly in rehabilitation-related activity. This includes goods purchased by the family of a construction worker who is involved in a local rehabilitation project, or the salary paid to the workers at the mill who supplied the lumber for the project.

All of these impacts come together to show how preservation projects have lasting results in a community. More material heavy jobs, that require fewer workers, will affect fewer segments of the local economy as the workers will have less of an impact on the local economy. Spending a week restoring historic wood windows (a job done by a well-paid, skilled professional) will allow the rehabilitators time to spend money in that locale, but simply replacing the windows (a job which requires a lower education level and thus generally receives lower pay) will take less time and the workers are less likely to have an impact on the local economy.

The following table comes from the report:

Historic Rehabilitation Spending and Economic Impacts

| County/State | Average Annual Spending ($million) | Average Annual Impacts 2000 to 2004 | | | |
|---|---|---|---|---|---|
| | | Output (Sales) ($million) | Employment (Jobs) | Income ($million) | Taxes ($million)[1/] |
| King | 51.8 | 105.6 | 1,230 | 43.1 | 4.9 |
| Pierce | 12.9 | 28.7 | 325 | 11.1 | 1.3 |
| Spokane | 15.4 | 34.0 | 400 | 13.7 | 1.5 |
| **Washington** | **83.5** | **220.8** | **2,323** | **86.8** | **8.9** |

Note:
1/These tax revenue estimates include state sales and Business and Occupation (B&O) taxes. They do not include revenues generated by local sales taxes, which range from 0.5 percent to 1.7 percent of the state base rate of 6.5 percent and vary by jurisdiction.

The table breaks up the average spending on rehabilitation projects (separated by county), along with the total sales from direct, indirect, and induced impacts, the total jobs created, the total amount of income generated from those jobs, and finally the taxes generated by those jobs.

**Job Stimulation**

**Jobs, materials and taxes: the local connection**

It is clear that rehabilitation projects create jobs, but how great is the impact of those jobs compared to new-construction and other employment segments statewide?

Comparison of Historic Rehabilitation with Other Economic Sectors

| Economic Sector | Jobs (per $1 million of Sales) | Labor Income ($ per $1 million of Sales) |
|---|---|---|
| Health Services | 36.31 | 1.185 |
| Retail Trades | 33.87 | 0.962 |
| **Historic Rehabilitation** | **27.50** | **1.026** |
| Finance and Insurance | 26.73 | 0.978 |
| Construction | 26.45 | 0.908 |
| Wood Products Manufacturing | 26.39 | 0.920 |
| Food Products Manufacturing | 21.72 | 0.705 |
| Aerospace Manufacturing | 10.60 | 0.452 |

According to the report, historic rehabilitation created 27.5 jobs per $1 million dollars made in sales. The labor income (amount workers made compared to the amount of money spent) was 1.026 dollars for every 1 dollar spent. This is substantial since a common misconception is that preservation hurts jobs through limiting new-construction. Preservation work actually provides more jobs, at a higher pay rate, than new-construction. Yes, deciding to rehabilitate a building takes away from demolition and new construction jobs that could have occurred in that area, but those jobs would have had less of a job impact.

**The following facts come from "The Economics of Historic Preservation" by Donovan Rypkema:**

***Historic Preservation creates jobs***

Example:

"Each $10 million in expenditures (for preservation rehabilitation projects) creates 285 jobs in Rhode Island and an additional 65 jobs outside of the state. Of in-state jobs, 129 are construction workers; 51 are services provided by engineers, architects, attorneys, accountants, preservationists, etc.; 37 involve retail; 23 involve manufacturing; and 19 are in the fields of finance and real estate."

**Job Stimulation**

**Jobs, materials and taxes: the local connection**

Major takeaways from this example include the fact that the jobs created by preservation projects are well-paying local jobs, and that they do provide for general construction jobs as well. Jobs such as roofing, painting, landscaping, carpeting, and HVAC repair are involved in many rehabilitation projects.

- 5-9 more construction jobs will be created with rehabilitation than with new construction.
- 4-7 more new jobs will be created elsewhere in the community with rehabilitation than with new construction.
- Household incomes in the community will increase $107,000 more with rehabilitation than with new construction.
- Retail sales in the community will increase $142,000 as a result of $1,000,000 of rehabilitation expenditure-$34,000 more than with $1,000,000 of new construction.

The end result is this; preservation creates more construction jobs, more service and specialty financial jobs, those jobs pay more on average, and income produced locally is greater.

An additional example comes from the State of Oregon's Main Street program.

The Oregon Mains Street program has worked very hard to promote economic development, physical building improvements, and downtown business revitalization. This includes providing technical support including: design assistance, preservation planning and business planning, and resource assistance, to name a few. Local Main Street organizations can be a tremendous asset to owners of historic properties, and should be contacted to see what resources are available in your area.

| 2011 Total Reinvestment Statistics | |
|---|---|
| Private Dollars Reinvested: | $8,183,193 |
| Public Dollars Reinvested: | $18,661,200 |
| Total Private Rehab Projects: | 216 |
| Net Business Gain: | 151 |
| Net Job Gain: | 435 |

These statistics come from the 2011 Oregon Main Street Annual Report, which can be found at: http://www.oregon.gov/OPRD/HCD/SHPO/docs/2011_Main_Street_Annual_Report.pdf

# CHAPTER 2: Economic Sustainability

**Job Stimulation**

**Jobs, materials and taxes: the local connection**

The Oregon Mains Street program has worked very hard to promote economic development, physical building improvements, and downtown business revitalization. This includes providing technical support which includes: design assistance, preservation planning and business planning, resource assistance, and much more. Local Main Street organizations can be a tremendous asset to owners of historic properties, and should be contacted to see what resources are available in your area.

The Oregon Main Street Annual Report is a valuable source for seeing the economic impact of rehabilitation projects in Oregon. It is also good to see examples of what cities across the state are doing to revitalize their historic districts and buildings

Two examples from the 2011 Oregon Main Street Report highlight the economic achievements of Oregon Main Street cities:

- Albany, Oregon: In 2011, despite issues related to the recession, there were 21 new and re-opened businesses in Albany's downtown. This was, in-part, due to the fact that the downtown area has received a rejuvenated feel from revitalization projects. The increase in businesses equated to 53 additional employees in the district. Also in 2011, $537,194 was privately invested in downtown buildings, with an additional investment from the City of $78,000.

- Oregon City, Oregon: Oregon City has seen drastic changes in its downtown area in recent years, and many of them can be contributed to increased awareness, sensitivity, and creative reuse of historic structures. In 2011, about $1 million was privately invested in façade improvements, and more than 38 new businesses have joined the downtown marketplace in the last two years. Mixed-use creativity, including the introduction of residential housing, has created a vibrant atmosphere with life and business. Lastly, more than $2.5 million in streetscape enhancements, including crosswalks, lighting, and street trees are being planned for the downtown area.

Sources for this section:

Oregon Main Street. "Annual Report." 2011. http://www.oregon.gov/OPRD/HCD/SHPO /docs/2011_Main_Street_Annual_Report.pdf

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

Washington Department of Archaeology and Historic Preservation. "The Economic Benefits of Historic Preservation in Washington State: Summary Report." 2006. http://www.dahp.wa.gov/sites/default/files/EconomicDevStudySummaryReport.pdf

**Small business incubator**

Historic structures have the ability to be important small business incubators. This has been cited by Rypkema multiple times in publications, including:

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

In this he states historic buildings as being a good fit for businesses of all sizes, but particularly smaller businesses. He gives multiple reasons for this, including:

- The vast majority of new jobs created in this country are started by small businesses (those employing fewer than 20 people). Providing opportunities for small businesses to grow will then stimulate jobs nationwide.
- The acquisition price of historic structures is nearly always less than that of land and the construction of a new building. New and small businesses often have trouble raising capital for infrastructure investments related to growing their business, and being able to purchase a building, or space in a building, for less and have it available sooner will save the business money.
- For incubator use, which generally consists of small businesses that have less space intensive needs, the amount of rehabilitation is often moderate (fewer changes need to be made for the business to inhabit the space), making the cost far less than that of new construction.
- Since building operational costs are low, initial occupancy costs are lower than with new construction. This can be critical during the first years that a business is in operation.
- Historic buildings are often more centrally located, making important offices (accountants, bankers, attorneys, post offices, and City buildings) more accessible and lessening the transportation costs. In fact, many historic structures are on transit lines which can lessen transportation costs for employees travelling to work.
- Historic rehabilitation is an excellent use of buildings once thought unusable or unsightly. The rehabilitation and occupation of a historic structure also has a public relations advantage as these changes often spark local news interest.

**Small business incubator**

An example of rehabilitation spurring both economic development and a renewed interest in an unused space comes from the Gerding Theater at the Armory in Portland, Oregon. Built in 1891, the historic Oregon National Guard Armory Annex was rehabilitated in 2006 at a total cost of $28 million for the 56,000 square foot structure. Financing was secured through multiple tax credits (historic, new market, energy, and Oregon's Special Assessment), which made the project feasible. The project received LEED Platinum certification. Underutilized since 1968 as a storage facility, the building now houses the very popular Gerding Theater, and is once again an active part of the local community.

Glisson, Linda, Luke Vanbelleghem and Carl Hoffman. "Incubators: Nurturing Small Business Growth." *Main Street News* 210 (September 2004): 1-10.

This source shows multiple examples nationwide of buildings that have been rehabilitated as small business incubation spaces.

Examples of small business incubator space include:

- Adams-Morgan Affinity Lab: Washington, D.C.

In this example, the second floor of a historic downtown commercial building became available on the market. Interested buyers, owners of the company Articulated Impact, desired to use the space but it was too large for their needs.

*Continued on next page*

**Small business incubator**

*Continued*

- Adams-Morgan Affinity Lab: Washington, D.C.

Instead of finding a new location, they decided to inventively use the space. They chose not to break up the interior and instead put in desks, tables, and a common space and set up a membership program where small businesses could rent a desk, utilize common business resources such as a mailing address, printing and scanning services, internet and phone lines, and private meeting space for professional events. What developed was a creative working environment where people collaborate, discover, and do their everyday business without having to purchase the infrastructure and space required to run a business. This allowed small businesses to grow their business with less than the usual start-up costs, helping many of the start-ups to make it through their crucial formative years. The flexibility and ease of start-up has allowed many small businesses to get their start and eventually move out of the membership to a bigger location (freeing up space for others to do the same).

- Shoals Commercial Culinary Center: Florence, Alabama

Smaller professional firms are not the only small businesses that can benefit from shared work spaces and infrastructural costs. The Shoals Commercial Culinary Center provides the same environment for small culinary businesses that do not necessarily have the funds, or need, for a large commercial kitchen. The historic building that houses the center rents the commercial kitchen space for $20 per hour, and provides each company with free business and marketing advice and support.

This is important for two reasons: many small businesses can't afford to purchase commercial kitchens, and the Food and Drug Administration requires businesses to use commercial kitchens (more specifically licensed kitchens) if they wish to commercially sell their products (making even the nicest home kitchen un-usable for commercial use).

Sources for this section:

Glisson, Linda, Luke Vanbelleghem and Carl Hoffman. "Incubators: Nurturing Small Business Growth." *Main Street News* 210 (September 2004): 1-10.

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

**Professional experience for students**

Historic preservation projects have the ability to reinvent commercial and unused historic spaces. In addition, these projects can integrate the work of architecture, historic preservation, and engineering students who are interested in developing their portfolio with creative adaptive reuse projects and façade re-designs. The incentive for the students is to receive professional experience and build their portfolio. The incentive for the building owner is to receive inventive, professionally researched and presented advice and guidance on how to reuse historic properties and deal with difficult design issues at little or no cost.

The following example received praise and support from the Oregon Main Street Program from Roseburg, Oregon.

In 2010 the Oregon Main Street Program awarded the City of Roseburg with the Outstanding Public Partner Award for Excellence in Downtown Revitalization. This award recognized the value of partnering students with private business owners in Roseburg's downtown area.

**Partners:**

City of Roseburg Community Development Department

Umpqua Community College Engineering Students (Through the RARE program headed by volunteer Virginia Elandt)

Downtown Roseburg commercial building owners

**Existing Conditions:**

The City of Roseburg was dealing with issues related to underutilized upper floor spaces in commercial buildings downtown.

Property owners were unsure how zoning, allowed uses, financing, and building codes applied to their historic buildings. As a result, many were unsure how to use these vacant spaces, which led the historic buildings to generate less value for owners than was possible.

**Professional experience for students**

*Continued*

**Project Details:**

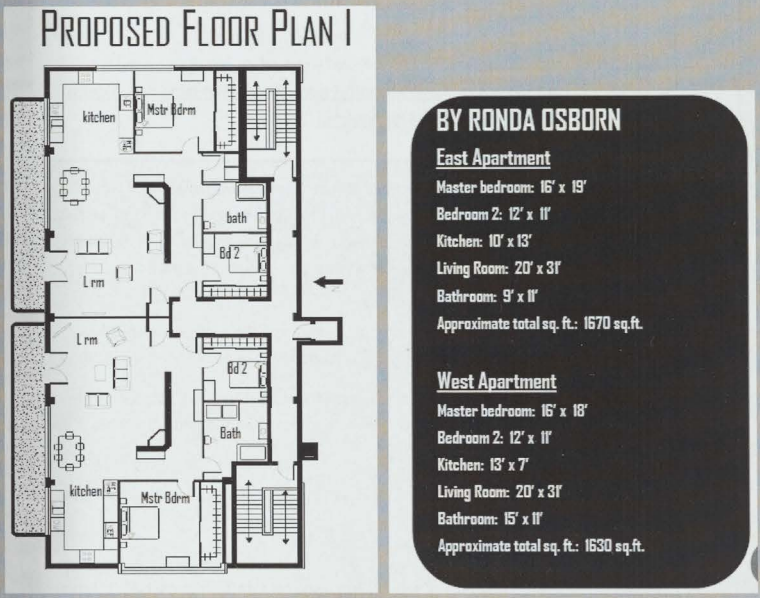
- Students, the City, and property owners developed a partnership to develop reports to the building owners on possible re-uses and design details for their buildings.
- Reports including information on: zoning, legal uses for the space, legal requirements for fire safety, possible layouts for residential housing uses, and details on restrictions on possible projects.
- Building owners were able to take these documents and use portions they found useful for developing plans for the site.
- Students were able to enter the buildings (to take measurements, pictures, and evaluate the space), and fulfill graduation requirements (105 hours of work were required for the 3-credit course). Payment for this course was covered by the City through an economic development fund. At a cost of $125 per student for the 3-credits, the total cost for the project turned out to be $1.19 per hour.

This shows a three-way win: students received valuable experience and credit (while also getting the class paid for), building owners received free advice, and the City received valuable economic restructuring advice that would have ran over $20 per hour through a private contractor.

An example of the work created by the students can be found on the next page.

**Professional experience for students**

*Continued*




Source: Roseburg Community Development Final Report, courtesy of the Oregon Main Street Program

**The example above shows how the building owner would be able to take the work done by the students, and use it to begin planning and rehabilitation work. Getting the drafted plans, and other documentation the students provided, for very low cost makes the possibility of moving forward with the project more financially feasible .**

Sources for this section:

Oregon Main Street. "Annual Report." 2010. http://www.oregon.gov/OPRD/HCD/SHPO/docs/OMS-2010annlRpt.pdf?ga=t

Oregon Main Street. "Roseburg Community Development Final Report." 2010. (Not publically available, requested from the Oregon Main Street Program.)

**Heritage tourism**

The National Trust defines cultural heritage tourism as: *"traveling to experience the places, artifacts and activities that authentically represent the stories and people of the past and present. It includes cultural, historic and natural resources."*

For more information on heritage tourism, including resources available please visit: http://www.preservationnation.org/information-center/economics-of-revitalization/heritage-tourism/

This definition is broad and covers the vast array of heritage tourism options across the country. Visiting battlefields, exploring natural history museums, visiting sites along a historic highway, and witnessing a Native American traditional ritual can all be forms of heritage tourism. Heritage tourism is both a popular recreational activity and a powerful economic stimulus tool.

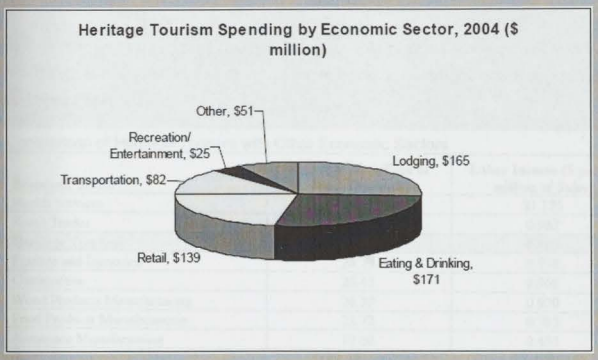
Heritage tourists buy gas, stay in lodging, consume food, pay entrance and day pass fees, and much more. This creates jobs and supports local economies.

An interesting case study comes from Washington State, where heritage tourism has been identified as an important economic sector statewide and quantifiable benefits have been calculated.

Washington Department of Archaeology and Historic Preservation. "The Economic Benefits of Historic Preservation in Washington State: Summary Report." 2006. http://www.dahp.wa.gov/sites/default/files/EconomicDevStudySummaryReport.pdf

The following four graphs can be used to aid in understanding heritage tourisms impact in Washington State. The figures come from the above 2006 report.

**Heritage tourism**




This graph helps demonstrate the variety of economic sectors affected by heritage tourism. Not all of these activities occur in culturally important sites. For example, a family may decide to visit a museum in a neighboring city. On their way they stop to get gas, when there, they may buy a souvenir from a local craft stand, and on their way back they may stop to get dinner at a local restaurant. All of those expenditures have a multiplying effect that creates a substantial amount of jobs.

Heritage Tourism Spending and Economic Impacts

| County/State | Annual Spending ($million) | Output (Sales) ($million) | Employment (Jobs) | Income ($million) | Taxes ($million)1/ |
|---|---|---|---|---|---|
| King | 306.9 | 513.84 | 8,472 | 209.52 | 27.6 |
| Pierce | 39.3 | 67.00 | 1,106 | 26.78 | 3.7 |
| Spokane | 37.6 | 62.43 | 1,055 | 25.55 | 3.5 |
| **Washington** | **632.6** | **1,287.71** | **20,025** | **510.17** | **66.5** |

Note:
1/These estimates do not include revenues generated by local sales taxes, which range from 0.5 percent to 1.7 percent of the state base rate of 6.5 percent and vary by jurisdiction.

The average annual spending refers to how much the state spends to maintain historic sites in each county (including historic buildings and sites within national parks). That money triggers the output in sales (which is more in each county than the amount going in). Those sales lead to jobs for people who have a sizable cumulative income, and then pay taxes.

### Heritage tourism

This cycle shows that heritage tourism has been able to bring more money into Washington State than has been put in, and that the financial results from job creation and taxes make the final impact even greater.

Comparison of Heritage Tourism with Other Economic Sectors

| Economic Sector | Jobs (per $1 million of Final Demand) | Labor Income ($ per $1 million of Sales) |
|---|---|---|
| Health Services | 36.31 | $1.185 |
| Retail Trades | 33.87 | 0.962 |
| **Heritage Tourism** | **31.66** | **0.807** |
| Finance and Insurance | 26.73 | 0.978 |
| Construction | 26.45 | 0.908 |
| Wood Products Manufacturing | 26.39 | 0.920 |
| Food Products Manufacturing | 21.72 | 0.705 |
| Aerospace Manufacturing | 10.60 | 0.452 |

Heritage tourism, much like rehabilitation work, stands well when compared to job creation and income from other major employment sectors in the state. The wide variety of jobs, including service, craft, educational, hospitality, and historic resource upkeep help protect the job segment from changes in the economy that would affect other industries. For example, aerospace manufacturing (though a major part of Washington's economy) is drastically affected by differences in current trends.

Heritage tourism is more sustainable because sites grow more significant and valuable with age. Visiting Mt. Rushmore will never go out of style, and the allure of lighthouses and bed and breakfasts is likely to survive into future generations. Creating an authentic, truthful, and environmentally responsible heritage tourism program that truly integrates tourism with cultural understanding is a healthy way to promote economic stimulation.

Heritage tourism can cause harm if implemented incorrectly. Tourists can put a large strain on local infrastructure, and historic sites that are not well protected can be overrun by visitors and damaged if safeguards are not in place.

An example of this is found on the following page

**Heritage tourism**

A very good example of this is St. Augustine, Florida. With a population of 12,000 residents, the City realized master planning needed to be in place to deal with the over 6 million visitors that the 'Nation's Oldest City' sees every year. Frustrations occurred when local residents felt sites were not being cared for accurately and tourists were trying to get into places where they simply didn't belong. In addition, infrastructure issues related to exceeding more cars on the road than was originally planned caused more frustration. To combat this, the National Trust conducted an assessment and provided recommendations for dealing with the massive amount of visitors. The report "Heritage Tourism Assessment & Recommendations for St. Augustine, Florida" outlined five guiding principles to aid in dealing with these issues:

1) Collaborate

-Make sure all stakeholders are brought into the conversation. This includes business owners, museum curators, home owners, and more. This ensures that all angles are inspected and appreciated.

2) Find the fit between a community and tourism

-Tourism, though clearly a staple in the community's income, is not the only function present in the small town, and everyone deserves to feel comfortable and heard,

3) Make sites and programs come alive

-Utilizing new ways to communicate the City's history will allow for new jobs, and will allow for an increased respect and appreciation for the history being shared.

4) Focus on quality and authenticity

-Tourism that does not present a truthful, respectful image of the past will not do the City justice, or the history of its inhabitants.

5) Preserve and protect resources

-Sites that are visited need to be respected, maintained, and preserved in order for tourism to be sustainable in any City or municipality. This allows for long-term use, and protects sites from loosing information, integrity and respect.

For more information on the St. Augustine situation, and how the National Trust is trying to help, please see the 2003 report at: http://www.preservationnation.org/information-center/economics-of-revitalization/heritage-tourism/additional-resources/ht_staugustine.pdf

Sources for this section:

National Trust. "Heritage Tourism Assessment and Recommendations for St. Augustine, Florida." 2003. http://www.preservationnation.org/information-center/economics-of-revitalization/heritage-tourism/additional-resources/ht_staugustine.pdf

Washington Department of Archaeology and Historic Preservation. "The Economic Benefits of Historic Preservation in Washington State: Summary Report." 2006.

**Economic Sustainability: Case Study**

The State of Virginia

Virginia is known for its important architectural remnants from America's youth. What it is perhaps less known for is the strong economic structure behind the state's management of historic sites. Virginia, like many other states in America, has realized the economic potential of restoring and reusing its historic structures. This has provided for job stimulation (which leads to tax revenue), heritage tourism, and increases in property values. Virginia has been very involved with the National Main Street program, which is designed to promote economic development in historic commercial areas (more information on the Main Street program can be found on page iii).

Virginia is made up of many small towns, and many of those small towns were at risk of abandonment and decay once the 'big-box' chain store boom began to rise across the nation. This happened in many states on the east coast as 'small town' America began to dwindle and cities became denser. In reaction to this, the state was able to stimulate growth, promote new businesses in small towns, and promote tourism through the calculated restoration and revitalization of historic structures. The facts from this case study are taken from a report showing the progress that the Main Street program was able to make in Virginia in only ten years.

Below is a summation of some of the lasting, substantial effects that preservation has had in the state.

The information from this section came from an study made in 1996 by Donovan D. Rypkema for the Preservation Alliance of Virginia titled "Virginia's Economy and Historic Preservation: The Impact of Preservation on Jobs, Business, and Community".

Rypkema, Donovan. "Virginia's Economy and Historic Preservation: The Impact of Preservation on Jobs, Business, and Community". National Trust for Historic Preservation: 1996.

**Economic Sustainability: Case Study**

The State of Virginia

- From 1985-1995 twenty Virginia Main Street communities with populations under 50,000 saw over $54 million of private funds invested in the rehabilitation of over 1600 properties.

  This means more new businesses and jobs.

- From 1980-1995 $350 million was invested in the rehabilitation of 900 income-producing properties across the state through the federal Historic Rehabilitation Tax Credit. This also created 12,697 jobs and increased household incomes to nearly $275 million.

  This means that they earn good wages.

- Historic preservation visitors (heritage tourists) stay longer on visits, visit twice as many places, and spend on average two-and-a-half times more money than do other visitors. One key tourist attraction- Colonial Williamsburg- averages over half a billion in revenue every year.

  Visitors interested in Virginia's history help sustain its future by adding money into the local economy.

- Property values of historic buildings and sites in a wide variety of communities out-perform the appreciation rates of non-historic properties.

*The benefits of owning historic properties are realized by Virginians of every economic status.*

| Main Street Investment | |
|---|---|
| $54,635,888 | Private dollars invested 1985-1994 |
| Ten Years of Progress (since the Main Street program was implemented in Bedford, VA) | |
| 52 | Net New Businesses |
| 116 | Net New Jobs |
| 234 | Building Rehabilitations |
| $3,405,531 | Private Investment in Bedford |

**Economic Sustainability: Case Study**

The State of Virginia

The job creation stimulated by preservation projects (shown in the graph on the previous page) affects all areas of the construction trade and involves many local professionals. In addition, many other jobs are created that relate to the rehabilitation (shown below). These include new service jobs that come from new businesses opening up, new jobs related to the ongoing management of historic sites, and many other jobs throughout the state.

| Rehabilitation of 900 Historic Virginia Buildings: | |
|---|---|
| 6,647 | Jobs in Construction Trades |
| 6,050 | Jobs Elsewhere |
| 12,697 | Total Jobs |
| $1,000,000 Spent Means... | |
| 15.6 | Construction Jobs |
| 14.2 | Jobs Elsewhere |
| $779,800 | Household Earnings |
| 3.4 | More jobs created per $1,000,000 invested than in new construction |

The results seen in Virginia are an example of the dramatic impact preservation development can have on an area. More money stays local, more people are visiting the area, more jobs are made which earn more money, and historic properties have greater value.

Source for this section:

Rypkema, Donovan. "Virginia's Economy and Historic Preservation: The Impact of Preservation on Jobs, Business, and Community". National Trust for Historic Preservation: 1996.

**Community pride and sense of place**

Historic resources have the potential to be a source of pride for a community by highlighting the history, commerce, culture, politics, and other areas of the community's identity.

Pride has the ability to instill a sense of ownership, which leads citizens in a community to feel a personal investment in buildings and spaces that they feel are *theirs.*

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

Donovan Rypkema is a strong supporter of the value preservation can have on community pride and makes many statements in his book "The Economics of Historic Preservation" including the following:

**Historic preservation creates a bond between a community and its citizens.** When citizens show a concerted effort to save a particular place or building, that space becomes more valuable. People are more likely to care about the community in which they live if they personally connect with spaces and try to maintain them.

A very good example of this comes from the "This Place Matters" campaign headed by the National Trust. Each year communities across the country submit photographs of sites and structures that are important to them and submit them to the National Trust. Photos may be as simple as a single individual holding a piece of paper that says 'This Place Matters' or a sizable group of supporters standing under a large sign. These photos are shared on the National Trust's website, and all communities are encouraged to show their support for what matters to *them.*

How it works:

- Photos are uploaded to the National Trusts website
- The wining site is chosen on a live Facebook poll by citizens across the country
- The wining site receives $10,000 to be used for rehabilitation and preservation work

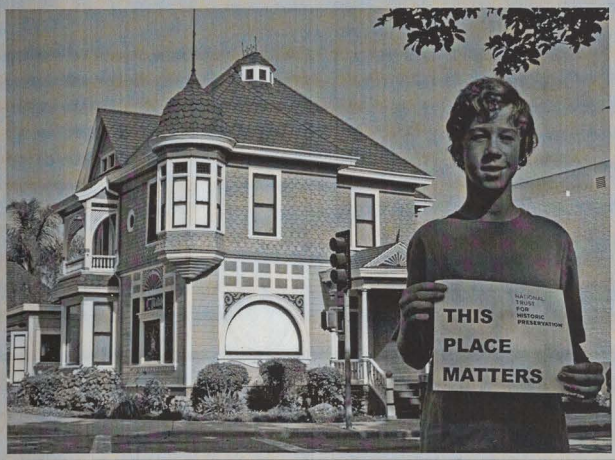
**For more information on submitting to the competition, or viewing past submissions and winners, please visit:** http://www.preservationnation.org/take-action/this-place-matters/?gclid=CLWF2-Stl68CFQ4zhwodGn_Z9w

**Community pride and sense of place**

Examples of "This Place Matters" photo contestants:


Some entries utilize entire communities and organizational support.

Source: http://pauldorpat.com/seattle-now-and-then/this-place-matters/




Some entries are more restrained and personal.

Source: http://www.santaanahistory.com/

Not only can this opportunity bring possible financial help, the act of bringing local communities together to support the site can also have a lasting impression. Gaining and maintaining lasting support for historic sites will ensure their survival and continued use.

**Community pride and sense of place**

The University of Kentucky, as part of their initiative to promote community health and development in the State, promotes historic preservation as a means of maintaining community pride and health saying:

> "As suburban sprawl and roadside development make more and more places look the same, it becomes important for communities to keep their identities intact. Even one or two striking historic buildings can help to define a community and hint at its past. If whole neighborhoods or rural areas can be preserved, the effect is that much greater. The sense of history can contribute to community pride, and to a better understanding of the community's present."

Source: http://ctb.ku.edu/en/tablecontents/MainSection26.7.aspx

This statement hints at two important facts:

- Historic preservation can be a source of community pride, encouraging more citizens to live in and protect the places that matter to them.
- Historic preservation can emphasize 'sense of place' which helps people feel a part of their community and their community's history.

***'Sense of place'*** has been cited repeatedly as a result of preservation efforts and efforts to restore community identity. 'Sense of place' has no single definition, but it refers to the idea that people connect with the physical space, features, and buildings around them and that connection anchors them to where they are.

Jackson, John. *A Sense of Place, a Sense of Time.* Yale University Press: New Haven,1994.

In his book "A Sense of Place, a Sense of Time", John Jackson writes:

"Most of us, I suspect, without giving much thought to the matter, would say that a sense of place, a sense of being at home in a town or city, grows as we become accustomed to it and learn to know its peculiarities ."

He then goes on to discuss the link between sense of place and downtown revitalization say-

Pedestrian malls and pedestrian oriented development differ in that pedestrian malls cut off all vehicle traffic. This has been found to be a poor choice for many cities, and may not be successful in all areas.

**Community pride and sense of place**

*Continued*

"Americans... wish that we could somehow give our downtown areas a sense of place. Much has been accomplished, in fact, in America in the way of injecting life and design into the decaying central city: the streets have sometimes been turned into pedestrian walks with brick pavements and fountains, adorned with planters and brilliant flowerbeds."

The above quotes lead to two important facts:

- The 'sense of being' that Jackson describes grows stronger when citizens learn the 'peculiarities' of an area. The unique characteristics of cities are what drive citizens to care about specific buildings, events, people, and sites. One will feel more at home, and more connected to an area once they know more about its history and character defining buildings. For example, when visiting a new location for the first time everything you see you are seeing for the first time, and many details may not get absorbed. Upon returning for another trip you notice more about the area, and are able to remember certain sites. The visual impact these sites had on your memory triggers emotions, which can lead to a feeling of belonging and comfort.
- Downtown environments have the ability to be a catalyst for community interaction, commerce, and recreation. The more people are physically present in a space, actually walking the streets and looking at buildings, the greater their sense of place will be. In addition, the pedestrian approach in downtowns that many find so alluring can also make downtown areas more sustainable, as more people are walking and taking in the sites, and fewer people are bypassing the area in vehicles.

Feeling as though you belong in a space and have a stake in it will encourage you to protect it. Citizens who feel that they have a sense of place will also be more likely to partake in local activities and causes.

Community pride and sense of place are perhaps the most difficult qualities of historic preservation to financial account for or numerically evaluate. This does not mean that there is no value in these qualities, but in fact points to the need for additional research in this area of study to determine the effects of place making and pride building on local economies.

Sources for this section:

Jackson, John. *A Sense of Place, a Sense of Time.* Yale University Press: New Haven, 1994.

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Prese vation, 1994.

**Redeveloped properties into low-income spaces**

Perhaps the easiest socially minded sustainability effort to quantify economically when discussing historic preservation is its ability to create low-income housing.

Low-Income Housing:
Donovan Rypkema again has much to say in his book "The Economics of Historic Preservation" in regards to the availability of housing:

***Historic residential neighborhoods accommodate a mix of household incomes:*** the varying sizes of housing units, unit configurations, and proximity to schools, parks and public transportation allows for a wide array of housing prices in convenient locations. Being close to jobs, basic needs, and social centers allows for people of all backgrounds and income brackets to find a niche in the mixture of housing available in historic commercial and residential areas. In a new housing development, which generally creates many units of a similar size and price range, the immediate need to recapture the investment made in the new structure disallows for a variety of pricing options.

***Vacant housing reduces property values and historic preservation reduces vacancy:*** this combination of facts shows two possible outcomes. One, a neighborhood or commercial area sees an increase in vacancy. That vacancy leads to reduced property values. As a result, properties in the vicinity become vacant and care is not taken to restore them. This has the possibility of creating blight and large scale demolition or neglect. In the second outcome, a building is left vacant for what could be any multitude of reasons. That building is purchased, and turned into low-income housing. The building owner is able to recapture their investment through a combination of tax incentives, reduced construction costs from reusing the historic structure, and through the increased value that can now be placed on the structure.

***Replacing housing units is far more expensive than preserving them:*** when buildings are reused, there is less of a burden on building owners to raise rates than if a building is razed to build a brand new structure. According to a study by the Department of the Army (described on page 72 of Rypkema's book) the cost of replacing historic housing was 10-times more than the original investment and the cost to rehabilitate existing units to meet current use and energy conservation standards would be one-quarter to one-third of the replacement cost. Thus, in times of limited financial, energy, and material resources, financial investment into existing housing is cheaper and more efficient.

Source for this section:

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

**Incentives for Low-Income Housing:**

There are financial incentives available in most areas that relate to the promotion of low-income housing. Through a Federally subsidized program the tax credits described below are distributed with the discretion of individual states and individual states will have different requirements and qualifications. Contact your local housing authority for more information on yours state's Low-Income Tax Credit program.

**Federal Level:**

Low-Income Housing Tax Credits (LIHTC): Administered by the U.S. Department of Housing and Urban Development (HUD), LIHTC are an indirect Federal subsidy that can be used to finance the development of affordable rental housing for low-income households.

These were discussed briefly before, but this section is meant to elaborate specifically on how they can be used to promote social equity.

How it Works:

- Enacted by Congress in 1986 to provide the private market with an incentive to invest in affordable rental housing.
- Awarded to developers of qualified projects. Developers then sell the credits to investors to raise capital for projects, which in turn reduces the debt developers would have to borrow. The public benefits through reduced rents. This allows non-profit organizations to use this resource, as many don't have a need or use for tax credits.
- The tax credit is a dollar-for-dollar tax credit towards Federal income tax liability for 10 years. Credit totals depend on investment total. Tax credits can have a much greater impact than tax deductions.
- The IRS allocates tax credits to designated state agencies (usually state housing finance agencies) that award credits to developers through a competitive application process. The goal for the state agency is to serve the lowest income families and promote projects that are structured to remain affordable for the longest period of time. In addition, 10% of the credits are immediately set aside for projects owned by non-profit organizations.
- Credits are based on the total development costs and the number of qualified low-income units being made available (every unit in the building does not need to qualify to receive some credits).

**Incentives for Low-Income Housing:**

**Eligibility:**

- Only for residential rental properties.
- The Developer must elect one of the two following thresholds:

  -20-50 Rule: At least 20% of the units must be rent restricted and occupied by house holds with incomes at or below 50% of the HUD-determined area median income.

  -40-60 Rule: At least 40% of the units must be rent restricted and occupied by house holds with incomes at or below 60% of the HUD-determined area median income.
- Rents, including utility charges, must be restricted in low-income units.
- Restrictions must be in place for at least 30 years.

Some states require a greater number of low-income units or a longer period of time for rate restriction. Make sure to check with your local housing authority to understand the individual terms in your area.

For more information on Low-Income Housing Tax Credits or to submit an application please visit: http://www.hud.gov/offices/cpd/affordablehousing/training/web/lihtc/basics/

Additional incentives for low-income housing vary by state and should be investigated as well as an opportunity to make rehabilitation projects more affordable.

KEY FACT: On many occasions, building owners combine multiple types of tax credits (LIHTC, Historic Tax Credits (HTC), and Energy Tax Credits to name a few). When this happens, the value that the tax credits bring to the project increases and the project becomes more feasible.

The except on the following page from the National Trust Community Investment Corporation illustrates this:

**Incentives for Low-Income Housing:**

*Continued*

> "When a transaction twins the federal LIHTC and the federal Historic Tax Credit (HTC), the federal HTC is recognized all at once when the property is placed in service, providing a stronger investment return up front to enhance the 10-year stream of LIHTCs. The acquisition and rehabilitation of a historic property into tax credit eligible low-income housing has become a popular option for developers. These buildings are often located at urban cores and are accessible to retail, transit and other services. Many times these properties have been abandoned or blighted, and there is local support for rehabilitation."

Source: http://ntcicfunds.com/tax-credit-basics/lihtc-basics/

The following examples show how affordable housing can be used in existing properties to remain viable, useful, and economically sustainable. This is because housing is both a viable use of historic buildings and because tax credits help make housing in historic buildings more financially feasible. The first utilized LIHTC, HTCs, New Market Tax Credits (available in some areas), and Renewable Energy Tax Credits in Thomaston, Maine and the second used local housing tax credits in New Bedford, Massachusetts.

The Knox Hotel, Thomaston, Maine:

Rehabilitated in 2009, the historic Knox Hotel needed an immense amount of work to continue serving low-income seniors. The hotel was transformed into housing units in 1978, but the structure had been neglected from that point on and serious repairs were necessary. Not only did the LIHTC make the project more feasible, they ensured the housing units would remain for low-income use. This is a perfect example of combining tax credits and incentives to maximize the feasibility of a rehabilitation project.

**Incentives for Low-Income Housing:**

The Knox Hotel, Thomaston, Maine:

**Financing Details:**

- LIHTC allocated competitively through the Maine State Housing Authority
- 20% Historic Tax Credit
- 25% Maine Substantial Rehabilitation Credit
- Northern New England Housing Investment Fund (a private, non-profit corporation) syndicated the credits and brought in TD Bank to purchase them to provide funding for the project
- Total project costs were about $5 million, and all the tax credits collectively generated 45 cents for every dollar of qualifying expense

For more information on the Knox Hotel rehabilitation project please visit: http://www.heritage-consulting.com/heritage-docs/news-events/Unique%20 Opportunities%20and%20Small%20LIHTC%20Deals%20-%20Novogradac.pdf

24 Allen Street, New Bedford, Massachusetts:

The 1880s, Second Empire style historic building has been sitting vacant for over two decades. Thanks to efforts being made by the Waterfront Historic Area LeaguE (WHALE), the building began rehabilitation in April of 2012. Originally built as a boarding house, the historic building was in danger of demolition. WHALE hopes to revitalize the area and bring life back to the busy intersection at which the house currently stands.

The project is a partnership between WHALE, the City of New Bedford, and the Community Action for Better Housing (CABH)- a local non-profit. The end result of the project will be a mixed-use space (with commercial space on the first floor) that creates 12 quality, affordable residential units.

**Incentives for Low-Income Housing:**

24 Allen Street, New Bedford, Massachusetts:

**Financing Details:**

Financing Details:

- WHALE provided free consultation by writing a National Register Nomination for the property, providing technical advice, and writing the rehabilitation tax credit application. These services would have added to the cost of the project. It is always advised to consult local non-profit preservation groups, your local SHPO, and local universities to see if help with technical support is available at little or no cost. The University of Oregon in Eugene, Oregon, is often contacted for technical support for writing National Register Nominations is solicited by individuals who are concerned about a property, and need informed research help.
- $450,000 was awarded in state historic tax credits
- $1.6 million was awarded in state funding through the Department of Housing and Community Development (DHCD)
- $175,000 was awarded in City HOME funds through the New Bedford Office of Housing and Community Development (OHCD)
- $925,000 was obtained from the Citizens-Union Savings bank for construction and loan financing

http://www.waterfrontleague.org/2011/11/abandoned-historic-allen-street-building-saved/

Both of these examples help to show that tax credits and other incentives can be combined to provide for much-needed low-income housing across the U.S. Not only do these projects benefit the community, they create jobs, keep buildings from being torn down and placed in landfills, and help foster community pride through the redevelopment of import local buildings.

**Inventive Community Spaces:**

It is inevitable that some historic buildings will not be economically sustainable if they maintain their current use. This is the primary reason why adaptive reuse projects are key for maintaining the life of historic buildings. One possible use change is into an inventive community space. Some building types are particularly adept for this change. For example: a theater that once showed movies, but alas does not have the 12 screens needed in many large towns to maintain economic benefit, can become a community performance or meeting space. In addition, it could be used by local non-profits and small businesses to hold large meetings and by school groups for award ceremonies and graduations.

Pasadena, California:

The Pasadena Armory Center for the Arts is a great example of an inventive reuse of a historic building. Armory buildings, which both of these examples are, tend to have great potential for re-use. This is true for at least two reasons: they are often large buildings in prominent downtown locations, and they were very solidly built with- already invested- federal funds and tend to have high integrity and are still in good condition.

The Armory Building became the home of the Pasadena Arts Workshop in 1989 and changed its name to the Armory Center for the Arts. They were able to use the space (with its variety of small and big rooms and unique floor plan) because the organization felt that it would be a good fit for studio spaces, workshops, galleries, and exhibitions. The key was that the original layout of the building was able to fit the needs of the organization, so they did not have to build an entirely new building.

Today, the center has a wide variety of classes and meaningful experiences in art education. It is committed to providing accessible public spaces for the exhibition of contemporary art. In addition, the center is a non-profit, community-based organization that depends on members, sponsors, and volunteers. Keeping initial building purchase costs down by using the existing structure is a good use of limited funding.

The organization was able to reuse the space in a creative way that fosters community pride and promotes community involvement. Over 100,000 people have engaged in Armory programs and exhibitions, and classes are available for all ages and skill levels in a wide variety of mediums.

For more information on the Armory please visit: http://www.armoryarts.org/

**Inventive Community Spaces:**

There are many examples of buildings intended for one use being ideal for another. This is common with large government buildings that no longer serve their intended purpose. These can be ideal for small business incubation, community activities and workshops, and large and small events. The Lane County Historical Society in Eugene, Oregon has been working to transition into the Eugene Post Office in Eugene, Oregon. Located in the heart of downtown Eugene, the post office was an asset the Postal Service needed to liquidate. The Historical Society saw this as an opportunity to use the prominent public spaces and sorting rooms for display area, and the smaller offices for administration, workshops, and research. Not only did the layout work well for this reuse, most of the original historic detailing on the interior will be retained as part of the exhibit and museum environment.

Cottage Grove, Oregon:

Another great example a historic building that was unable to continue to function in its current use is the Oregon National Guard Armory Building in Cottage Grove, Oregon.

The 1931 Armory building was in use by the National Guard for most of its life, but recently became available for sale. The City of Cottage Grove saw this as an opportunity to re-use the historic (now National Register listed) building for a multitude of public uses. The City chose the site because of the intrinsic value of re-using an existing building and its surrounding infrastructure as well as for its aesthetic and historic importance. In addition, since the City helped fund the project during construction, they were given a deal on the purchase price. The City determined that a rehabilitation project, which will include restoring the original wood windows and doing repairs to the historic stucco and concrete, is more financial feasible than starting with a new building from scratch. In addition, the building holds a prominent spot in the center of the Cottage Grove Historic District. During a site visit, with a Cottage Grove City Official, many uses were described that will be introduced into the space to create an inventive, community based environment. In addition, the reuse of such a prominent community building is likely to instill additional community pride and interest in rehabilitation work.

*Continued on next page*

**Inventive Community Spaces:**

Cottage Grove, Oregon:

*Continued*

Planned Changes:

- Restore historic wood windows and stucco and masonry elements.
- Restore the kitchen for use as a small business incubator space. This means that a commercial kitchen in the building will be available to owners of small businesses who cannot afford, or don't have need for a company commercial kitchen (i.e. kitchen use is not needed on a daily basis or the purchasing of one would be too expensive). This, in turn, promotes the local economy and maximizes the usefulness of the space to reach a large number of people.
- Restoration of officers rooms for public meeting spaces, for small business incubation.
- Restoration of larger rooms for community events, activities, award ceremonies, etc.

This combination of uses will guarantee that the space meets the needs of community members, small businesses, youth, and senior citizens. The City saw an opportunity to use the structure, and now it will return it to a fully functioning facility which had receded since its heyday.

**Preservation non-profits**

There are many historic preservation non-profit groups across the country doing work to help save, reuse, restore, and promote the use of historic buildings. They come in many forms (some have a government structure while others are private or membership based), and serve many functions. Below is a list of non-profit groups that may be available in your area. Some of these are area specific, but a quick internet search may find a very similar group is working or volunteering in your area. Resources are divided into statewide for the State of Oregon and Nationwide.

**Statewide:**

***Architectural Heritage Center/ Bosco-Milligan Foundation, Portland, Oregon***

A local partner of the National Trust, the Bosco-Milligan Foundation was the dream of Jerry Bosco and Ben Milligan who were saddened by the destruction of historic buildings in Oregon and had a desire to save as much as they could. They recognized the value of preserving community vitality and identity, and created what is now one of Oregon's most active non-profit historic preservation organizations. Jerry and Ben collected salvaged parts from buildings that they saw being torn down all over the state from the 1950s to the 1980s. Started in 1987, the foundation was committed to using the massive holding of materials and parts that had been collected for educational and training programs, while also being committed to the greater vision of protecting Oregon's history.

The Architectural Center, opened in 2005, provided for a place where the public can interact in a variety of activities:

- Lectures on Oregon's history, specific buildings or architects, specific styles, etc.
- Workshops with titles like 'The Basics of Restoring Historic Wood Windows', which are provided at very little cost (the non-profit relies on admission prices and other private funding for support), and can be used by owners of historic buildings as a local tool for rehabilitation.
- A library and the vast collections can be used for historical research and for helping in a studied approach to the restoration of historic buildings.

The organization truly desires to celebrate, understand, and educate others about Oregon's unique history and important architectural past. They can be used as a tool for rehabilitation work, and as a research tool for investigating a building's physical history.

For more information on the organization please visit: http://www.visitahc.org/

**Preservation non-profits**

**Statewide:**

***Historic Preservation League of Oregon (HPLO), Portland, Oregon***

The HPLO's mission is to preserve, reuse, and pass forward Oregon's historic resources to ensure livable, sustainable communities.

Their goals include:

- Preserve and pass forward endangered historic sites, properties and districts.
- Ensure sufficient economic incentives for historic preservation.
- Ensure appropriate land use policies, development guidelines and preservation standards to address the full spectrum of preservation opportunities.
- Educate and increase awareness of the value of preservation and its essential role in sustainability.
- Advocate at the state and local government level, participate in policy-making.
- Provide effective tools for preservation in the form of conservation easements and actionable information.
- Maintain a consistent presence in the community.
- Include and constructively engage various perspectives from preservation, cultural, development, government, and other sectors.
- Provide services statewide by creating a league of partner organizations across Oregon.

The HPLO is a valuable resource for building advocacy, economic incentives, and for fostering and building community pride through education, roundtables, and workshops.

Some of their recent efforts include:

- Roundtable events that discuss important issues or developments in Oregon related to historic preservation
- Advocacy projects including Oregon's 'Most Endangered' list
- Being the holder of conservation easements (described on page 79) which allow for economic incentives for owners of historic structures
- Historic building tours used to educate community members on their local history and the importance of preservation.

For more information on this organization please visit:
http:/ /www.historicpreservationleague.org/

**Preservation non-profits**

**Statewide:**

***Portland Development Commission (PDC), Portland, Oregon***

The mission of the PDC is to create one of the world's most desirable and equitable cities by investing in job creation, innovation, and economic opportunity throughout Portland. The PDC was created by Portland voters in 1958 and has since been devoted to making Portland a functioning, livable city.

The organization plans its efforts around five goals:

- **Strong economic growth and competitiveness** Through prioritizing investments, nurturing innovation, developing predictable and dependable funding, and by creating a variety of partnerships.
- **Healthy neighborhoods** PDC supports a community-driven approach that successfully positions local businesses, neighborhoods, and residents to connect and compete in the regional economy. This means providing support for local businesses to aid in their survival as they move into larger or more diverse markets.
- **Social equity** The PDC promotes equal access to living wage jobs, especially to historically disadvantaged Portlanders (i.e., communities of color and people in priority neighborhoods).
- **A vibrant central city** This includes working with the five urban renewal areas that are on either side of the Willamette to support economic stimulation and job creation.
- **Effective stewardship over its resources and operations, and employee investment** This refers to how the organization is run, and effectively using resources and funds.

There are many opportunities within the Commission to find help on a variety of issues:

- Grant funding and loan options

For information on PDC grants, loans, and additional incentives, see Appendix B: Financial Incentives in Portland.

- Small business support (training on business management, help in developing a business plan, etc.)
- Business support and urban renewal support for new and existing businesses (this tends to be where historic preservation comes in as buildings in the Portland area that are within Urban Renewal Districts may qualify for financial support from the PDC).

**Preservation non-profits**

**Statewide:**

***Portland Development Commission (PDC), Portland, Oregon***

- The PDC has been involved with numerous renovation projects, and aided in the development of many important public spaces and resources in Portland including Pioneer Place and the light rail expansion to the airport. All if the projects that are involved in affect Portlanders and are meant to stimulate growth while promoting community development and pride.
- The PDC also houses the Portland Main Street Program, a valuable resource in Portland.

For more information on this organization please visit: http://www.pdc.us/welcome.aspx

***State Historic Preservation Office (SHPO), Salem, Oregon***

The Oregon SHPO, along with SHPOs in all other states, are extremely valuable sources of information and technical support related to all areas of rehabilitation, National Register documentation and evaluation, and many other grant and support programs.

The SHPO can be contacted for situations such as:

- National Register nomination guidance, research tools and support.
- Information on the Oregon Special Assessment taxation program and other tax credits.
- Information on statewide grant opportunities, including the Preserving Oregon Grant.
- Information on the Main Street program (described on page iii), and the Certified Local Government Program (which has the ability for additional funding and support).

The SHPO is also an important resource when conducting rehabilitation work on historic structures listed on the National Register, and should be consulted to ensure the project will not diminish the integrity of the building, which can cause de-listing and loss of grants, tax incentives, etc.

For more information on the Oregon SHPO please visit: http://www.oregon.gov/OPRD/HCD/SHPO/

**Preservation non-profits**

**Nationwide:**

***Advisory Council on Historic Preservation (ACHP)-***

The ACHP is an independent Federal agency whose goal is to promote the preservation, enhancement, and sustainable use of our nation's diverse historic resources, and advise the President and the Congress on national historic preservation policy. This means that the ACHP is an important connection between preservation advocacy and congressional matters related to preservation funding, support, and nationwide acknowledgment.

The ACHP has three program areas:

- **Preservation Initiatives** focuses on partnerships and program initiatives such as heritage tourism to promote preservation with groups such as state and local governments, Indian tribes, and the private sector.
- **Communications, Education, and Outreach** conveys ACHP's vision and message to constituents and the general public through public information and education programs and a public recognition program for historic preservation achievement.
- **Federal Agency Programs** administers the National Historic Preservation Act's Section 106 review process and works with federal agencies to help improve how they consider historic preservation values in their programs.

These initiatives are very broad because they are meant to meet the needs of individual groups nationwide who are dealing with a wide variety of preservation-related issues. The ACHP is a source for technical assistance and for assistance with saving significant resources.

For more information on the ACHP please visit: http://www.achp.gov/index.html

***National Trust for Historic Preservation (NTHP)***

The National Trust is one of the oldest preservation focused non-profits in the U.S., founded in 1947, and works nationwide to provide technical support, research tools, protection for threatened properties, and to support economic incentives.

The privately funded non-profit's goal is to provide leadership, education, advocacy, and resources to save America's diverse historic places and revitalize communities. The NTHP often partners with local non-profits for regional projects, but also administers many projects from the national level.

**Preservation non-profits**

**Nationwide:**

***National Trust for Historic Preservation (NTHP)***

**Some initiatives promoted by the National Trust include:**

- The "This Place Matters" campaign, (discussed on page 105) which promotes community pride and revitalization.
- The Most Endangered List.
- Tax incentives, and grant opportunities.
- Promoting historic sites and heritage tourism (discussed on page 98) as a form of economic sustainability.

For more information on the National Trust please visit: http://www.preservationnation.org/

**National Park Service Technical Briefs**

The Technical Preservation Briefs, a very important series of documents are put out by the National Park Service on important issues related to historic building maintenance, repair, cleaning, and more are also a valuable, free, online resource. These briefs are key tool for owners of historic buildings who are looking for guidance on specific preservation projects.

A complete list of the NPS Preservation Briefs can be found at: http://www.nps.gov/tps/how-to-preserve/briefs.htm

# CHAPTER 4: Case Study: Main Street Program in Iowa

### Iowa Department of Economic Development's Green Streets Initiative

Sustainability and historic preservation have the mutually beneficial goal of saving dwindling resources and protecting existing buildings. This is demonstrated throughout this guide and is the primary theme and reason for the creation of this publication.

The goal of this section is to better understand how projects are being developed and implemented, and to learn from the data they are able to provide. The focus of this section is on the State of Iowa, specifically the Main Street communities of Woodbine and West Union. More information on the Main Street program can be found on page iii.

All of the information used in this section comes from the sources listed at the end.

**Green Streets in Iowa**

In 2008, the Main Street communities of Woodbine and West Union were chosen by the Iowa Department of Economic Development (IDED) as pilots for its Green Streets Initiative.

Both cities were chosen for their ability to experiment with energy efficiency improvement measures involving historic commercial buildings. The cities were meant to become models of sustainable practices as part of an integrated district wide Main Street revitalization. This model, it is hoped, will be used by others in Iowa, and across the country.

The project was a partnership between the city, Woodbine and West Union Main Street programs, the Iowa Main Street program, utilities, consultants, and contractors and involved the use of many financial incentives.

**Woodbine, Iowa**

- Population: 1,564 (similar in size to many Iowa towns, making it a good fit for the pilot project)
- Buildings: 49 downtown businesses were invited into the project, 45 of which elected to receive free energy audits
- Funding:

*Energy audits*: Woodbine Main Street program and the City of Woodbine. Audits were provided by Cenergy- an independent, nationally certified building energy-use rating firm.

*Building improvements:* Iowa Power Fund Community Grant Program, the City of Woodbine. Woodbine Municipal Natural Gas, Woodbine Municipal Light and Power, the Missouri River Bright Energy Solutions, and the USDA's Rural Energy for America Program

**Iowa Department of Economic Development's Green Streets Initiative**

**Woodbine, Iowa**

- Nine buildings as of August 2010 had made energy efficiency improvements based on the date collected from the audits. Others are expected to join in this movement and are in plans to do so.

Five buildings were chosen by the City as case studies to demonstrate progress.

**Whitmore Building, Woodbine, Iowa:**

Previously underutilized, the building now houses office space, six upper-story apartments, and one efficiency unit on the ground floor.

The 2010 complete rehabilitation included: tightening of the building envelope (including putting spray foam insulation in the basement, walls, and attic spaces), introducing all Energy Star© appliances, using an efficient T-8 lighting systems, using compact fluorescent lamps (CFLs), and installing a highly efficient geothermal heating and cooling system.

The project found a decrease in total energy use in all areas of the building, including the dining areas, office spaces, apartments, and kitchen areas. The savings seen in the first few months is also thought to be less than the savings expected over a year period (once the space has been fully rented for a year and all tenants begin to use the energy efficient resources more regularly).

**Hometown Hardware, Woodbine, Iowa:**

The owners of a historic hardware building found through the free energy audit that their inefficient hot water boiler was in need of replacement. A new 90%+ efficiency furnace was used to replace the boiler, and new sheet metal ductwork was added to increase the efficiency of the distribution of the furnace's air.

This alteration saved the building owner money, promoted cleaner energy, and is positively impacting indoor air quality creating a more comfortable work and shopping environment.

Current energy savings for the unit is approximately 10%, and again the savings is projected to be higher once the unit has been installed for a full year.

# CHAPTER 4: Case Study: Main Street Program in Iowa

**Iowa Department of Economic Development's Green Streets Initiative**

**Woodbine, Iowa**

**NuStyle Building, Woodbine, Iowa:**

Historically a blacksmith shop, the NuStyle building was completely restored and now houses NuStyle Development. The historic heavy plank wood flooring and open brick face interior walls were both retained during the rehabilitation, which add greatly to the building's historic character.

New energy efficiency improvement changes included adding R-19 spray foam, blown into the basement walls and ceiling joists to increase heating and cooling efficiencies. Spray foam insulation is not always the best choice for historic buildings, because of its unsightly appearance, but in this case it was used only in areas where it would be discreet and most effective.

Benefits already being seen: the cost of the project will be made up in 3 years based on decreased energy payments, humidity and mold growth has been reduced (which also eliminated an un-friendly damp smell), the owners no longer have to spend time and money dehumidifying the basement, air quality is improved, and the basement can now be used for archival file storage.

This is a great example of a minimal impact project (visibly) that has a great impact on human health, energy use, and money savings. In addition, the value of the structure has increased since the basement space is now open to additional uses and is a better functioning space.

**Everything Ellen, Woodbine, Iowa:**

The Everything Ellen company replaced an old steam boiler and radiator system with a high efficiency furnace and central air system while adding new ductwork to distribute air. In addition, window repairs were made to tighten the building envelope, and insulation was added in the basement and between floors.

In the summer, energy savings were approximately 30%, going from about $325 per month to about $225. In the winter the savings were approximately 50%, going from about $400 per month to about $200.

Replacing the inefficient system, and updating existing materials had a low-impact on the building visually and a great impact financially in the long run.

# CHAPTER 4: Case Study: Main Street Program in Iowa

**Iowa Department of Economic Development's Green Streets Initiative**

**Woodbine, Iowa**

**Woodbine Antiques, Woodbine, Iowa:**

The now thriving antique and coffee shop is located in a previously vacant building.

Energy improvements included: replacing cracked window glass, replacing a faulty door, installing awnings to both first and second story windows, purchasing and implementing a 90%+ efficiency forced-air furnace, adding central air conditioning, and adding spray foam insulation in the basement.

The scale and style of the awnings chosen is compatible with awnings that were traditionally found on the first and second floors of Early 20th Century Commercial buildings. The improvements made not only equated to financial savings (the overall energy consumption of the property is approximately 18% lower than it had been previously), it also created a more comfortable environment which allowed for a thriving commercial business.

**Summary of Woodbine, Iowa:**

The City of Woodbine found building owners were initially reluctant to participate in the pilot project. This stemmed from a lack of understanding about the pilot project and doubts about the possible return on investment. The City countered this skepticism by simply starting the project and providing business owners with the ability to join.

Once the audits began to provide participating business owners with valuable information, others became excited about the project. Many business owners have seen positive impacts from the changes made through the audits, and the City is excited by the desire for more business owners to join in. It breaks down to the concept that giving someone the first step, in a frightening and unfamiliar process, will allow them to see benefit before investing further. It took the proof provided by the audits to show the true value a rehabilitation project could have. This is understandable, since making capital improvements is risky if the end result is unknown.

The Green Streets initiative has allowed the City of Woodbine to promote the longevity and sustainability of the community. This is particularly important during times of economic recession when many small towns must find a way to survive and attract new businesses and customers if they are going to survive. In addition, this mutually supports historic preservation by allowing for more historic fabric to be rehabilitated and reused and protected. This shows the project fulfilled both historic preservation and sustainability goals.

# CHAPTER 4: Case Study: Main Street Program in Iowa

**Iowa Department of Economic Development's Green Streets Initiative**

**West Union, Iowa**

- Population: 2,549
- Buildings: 76 buildings took advantage of energy audits. In addition, 60 buildings will be able to tap into a district-wide geothermal energy project discussed shortly.
- Funding:

*Energy audits:* Alliant Energy (electric company), Black Hills Energy (natural gas), and Woodbine Municipal Light and Power

*Building improvements:* Alliant Energy, the State of Iowa, and private building owner investments

*District-wide geothermal energy:* The City of West Union

- Twenty-five buildings as of August 2010 had made energy efficiency improvements based on the data collected from the audits. Others are expected to join in this movement.

The City of West Union was chosen because of its smaller size, community support for previous initiatives (including a food and fitness initiative), and because the City was on the cusp of a major master planning process. This allowed the City to look at large scale sustainability planning (the district-wide geothermal energy program), while also providing energy audits and promoting efficiency improvements to individual commercial buildings.

The geothermal heating and cooling system delivers heat extracted from the earth to heat and cool buildings (energy from the heat is used in the cooling process). All buildings were provided with a 'stub line' which allowed individual building owners (and allows future owners) to decide if they would like to attach to the district green energy line. This is similar to how the City hooks up any other water or electricity line, and provides for future owners to use the service, even if the current owner is disinterested. The main reason why some building owners may be slow to make the switch is because it does require the building to be upgraded to the point where they can connect to the new system. The cost of this will vary, but buildings that have had their furnaces upgraded in recent years will most likely need to make either minimal or no changes. Older buildings that have never updated their heating systems, or did so a long time ago will have a greater initial cost.

Once initiated, and the capital improvement costs have been made, the building owner will find reductions to heating and cooling bills.

# CHAPTER 4: Case Study: Main Street Program in Iowa

**Iowa Department of Economic Development's Green Streets Initiative**

**West Union, Iowa**

Five buildings were chosen by the City as case studies to demonstrate progress .

**Chamber of Commerce, West Union, Iowa:**

The Chamber of Commerce and one of its tenants, Main Street West Union, decided to hook up to the geothermal stub line to demonstrate confidence in the project, and because of the anticipated energy reduction and financial savings

Changes to the building will include: installing R-11 insulation to tighten the building, a vegetative green roof system to assist in heating and cooling, and hooking up to the geothermal system.

The energy savings for the building, which is still under construction, are estimated to be 43% on average between electricity and natural gas costs.

**First National Bank, West Union, Iowa:**

Stemming from information provided by the energy audit, the bank was able to find that they could benefit greatly from the installation of new T-8 lamps and electronic ballast to replace the original T-12 lighting lamps and magnetic ballasts (which are common in commercial buildings but are not as efficient). The bank received a rebate from Alliant Energy which aided in the payment process and allowed the project to have a payback period of just over three years.

| | |
|---|---|
| Cost of Improvements | $3,951.00 |
| Energy Savings | $1,274.52 |
| Simple Payback | 3.1 years |

This is significantly short payback period compared to a full re-wiring, or the wiring that would have resulted from building a new building.

In many situations and in many municipalities, local energy providers have systems in place that provide for rebates, discounts, or free services to energy users. Local energy providers should be contacted to understand possible money saving opportunities in your area.

**Iowa Department of Economic Development's Green Streets Initiative**

**West Union, Iowa**

**Tap't Out Stein-N-Dine, West Union, Iowa:**

The restaurant and lounge is a very energy consumptive business, by the shear nature of its operations. Through the energy audit they were able to alleviate some of the costs of those operations.

Updates included: new energy efficient lighting, new central air conditioning, and a new Energy Star© rated fryer and bottle cooler. Total energy use for the company reduced by over 30%, with the greatest reductions coming from the HVAC and lighting updates.

**Burnham-Wood Funeral Home, West Union, Iowa:**

The replacement of an old 70% efficiency water heater with a new 85% efficiency water heater resulted in a payback of 5.2 years for this small business.

Once again, this shows that building owners were more likely to make the necessary changes if they had adequate information.

**Fayette County Courthouse, West Union, Iowa:**

The Fayette County Board of Supervisors installed a new energy efficient lighting system that resulted in significant reduction in lighting energy use and costs shown below.

| | BEFORE | | AFTER | |
|---|---|---|---|---|
| | Kilowatt Hours | Cost ($) | Kilowatt Hours | Cost ($) |
| January | 11,900 | 952 | 8,330 | 666.40 |
| February | 12,400 | 992.00 | 8,680 | 694.40 |
| March | 12,160 | 972.80 | 8,512 | 680.96 |
| April | 12,420 | 993.60 | 8,694 | 695.52 |
| May | 10,880 | 870.40 | 7,616 | 609.28 |
| June | 16,160 | 1,292.80 | 11,312 | 904.96 |
| July | 14,360 | 1,148.80 | 10,052 | 804.16 |
| August | 23,200 | 1,856.00 | 16,240 | 1,299.20 |
| September | 16,800 | 1,344.00 | 11,760 | 940.80 |
| October | 14,500 | 1,160.00 | 10,150 | 812.00 |
| November | 12,500 | 1,000.00 | 8,750 | 700.00 |
| December | 12,400 | 992.00 | 8,680 | 694.40 |
| | | | Energy Saved: 50,904 kwh | Total Savings: $4,072.32 |

# CHAPTER 4: Case Study: Main Street Program in Iowa

**Iowa Department of Economic Development's Green Streets Initiative**

**West Union, Iowa**

**Cumulative Energy Savings for West Union, Iowa:**

Efficiency gains made in just the five case studies results in the equivalency of:

- 18% less energy being used in a three year comparison
- Annual greenhouse gas emissions savings equivalent to 19.5 passenger vehicles

Greenhouse gas emissions equivalent to 363 barrels of oil being consumed

**Summary of West Union, Iowa:**

The City of West Union was in a unique situation where they were able to integrate sustainability practices into current planning for future need. This allowed the City to make bold moves (like the district geothermal energy line), and convince many businesses to learn more about how they could increase the life and value of their buildings.

Great strides were taken to make sure the public was adequately informed and educated on sustainability practices and the effect they could have on their individual buildings and the community as a whole. The success of the project has spawned interest in sustainability in West Union's schools, which are looking at how they can turn a wetlands restoration project on the school's property into a teaching tool for children.

Securing grants for the project was perhaps the most difficult part for the City as it began planning for the district-wide energy project. Rural communities often have limited resources. Through planning and dedication, the City has already secured more than $5 million of the $8.6 necessary to complete the project in grants alone. In addition, the City will be able to make back costs through the sale of the power to local commercial building owners.

Sources for this section:

Craig, Kathryn. "Green Streets in Iowa". National Trust for Historic Preservation. *Main Street Now*, March/April 2010.

*Energy Savings Progress: Woodbine and West Union Main Street Districts*. Iowa Economic Development. Last modified 2012. http://www.iowaeconomicdevelopment.com/community/downloads/green/EnergyGroupCaseStudy.pdf.

*Upper Story Housing Case Studies*. Iowa Economic Development. 2012.

*This last source was not yet available online at the time that this publication was made. It was privately provided by a member of the Iowa Economic Development. It should be available online at iowaeconomicdevelopment.com/community/community/downtown-training.aspx in the near future.

# CHAPTER 4: Case Study: Main Street Program in Iowa

**Green and Main in Des Moines, Iowa**

The vision of the Green and Main project is to restore, create, and nurture sustainable communities. With goals including limiting the carbon footprint of buildings and neighborhoods, increasing energy efficiency, and promoting better use of materials, the project focuses on one building at a time while also maintaining the goal of educating the public to ensure future stewardship and involvement.

The initiative hopes to show, through tangible benefits that are both financial and environmental and through education, that communities need to embrace sustainable life styles that will in-turn promote social sustainability. To do this, they have begun working on physical sustainability projects to demonstrate these benefits. A historic building in the Sherman Hill neighborhood of Des Moines, Iowa (800 19th Street) was chosen as the pilot project.

The goal of the project was to achieve LEED Platinum certification from the U.S. Green Building Council (more information on LEED is on page 1, and in Appendix D on page)

**History of the Building:**

Built in c. 1915, the historic brick building had been the home to numerous stores, and had even provided housing on the second floor for some time. The building became undesirable and was abandoned as the urban fabric encroached around it. At that time the building had already been listed in the National Register in 1979 as contributing to the Sherman Hills Historic District.

This was the case until the Green and Main project found the building. When others saw an old building surrounded by traffic, the initiative saws a potential commercial asset with great possibility on a busy, transit-oriented street.

Source: "History of the Building." Green and Main. Last modified 2011. http://greenandmain.org/renovation-plans-updates/building-history/.

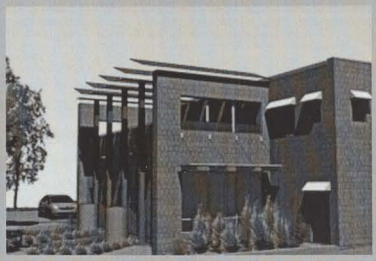
**Green and Main in Des Moines Iowa**

**Change in Use:**

Owner: Chaden Halfhill, Indigo Dawn

Square footage: 3,384 now, 5,912 after an addition is added to the rear of the historic building

As many walls were kept as possible, and architectural detailing such as trim were carefully maintained. The pattern of the historic interior on the first floor will be maintained, and no additions will exist on the main façade or projected off of the roof. The addition is set back on the property, and will have a porch for outdoor living space on the second floor.



Source: "Future of the Building." Green and Main. Last modified 2011. http://greenandmain.org/renovation-plans-updates/building-future/.

**Future of the Building:**

After renovation, the building will be turned into a modern mixed-use building. The down stairs tenant will be a women's holistic health center, with residential housing above. There will also be space for ongoing education about green historic rehabilitation and the development of sustainable communities. This combination of uses (commercial, residential, and educational) is true to the goal of the projects: making a sustainable community environment.

This project is socially sustainable in that it provides for ongoing education and community involvement. In addition, it is economically sustainable because an underutilized building now houses multiple tenants. Lastly, it is environmentally sustainable because the project team maintained and achieved the goal of making the rehabilitation/building expansion project LEED Platinum.

**Green and Main in Des Moines Iowa**

**Historic Preservation:**

Historic preservation was an integral part of this project for two reasons. First, the historic tax credits earned through the project required that the Secretary of the Interior's Standards for Rehabilitation (found in Appendix A) be followed. Tax credits were available because the building is listed as a contributing building in an Historic District, and thus the standards had to be followed to ensure that the building maintained integrity. Second, the project team had a strong desire to maintain the 'Main Street' feel of the building. This authentic historic approach to maintaining the building is popular to many business owners, and helps create a pedestrian friendly, community-based feel to the entire district.

Windows on the building were maintained and restored to provide better efficiency, and the historic brick was also restored to protect the life of the building as a whole. All windows were kept operable to ensure passive air-flow could occur through the building. The addition was located to the rear, which also helped maintain the integrity of the building. Materials and massing were chosen to relate to the historic building, while also making sure to differentiate the addition so to avoid creating a false sense of history. Thus, this is both a successful historic preservation project and a successful sustainability project. This is just one example of how this can be done successfully, while promoting economic stimulation and jobs.

**Sustainability Components:**

All of the sustainability measures described below are also discussed in the first chapter of this guide: "Environmental Sustainability and Historic Preservations".

***Site:*** Permeable pavement was used in the parking lot and on the sidewalk. This will help mitigate stormwater discharge and help more water to be treated and absorbed on site. Native vegetation was also chosen for the site that will aid in water filtration while providing for non-intrusive plant cover that will reduce the heat island affect. A bioswale and green roof were also installed which will help in water infiltration and stormwater and flooding mitigation. Public transportation and bike transportation are also encouraged, with bike parking and a place to change and shower being located on site.

***Water:*** Greywater from sinks and showers will be reused in toilets, and rainwater collected on site will be reused as well. Low-flow fixtures will also be installed and used in the building.

**Green and Main in Des Moines Iowa**

***Heating, Cooling, and Air Conditioning/Energy:*** The building's HVAC system will be powered using renewable geothermal energy, and occupants will be able to individually control each section of the building for localized needs. This will provide for more efficient and effective energy use. Water heater costs will also be lessened through a pre-heating process involving the geothermal system. Insulation will be used within the masonry walls, in the roof area and on some interior walls. The exterior walls of the building will not be altered or covered.

***Light:*** Natural daylight has been used and enhanced through the rehabilitation, along with interior blinds and exterior awnings for more personalized control of the daylight. Efficient lighting, including CFLs, is being used, along with personalized controls and sensors which will allow for efficient and effective use of interior light. Blinds and dimmers will also have automatic controls for comfort and efficiency.

***Materials:*** Materials extracted from the building were often recycled, and new materials brought to the site were often from recycled origin. A large portion of the wood used in the framing of the addition came from a local deconstruction project, and many interior finishes and furniture pieces will be made of recycled materials.

***Indoor Environment:*** Asbestos ablation (which includes identifying asbestos found on the property and properly and safely disposing of it) was conducted. In addition, care was taken to ensure proper ventilation and the use of safe interior materials. Naturally toxin free and non-chemical leaching materials were given preference to avoid chemicals and pollutants from entering the building.

***Ongoing education:*** Building occupants are receiving ongoing education on how energy is used in the building and how in order to better inform them on ways to reduce energy use.

This holistic approach to sustainability, social/economic/environmental/ongoing education, is exactly the approach being promoted by this guide. It is through a fully integrated understanding of the process and ongoing maintenance that historic buildings will continue to be of value for future generations.

Sources for this section:

"About the Initiative." Green and Main. Last modified 2011. http://greenandmain.org/about-the-initiative/.

"Future of the Building." Green and Main. Last modified 2011. http://greenandmain.org/renovation-plans-updates/building-future/.

"History of the Building." Green and Main. Last modified 2011. http://greenandmain.org/renovation-plans-updates/building-history/.

Morin, Jamie and Ulrike Passe. "Cost Benefit Analysis for Energy Efficiency in a Small Scale Retrofit Building in Des Moines: Precedent Comparison." Green and Main and Iowa State University. Last modified 2011. http://greenandmain.org.s55662.gridserver.com /wp-content/uploads/2010/09/Cost-benefit-analysis-energy-retrofit.pdf.

## Conclusion

The modern historic preservation movement is not focused on freezing time and sealing buildings off as time capsules. It is concerned with understanding cultures, promoting local business, and preserving the environmentally, economically, and socially valuable historic resources already built today. Change is inevitable, and those who truly care about the longevity and survivability of historic resources will continue to rehabilitate, protect, and promote the reuse of these precious, energy rich resources.

Sustainability, which has evolved from purely an environmental movement into a way of life concerned with sustainable jobs, materials, economic structures, and food sources, is also continuing to evolve. This simultaneous evolution and adaptation, which requires dealing with constant environmental, social, and political change, has allowed both movements to create incentives and opportunities for a cooperative effort to occur.

Tax credits, new technologies, LEED certification, and renewable energy sources all have the ability to make existing buildings cleaner, less dependent of fossil fuels, and economically more attractive and desirable. With these advancements in mind, there is still much to be done. Government policies should be enacted that promote and require the reuse of existing fabric. In addition, project carbon use limits (determined by individual jurisdictions) would promote rehabilitation projects that are less energy intensive than new construction. Also, incentives should be in place that require sustainability components to be involved with the rehabilitation project, thus providing more incentive to maintain the viability of the building. Lastly, income tax deductions often favor new construction and new building components and thus increase the incentive to replace. For example, when weatherizing windows tax credits are currently only available to incorporate new windows. Instead, tax credits should be available for adding storm windows, or having the windows restored by a rehabilitation specialist.

It was the goal of this guide to provide the reader with options, incentives, ideas, resources, case studies, and background research to begin the important, and continual, process of making buildings more sustainable. With this knowledge, and the immense amount of additional knowledge which is readily available, building owners can make the changes needed to extend the life and quality of life associated with their buildings.

***Recycle*** **(materials),** ***Reduce*** **(energy use),** ***Reuse*** **(historic resources).**

## Appendix A: Secretary of the Interior's Standards for Rehabilitation

The Secretary of the Interior's Standards for Rehabilitation (the Standards) are important for understanding the parameters that must be met if a project is hoping to receive Special Assessment or if the building is on the National Register and the owner does not wish to jeopardize that standing.

In general, the Standards are quite flexible and are written fairly broad as to allow for changes to the building to occur over time to ensure that the building will remain in viable use.

**1.** A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.

-This means that building uses should be chosen that do not require extreme alteration. For example, a hotel that is important for a prominent lobby space or public area should retain that important space, even if the use is to change.

**2.** The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

-The goal of this standard is for building owners to attempt to save as many distinctive features as they can when rehabilitating a property. Not all features have to remain, but those which are important to the buildings integrity are also, most likely, adding to the value of that property and should be maintained.

**3.** Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

-The most important point from this standard is to avoid making changes that look like they are original to the property. Replacing pieces that were once on the building, after careful documentation and research, is different from adding a cornice or tower to a building and trying to make it look old, when it did not exist on the building originally.

**4.** Changes to a property that have acquired historic significance in their own right will be retained and preserved.

-Changes to a building that are over 50 years old, for example a 1950s façade alteration to an 1880s commercial building, needs to be respected in its own right. This does not mean that every historic change will have to be retained, but care needs to be taken to understand the history of the building, including changes, and what aspects of its history have become important today.

**5.** Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

-Original detailing is important for telling the story of historic buildings, and can add significantly to the value of them as well.

**6.** Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

-It is understood that features on historic buildings may not be able to be fixed. When this happens, after much research to make sure features that can be retained are, replacement parts can be made that blend well with the existing building and do not over power it visually. Documenting changes is very important for future work that may be done on the building to make sure materials and changes can be identified.

**7.** Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

-Specific treatment of historic materials will vary, but there are many techniques not generally accepted today that were used historically to clean buildings. For example, it is now known that sandblasting masonry can cause it to deteriorate, deface, crumble, and fail. Thus, it should not be employed on a historic building.

**8.** Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

-Any archeological resources that are found need to be reported immediately. If not, legal issues can arise and valuable information about human patterns of history can be lost.

**9.** New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

-What this standard is implying is that even though you want new additions to match the original building in size, massing, and other details like window patterns, it is very important that those additions are still clearly not from the same time period. This will ensure that a false sense of history is not projected about the building.

## Appendix A: Secretary of the Interior's Standards for Rehabilitation

10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

-Whenever possible, new additions should be able to be completely removed from the structure at a later date and the building would be able to remain in its original form.

Source: http://www.nps.gov/hps/tps/standguide/rehab/rehab_standards.htm

# Appendix B: Financial Incentives in Portland

The following incentives are available in Portland which can be utilized to make rehabilitation projects economically feasible and sustainable. All but one comes from the Portland Development Commission (PDC), which is discussed more on page 120. The other comes from the City of Portland Bureau of Planning and Sustainability.

***Commercial Property Redevelopment Loan Program (PDC):***
The Commercial Property Redevelopment Loan Program is used to assist property owners with redevelopment, new development and tenant improvements that encourage business development and job growth within urban renewal areas (URAs).

How it works:

- This PDC loan is meant to supplement additional contributions and loans in hopes of filling gaps in financing in order to make projects feasible. The PDC generally provides up to 10-20% of the project funding.
- Funding is available for commercial or mixed use properties within Portland's urban renewal areas (URAs).

**Funds may be used to cover certain rehabilitation costs, which include:**

- hard and soft project costs,
- development feasibility analysis,
- property acquisition associated with a redevelopment project,
- environmental analysis and remediation,
- seismic upgrades and tenant improvements, and

public infrastructure improvements related to a development project.

The redevelopment project must demonstrate a significant public purpose and contribute to the PDC's goals, which include:

- **Preservation of older and historic buildings**, as being listed inn the National Register of Historic Places, either individually or identified as contributing in an historic district, or an older building eligible for 10% Historic Tax Credits (described on page 72).
- **Transit-oriented development**, defined as mixed-use development within ½ mile of light rail stations and ¼ mile of frequent transit service.

# Appendix B: Financial Incentives in Portland

***Commercial Property Redevelopment Loan Program (PDC)***

- **Supportive of permanent job growth or job retention** that reflect the strategic priorities of PDC, as defined in the Portland Economic Development Strategy, PDC Strategic Plan, Neighborhood Economic Development Strategy, and Downtown Portland Retail Strategy. Current business categories include:

- **Target Cluster businesses** are defined as traded sector firms, in a target cluster, having the highest potential for growth due to the concentration of firms in the city and the existence of critical elements to competitive advantage over other industries.

- **High Growth businesses** are defined as traded sector firms characterized by robust historical sales growth, identified markets for potential exponential growth in sales, and previous success in raising either debt or equity capital to finance initial start-up and expansion.

- **Community Economic Development businesses** promote wealth creation opportunities for small business owners and jobs for neighborhood residents and offer a mix of goods and services. Investing in these businesses furthers the promotion of physical revitalization in neighborhood commercial corridors.

- **Downtown Retail businesses** reside inside the Downtown Retail corridor (as defined by the PDC).

- **Integration of sustainable and green building practices** into construction projects. This could include implementation of PDC's Green Building Policy.

- **Advancement of social equity** through providing contracting and employment opportunities to Portland's diverse populations, particularly those that historically have been underutilized. This could include implementation of PDC's Business Equity Program (formerly the Good Faith Effort Program) or the Workforce Equity Program (formerly the Workforce Training and Hiring Program).

For more information on the loan program, or to apply, please visit: http://www.pdc.us/developers-and-contractors/developer-contractor-programs/commercial-property-redevelopment.aspx

***Community Livability Grant Program (PDC):***

This grant program is meant to promote redevelopment projects that promote the fostering of vibrant and healthy neighborhoods within the Interstate Corridor and Lents Town Center Urban Renewal Areas in Portland, Oregon.

# Appendix B: Financial Incentives in Portland

***Community Livability Grant Program (PDC)***

**How it works:**

- Projects must propose the enhancement of livability, which includes the preservation of historic community assets.
- The applicant must by the property owner or on the lease.
- Applicable to certain rehabilitation costs (for specific questions on applicable costs please contact the PDC at their website listed below).
- Projects must add, expand or improve physical space that benefits the broader community.

**Examples include:**

- Community health or nutrition centers
- Education and workforce training centers
- Recreational space
- Childcare centers
- Open space and community gardens
- Music, arts and cultural centers
- Historic or cultural assets
- Senior centers

For more information on this grant program, or to apply please visit: http://www.pdc.us/for residents/community-livability-grant.aspx

***Development Opportunity Services (DOS) Program (PDC):***

This program is meant to assist property owners (and, in some cases, tenants) with seed money and in evaluating development project feasibility by providing real estate development expertise and technical assistance.

# Appendix B: Financial Incentives in Portland

***Development Opportunity Services (DOS) Program (PDC)***

**How it works:**

- Properties must be zoned mixed-use or high-density housing and be in the Central Eastside, Gateway, Interstate, Lents, Oregon Convention Center, River District, or South Park Blocks URAs.
- The program provides a reimbursement of up to 80% of pre-development services.
- Funding is available for professional services related to planning for development and does not cover the preparation of construction drawings, permitting or any of the actual construction costs.
- There must be a strong feasibility that the project will be completed in 3-5 years.

For more information on this program please visit: http://www.pdc.us/developers-and-contractors/developer-contractor-programs/developer-opportunity-service-program.aspx

***Storefront Improvement Program (PDC):*** This program is meant to provide cash grants and technical assistance to business and property owners in eligible neighborhoods (as defined by the PDC, currently 8 of Portland's URAs may apply).
How it works:

- The program provides a matching grant of up to $20,000 for building façade design, and improvement assistance.
- Funds can be used for a variety of projects, including re-painting, awning design and creation, and window rehabilitation.

**Storefront target areas include:**

Central Eastside, Downtown Waterfront, Oregon Convention Center, River District, South Park Blocks, Gateway Regional Center, Interstate Corridor, and Lents Town Center. There is a link on the website below that will help determine if your property is located in one of these areas.

For more information on this program please visit: http://www.pdc.us/for-businesses/business-programs/storefront-improvement.aspx

**Signage and Lighting Improvement Program (SLIP) (PDC)**

This program is meant to compliment the Storefront Improvement Program as a supplemental grant specifically for signage and lighting improvements.

How it works:

- Available in the following URAs: Portland's Downtown Waterfront, South Park Blocks, and River District.
- The project must first meet the application requirements of the Storefront Improvement Program.

For more information on this grant please contact the PDC directly, as there is limited public information posted about this grant.

***Transfer of Density and Floor Area Ratio (FAR):*** This program, administered by the City of Portland Bureau of Planning and Sustainability, is meant to provide financial incentive for preservation focused redevelopment projects that choose not to develop properties to the maximum height and density allowed by allowing owners to transfer those rights to different properties.

**How it works:**

- The program allows for the transfer and sale of unused density or FAR from a historic or conservation landmark (the State Historic Preservation Office, defined on page iv, is a good source for understanding Landmark designation and listing) to another site.
- The transfer must occur within two miles of the Landmark.
- The transfer is available to properties in Multi-Dwelling, Commercial, and Employment zoning areas.

For more information on this financial incentive please visit: http://www.portlandonline.com/bps/index.cfm?a=146263&c=44012

## Appendix C: National Register Designation process

Listing a property in the National Register provides the opportunity to apply for grants, loans, tax credit programs, attract potential customers, and more. In addition, it can also come with restrictions on what can be done to the property after listing. Restrictions will vary by city, and it is important to contact city officials in your area to understand how designation will affect you.

Designation on the National Register (NR) does not mean that your property will have any Federal regulation. On the National level, designation is an honor bestowed on the building, and provides no loss of rights. On the local level, restrictions on development will vary. These restrictions are why most cities have incentives (like those discussed in Appendix: B) that help to counter any financial opportunity that may have been lost in order to balance the goal of preservation and protection of history. Nominating a building to the National Register is a lengthy process that requires planning and research, and can be aided from support from your local State Historic Preservation Office.

How it works:

- The National Register (NR) was designed for properties deemed important for National, State, or local history (nominations must clearly state the time period, category of, and location of significance for the property).
- Eligible properties include districts, sites, buildings, structures, and objects that are significant for their contribution to American history (for their association with historic people or events), architecture (for their design, craftsmanship, materials, architect, etc.), and archaeology (for their ability to provide information on human history).
- Nominations must be submitted that clearly explain the importance and history of the property. Nominations are submitted to, and evaluated by, the SHPO.

**Timeline:**

Nominations usually take up to a year to complete from research to listing:

Research can take several months and the SHPO has a minimum of 90 days to review. If they approve the first document the Keeper of the NR (in Washington, D.C.) has 45-60 days to make a final decision.

## Appendix C: National Register Designation process

Note: The SHPO may require revisions to the original nomination which include needing more information, or having the information presented in a more technical or clear manner. Time should be set aside for the possibility of a revision period. Consultation with an historic preservation professional will lessen the chances that this will happen. The SHPO office is also willing to take drafts of portions of the nomination to make sure that the copy they receive has at least a good chance of providing all of the required information. There are also many publications available from the National Park Service that will aid you in completed the nomination, and can answer most general questions. More detailed or specific questions can be asked to the SHPO directly.

A complete list of, and links to, the National Park Service's National Register Bulletins can be found at: http://www.nps.gov/nr/publications/

**These bulletins provide information on how to nominate, evaluate, and research historic properties.**

# Appendix D: Applying LEED rating to existing buildings

This section will be showing how many of the points which can be gained through LEED for Existing Buildings can be achieved while also maintaining the historic character of your building.

All of the information for this section comes from the following publication:

"LEED Reference Guide for Green Operations and Maintenance." U.S. Green Building Council. 2009.

Before beginning any project in which LEED certification is desired, you must first register the project with the Green Building Certification Institute. More information on registering (including associated costs and minimum requirements), please visit: www.gbci.org. In addition, documentation is required to prove inclusion of each credit, and consultation with a LEED accredited professional before work begins is mandatory.

Testing the effectiveness of many of these credits includes a performance or measurement period, where the true effects of the changes made can be seen. More information about this can also be found in the above publication and website.

| | |
|---|---|
| The points break down is as follows: | |
| Certified: | 40-49 points |
| Silver: | 50-59 points |
| Gold: | 60-79 points |
| Platinum: | 80 points and above |
| There are 110 points possible, and ten bonus points. The point sections are: | |
| Sustainable Sites: | 26 |
| Water Efficiency: | 14 |
| Energy and Atmosphere: | 35 |
| Materials and Resources: | 10 |
| Indoor Environmental Quality: | 15 |
| Bonus: | |
| Innovation in Operations: | 6 |
| Regional Priority: | 4 |

# Appendix D: Applying LEED rating to existing buildings

Below is a summary of how many credits can be applied to existing historic structures. There is a basic description of each credit (except credit SS 1, which does not fit well with the reuse of historic buildings) and information on how it could be utilized in an existing building. For more information on LEED, the rating system, credits, and applying the credits, please visit www.usgbc.org.

In addition, many of the credit sections have additional prerequisites that are necessary for gaining points in those areas. More information on those can also be found at the USGBC website listed above.

**Sustainable Sites:**

SS Credit 2: Building exterior and hardscape management plan: 1 point

The goal of this credit is to promote environmentally sensitive building exterior and hardscape management practices, and to provide a clean, well-maintained and safe building exterior while supporting high-performance operations. Management practices that significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical runoff compared with standard practices must be employed. The plan must address the following elements:

1) Maintenance equipment: parking lot sweepers, mowers, pressure washers, and other equipment often utilize fossil fuels. In addition, some of them can be harmful for historic buildings (especially pressure washing). Utilizing lower impact alternatives, which could also help in the longevity of exterior materials, is required. Instead of cleaning your masonry building with a pressure washer (which can cause it to de-laminate and fracture), consider using a mild hose nozzle and environmentally friendly detergents. These will add to the life of the material while also limiting emissions and chemical leeching. In addition, choosing equipment that minimizes waste (i.e. mulching mowers) can also help to earn this credit.

2) Snow and ice removal: a low-impact removal plan is important for cold climates. Ice prevention, which is greatly preferred over deicing, requires that a small amount of deicer be applied to hardscape (curbs, benches, sidewalks) before a storm of heavy frost. Limiting the amount of deicer that needs to be used, and utilizing more environmentally-friendly options will help with earning this credit. Not only does this not effect historic buildings negatively, it may also promote safer, more cost-effective practices.

3) Cleaning of building exterior: clean only as often as needed (as the credit calls for) is also a mantra of the preservation field. Often buildings are 'over cleaned' or too harshly cleaned, and in the process the materials are eroded and break down. Using low-impact cleaning products, and having a plan for run-off will help in earning this credit. In addition, these practices (low-impact cleaning supplies and cleaning only when necessary) are also common inclusions in preservation operations and maintenance plans, so this step could be utilized in both occasions.

4) Paints and sealants on building exterior: this credit calls for using environmentally preferable paints and sealants on the building's exterior that limit harmful VOC (volatile organic compounds) emissions. Visit the U.S. Green Building Council website, www.usgbc.org, for more information on specific products that are recommended. Though buildings that have historically always been painted should remain painted, the choice of paints and sealants are more open. Make sure you check with a preservation professional before applying any paint or sealant to a historic building.

5) Cleaning of sidewalks, pavement and other hardscape: similar to the cleaning or exterior walls, cleaning these surfaces should be done less often as well, and only when needed. Historically, many commercial storefronts would use a hose, often daily, to spray off the sidewalk in front of their building, sending many gallons of water into storm drains and streets. Sweeping, using water sparingly, and avoiding the use of chemicals will not only help in earning this credit, it will also help the environment and save you money.

SS Credit 3: Integrated pest management, erosion control, and landscape management plan: 1 point

The goal is to have an environmentally sensitive management plan for the sites' natural components. This will: preserve ecological integrity, enhance natural diversity, and protect wildlife while supporting high-performance building operations:

Environmentally sensitive management plan: for natural components. Should significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste, and/or chemical runoff.

1) Pest management: management of animals, plants, and bugs that protects human health. This will also increase economic returns through the use of the most effective, least-risk option. The goal of this is minimizing the use of chemicals and pesticides. The plan should also include routine inspection and monitoring.

2) Erosion and sedimentation control for ongoing landscape operations and future construction activity (where applicable). Not only will this prevent contamination to soil and nearby water ways, it will also protect the landscaping of your property and limit the need to make major changes caused by severe damage.

3) Diversion of landscape waste from the waste stream via mulching, composting other low -impact means. This could include bioretention, water runoff collection and treatment, and other options that will not injure the integrity of the existing building.

4) Chemical fertilizer use should be limited through the use of locally adapted plants that need no fertilizer, less-polluting alternatives, or other low-impact practices. Not only will this limit chemical runoff to streams, it will enhance the use of native plants found already in the area, which builds on the areas existing historic character. Examples of native plants can be found locally, perhaps even on the same site, and thus using them is sustainable, local, and cost effective.

SS Credit 4: Alternative commuting transportation: 3-15 points

The weight of this credit is so heavy because promoting alternate forms of transportation is very important for limiting the use of fossil fuels and promoting healthy, transit oriented development. The goal is to reduce the number of trips made by regular building occupants using single occupant, conventionally powered and conventionally fueled vehicles. In order to measure the effectiveness in which you have been able to reduce those trips, a performance period must be used to measure the amount of trips that have actually been limited.

| Demonstrated percentage reduction in conventional commuting trips | Points |
|---|---|
| 10% | 3 |
| 13.75% | 4 |
| 17.50% | 5 |
| 21.25% | 6 |
| 25% | 7 |
| 31.25% | 8 |
| 37.50% | 9 |
| 43.75% | 10 |
| 50.00% | 11 |
| 56.25% | 12 |
| 62.50% | 13 |
| 68.75% | 14 |
| 75% | 15 |

# Appendix D: Applying LEED rating to existing buildings

For detailed information on how to implement the survey (which includes asking building occupants how they arrived at work) can be found in the reference book "LEED for Existing Buildings: Operations and Maintenance Reference Guide".

There are many ways to achieve points through this credit:

**Infrastructure:**

- Reliable, secure bicycle storage and shower or changing facilities. Storage can easily be added to the exterior of an existing building in a parking lot or alley way, and locker rooms can be added to underused storage space, basements, non-historic additions, and other spaces.
- Provide public bicycles for employees to use on campus grounds or between multibuilding facilities.
- Offer a preferred parking program that reserves the most desirable parking spaces for carpool or fuel-efficient vehicles.
- Provide charging station for electric, hybrid-electric, or compressed-air vehicles. These can be added to the existing parking lot, and come in many styles, shapes, and colors.
- For buildings without access to public transportation, provide regular shuttles to and from transit hubs. Often times, historic commercial buildings are already located near transit centers and lines, but this option may be helpful for converted industrial or agricultural buildings, where the location is less conducive to transit use.
- Promote and support compressed workweeks and telecommuting programs for employees whose jobs allow a nontraditional schedule. This could mean longer days Monday-Thursday to allow for Fridays to be off, or implementing 'work from home days' where employees are allowed to do tasks from home on their computers. The second option not only limits fossil fuel use, it will lessen the drain of electricity use (ex. computers, phones, fax machines, printers, desk lamps), and water use (ex. bathroom facilities) that would occur if the employee were to be working in the office.

**Incentive Programs:**

- Provide financial incentives for using alternative transportation. This could include bonuses for using alternate transportation sources.
- Provide nonfinancial incentives, like employee recognition programs, awards, or intercompany competitions.

- Provide management-subsidized passes for public transit.
- Provide management subsidies or payback programs for the purchase of bicycles or environmentally-friendly vehicles. This option may be ne feasible, particularly for many small business owners, but it is an option.

**Programs:**

- Institute a "free ride home" program for alternative-mode commuters who need to work unexpected hours that result in missed carpools or unsafe commute conditions.
- Facilitate carpooling by creating a database that allows occupants to identify potential carpool opportunities based on their commuting routes and schedules. This could be done using social networking, an email list-serve, or many other electronic and non-electronic options (ex. a message board where people are able to post openings and availability).
- Promote the use of mass transit by providing information on transit options, routes, services, and incentives. Having pamphlets that show the schedules and stops of routes easily accessible (either in hard copy in a break room or lobby, or online through email alerts).
- Participate in local or regional transportation planning to ensure that building occupants' needs are considered. Is a new bus line, light rail system, or bike lane being implemented in your area? If so, make sure you attend public planning meetings to ensure your input is considered in stop choices, road choices, etc.

All of these ideas will aid increasing multi-person trips, and trips using alternate forms of transportation. It is important to understand the needs and goals of your own employees before implementing a program that will not be fully utilized. 20% of an average families' income goes to transportation costs, and more than likely employees will be interested in options for lessening those costs.

SS Credit 5: Site development-Protect or restore open habitat: 1 point

The goal is to conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

- This credit is based on the percentage of native or adapted (non invasive) vegetation covering the site area. During the performance period, 25% of the total site area (excluding the building footprint) or 5% of the total site area (including the building footprint), whichever is greater, needs to be covered native or adapted vegetation.
- This will allow for less water use (native plants are more adapted to existing rainfall), fewer chemicals (native plants are less likely to need fertilizer or pesticides), and more diverse animal habitat options.

# Appendix D: Applying LEED rating to existing buildings

SS Credit 6: Stormwater quantity control: 1 point

The goal is to limit disruption to natural environments by reducing impervious cover (discussed in the early section of this book in 'Water and Site: Treatment'), increasing on-site infiltration, reducing or eliminating pollution from stormwater runoff and eliminating contaminants.

During the performance period, implement a stormwater management plan that infiltrates, collects, and reuses runoff or evapotranspirates (the combination of evaporation-water returning from the earth's surface to the air, and transpiration-water returning from plants to the air after it has been absorbed by the plant) runoff from at least 15% of the precipitation falling on the whole project site for both an average weather year and for the 2-year, 24-hor storm design. For more information on this, please see the LEED Reference Guide.

Increasing pervious (porous, water-passable) surfaces, using water catchment for irrigation, and utilizing bioswales (all discussed in previous sections) are all good options for earning this credit. In addition to lessening the impact on local stormwater treatment facilities, this control mechanism can also be used to save money through the reuse of water.

SS Credit 7.1: Heat Island reduction-Nonroof: 1 point

The Heat Island Affect (described in the earlier section on 'Water and Site: Treatment') is caused by an overuse of impervious and dark surface that trap heat on the earth's surface, creating higher air temperatures in dense cities. The goal of this credit is to reduce heat islands in order to minimize impacts on humans, plants, and animals.

Two options are available for achieving this:

Option 1: Use any combination of following strategies for 50% of the site hardscape (roads, sidewalks, courtyards, and parking lots):

- Provide shade from the existing tree canopy or within 5 years of landscape installation, landscaping (trees) must be in place at the time of certification application. This allows for existing mature trees on the site to be counted towards this credit. In addition, adding new trees can add beauty and interest to outdoor spaces.
- Provide shade from structures covered by solar panels that produce energy used to offset some nonrenewable resource use. This could include having solar panels on top of a cover protecting a bench, or putting solar panels on covers protecting exposed outdoor walkways. These are already good choices for implementing solar panels since (most likely) these elements are of secondary importance to the historic character of the building, and will remain fairly low and have low visual impact.

- Provide shade from architectural devices or structures that have a solar reflectance index (SRI) of at least 29. SRI is a measure of the constructed surfaces ability to reflect solar heat. A solid white surface has an SRI of 100, and a solid black surface 0. Thus, the higher the number, the greater the reflection (and lessened heat gain). Include in maintenance procedures a note that surfaces must be cleaned every 2 years to maintain optimal performance. This option can be utilized on a wide variety of historic resources. One thing that does need to be taken into account is how the change in surface material will affect the integrity of the building. For example, a building that historically has had character defining terra-cotta tile (which has a long life), should not be replaced by a white sheet-metal roof in most circumstances. This could affect the building's integrity greatly. There are many design, material, and color options available for implementing high SRI materials.
- Use hardscape materials with an SRI of at least 29 and make sure surfaces are cleaned every 2 years to maintain good reflectance. Lighter colored concrete paving, lighter colored benches, and light colored garbage cans and drinking fountains are a few options for this.
- Use an open-grid pavement system (at least 50% pervious). Be aware of how the pavement area will be used (information on different pervious surface can be found in the section on 'Water and Site: Treatment'.

**Option 2:**

- Place a minimum of 50% of parking spaces undercover. Any roof or shade used to cover parking must have an SRI of 29, have vegetated roof cover, or be covered in solar panels to offset nonrenewable resources used. In many cases, this is going to dramatically affect the character of your site (depending on how much parking you have). One thing to keep in mind is the height of the cover and how much it obscures the building and other character defining features on the site.

SS Credit 7.2: Heat island reduction-Roof: 1 point

The goals of this credit are the same as for 7.1, except the point is awarded for utilization at the roof level.

Option 1:

- Use roofing materials that meet the necessary SRI for a minimum of 75% of the roof surface.

$$\frac{\text{Area Roof Meeting Minimum SRI}}{\text{Total Roof Area}} \times \frac{\text{SRI of Installed Roof}}{\text{Required SRI}} \geq 75\%$$

- All nonemergency built-in lights with direct line of sight to any openings in the envelope must be automatically controlled to turn off during all after-hours periods during the performance period.

**Exterior**

Option 1:

For projects being certified under LEED for Schools or New Construction, show that SS Credit 8 was earned. If the project is certified under LEED for Core & Shell Development and 75% of the floor area is LEED for Commercial Interiors, show that SS Credit 8 was earned for both systems.

OR

Option 2:

Partially (light fixtures are shielded so that the lower edge of the shield is at or below the centerline of the light source or lamp to minimize light emissions above the horizontal plane) or fully shield all exterior features 50 watts and over so that they do not directly emit light to the night sky.

OR

Option 3:

Measure the night illumination levels at regularly spaced points around the perimeter of the property. Measurements are taken with the building's exterior and site lights both on and off. The building's interior lights must be in the same state during both measurements. The illumination level measured with the lights on must not be more than 20% above the level measured with the lights off. This must be seen at all measurement points (8 total are required).

The goal of this credit is to minimize the impact of light on night sky visual appearance. This is a particularly good credit to utilize for historic structures as this credit is both non-intrusive on the building itself and the minimized glare from exterior lights can add to the ambience and character of the historic building.

**Water Efficiency:**

With the goal of minimizing over-consumption of water, and protecting the Earth's limited clean water resources, the credits in this section describe options for limiting water usage and pollution.

WE Credit 1: Water performance measurement: 1-2 points

The goal of this credit is to measure building and subsystem performance over time in order to understand consumption and patterns, and to identify opportunities for additional water savings.

Option 1: Whole Building Meter (1 point)

This requires having in place a permanent water metering system that measures total potable water use for the building and associated grounds. Data must be collected regularly and compiled into monthly and annual summaries

OR

Option 2: Submetering (2 points)

This requires having both the metering system described in option 1 and one or more of the following additional water metering systems in place:

- Irrigation water metering. These are systems that serve at least 80% of the irrigated landscape area on the grounds.
- Indoor plumbing fixtures and fittings. These are systems serving at least 80% of the indoor plumbing fixtures and fittings.
- Cooling towers. This meter measures water use of all cooling towers serving the facility.
- Domestic hot water. This meter measures water use of at least 80% of the installed domestic hot water heating capacity (included both tanks and on-demand heaters).
- Other process water. This means metering at least 80% of expected dialing use of water consumption for process-type end uses (this includes humidifiers, dishwashers, clothes washers, pools, and other systems using process water).

Meters must measure the use of potable water, but the credit also recommends measuring grey or reclaimed water.

WE Credit 2: Additional Indoor Plumbing Fixture and Fitting Efficiency: 1-5 Credits

The goal of this credit is to maximize the efficiency of indoor plumbing fixtures and fittings, thus reducing the impact on potable water use, municipal water supplies, and demand on wastewater systems.

During the performance period, a percentage difference in water use must be found to show a significant reduction. The reduction amount determines the credits earned.

| Percentage Reduction | Points |
|---|---|
| 10% | 1 |
| 15% | 2 |
| 20% | 3 |
| 25% | 4 |
| 30% | 6 |

For more information on more efficient indoor water use, please see Chapter 1. This credit is fairly non-obtrusive and is recommended for historic properties. In some situations, historic plumbing fixtures that are in good condition should not necessarily be removed without considering the effect it may have on the building's overall interior character. This is specifically important for historic structures which have been identified as important for their historic interiors. Consultation is recommended with the local SHPO before changes are made to important historic interiors.

WE Credit 3: Water Efficient Landscaping: 1-5 Points

The goal of this credit is to eliminate the use of potable water, or other natural surface or subsurface resources available on or near the project site, for landscape irrigation. A full explanation of potable, grey, and black water is described earlier in this publication. Often times, limiting potable water use is aided by utilizing rain water run-off and other options.

The percent reduction in use determines the points allocated.

| Percentage Reduction | Points |
|---|---|
| 50% | 1 |
| 62.5% | 2 |
| 75% | 3 |
| 87.5% | 4 |
| 100% | 5 |

## Appendix D: Applying LEED rating to existing buildings

Demonstration of compliance is required for this credit. This requires a rather complex calculation process, which is likely to require the aid of a LEED trained professional

WE Credits 4.1-4.2: Cooling Tower Water Management: 1-2 Credits

The goal of this credit is to reduce potable water consumption for cooling tower equipment. By the nature of the credit, it is any applicable in specific circumstances, but it has the ability to both limit the use of potable water and save the property owner money over time.

WE Credit 4.1 (1 point): Chemical Management

This requires developing and implementing a water management plan for the cooling tower that addresses chemical treatment, exposure of chemicals to surrounding area, and staff training regarding tower maintenance and chemical use. It is also required to improve water efficiency by installing and/or maintaining a conductivity meter and automatic controls.

AND/OR

WE Credit 4.2 (1 Point): Nonpotable Water Source Use

The makeup of water used for the cooling tower must be at least 50% nonpotable water. This water could have been harvested rainwater, harvested stormwater (which are all explained earlier in this publication) air-conditioner condensate, swimming pool filter backwash water, cooling tower blowdown, pass-through cooling water, and other sources.

A measurement program must be in place that shows this reduction in potable water use, and verifies total water makeup properties.

# Appendix D: Applying LEED rating to existing buildings

**Energy and Atmosphere:**

This section is focused on limiting energy use and the effects that electricity consumption has on human environments. Most of the credits in this section are fairly non-obtrusive, and require taking a look at how the building functions and uses energy to make strides towards increasing efficiency.

EA Credit 1: Optimize Energy Efficiency Performance: 1-18 Points

The goal of this credit to promote increasing levels of operating performance relative to typical buildings of similar type to reduce environmental and economic impacts related to excessive energy use.

The implementation of this credit is broken into two separate cases:

Case 1: Projects eligible for Energy Star rating:

This includes building projects which are eligible for Energy Star rating (which can be found out by using the EPA's Energy Star Portfolio Management Tool- energystar.gov/benchmark) that received an energy performance rating of at least 71. Points earned based on energy performance, as determined by the EPA, relate to the following points being earned:

| EPA Energy Star Energy Performance Rating | Points |
|---|---|
| 71 | 1 |
| 73 | 2 |
| 74 | 3 |
| 75 | 4 |
| 76 | 5 |
| 77 | 6 |
| 78 | 7 |
| 79 | 8 |
| 80 | 9 |
| 81 | 10 |
| 82 | 11 |
| 83 | 12 |
| 85 | 13 |
| 87 | 14 |
| 89 | 15 |
| 91 | 16 |
| 93 | 17 |
| 95 | 18 |

## Appendix D: Applying LEED rating to existing buildings

Case 2: Buildings Not Eligible for Energy Star Rating

Buildings not eligible for Energy Star rating must comply with one of the following:

Option 1:

Be able to show energy efficiency at least 21% better than the average for typical buildings of similar type, or measuring against national average source energy data (provided in the Portfolio Manager tool as an alternative to energy performance ratings).

OR

Option 2:

For buildings where the above option is not suited, an alternative is available. First, they must use the alternative method described in the LEED Reference Guide for Green Building Operations and Maintenance, 2009 edition. Second, the building must achieve energy efficiency performance better than the minimum listed above.

The amount of points allocated in Case 2 are based on the following table:

| Percentile level above the national median (for buildings not eligible for Energy Star energy performance rating) | Points |
|---|---|
| 21 | 1 |
| 23 | 2 |
| 24 | 3 |
| 25 | 4 |
| 26 | 5 |
| 27 | 6 |
| 28 | 7 |
| 29 | 8 |
| 30 | 9 |
| 31 | 10 |
| 32 | 11 |
| 33 | 12 |
| 35 | 13 |
| 37 | 14 |
| 39 | 15 |
| 41 | 16 |
| 43 | 17 |
| 45 | 18 |

# Appendix D: Applying LEED rating to existing buildings

EA Credit 2.1: Existing Building Commissioning-Investigation and Analysis: 2 Points

The goal of this credit is to understand the major energy-using systems in the buildings, find options for optimizing energy performance, and developing a plan to achieve energy savings.

Option 1: Commissioning Process

-Develop a retrocommissioning, recommissioning or ongoing commissioning plan for the building's major energy-using systems.

-Conduct the investigation and analysis phase.

-Document the breakdown of energy use in the building.

-List the operating problems that affect occupants' comfort and energy use, and develop potential operational changes that will solve them.

-List the identified capital improvements that will provide cost-effective energy savings and document the cost-benefit analysis associated with each.

OR

Option 2: ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Level II Energy Audit

-Conduct an energy audit that meets ASHRAE Level II Requirements.

-Document the breakdown of energy use in the building.

-Perform a savings and cost analysis of all practical measures that meet the owner's constraints and economic criteria, along with a discussion of any effect on operations and maintenance procedures.

-List identified capital improvements that will provide cost-effective energy savings and document the cost-benefit analysis associated with each.

This credit not only requires no change to the building, it will also help with the longevity of the building's life by better understanding ways that energy can be used, which in turn will make the building more economically sustainable.

EA Credit 2.2: Existing Building Commissioning-Implementation: 2 Points

The goal of this credit is to implement minor improvements and identify planned capital projects to ensure that the building's major energy-using systems are repaired, operated, and maintained effectively to optimize performance.

- Implement no- or low-cost operational improvements and create a capital plan for major retrofits or upgrades.
- Provide training for staff on awareness and skills related to building maintenance and operation related to sustainable building operations.
- Demonstrate observed and/or expected financial costs and benefits.
- Update the building operating plan as necessary to reflect any changes in the occupancy schedule, equipment run-time schedule, design set points, and lighting levels.
- Developing this plan and financial breakdown will also aid in future work being done on the building.

EA Credit 2.3: Existing Building Commissioning-Ongoing Commissioning: 2 Points

The goal of this credit is for ongoing changes to the facility's occupancy, use, maintenance, and repair to be utilized when making periodic adjustments and reviews of building operating systems. This will ensure maximum energy efficiency with changing needs.

- Implementing an ongoing commissioning program that includes planning, system testing, performance verification (making sure the performance expected matches the performance achieved), corrective action response, and ongoing measurement and documentation.
- Create a written plan that summarizes the overall commission cycle for the building by equipment or building system group.
- Complete at least half of the scope of work in the first commissioning cycle prior to the date of application for LEED standing. Only work completed within two-years prior to the LEED application may be included to show ongoing progress.

Credit 2 builds on itself from 2.1-2.3. By 2.3 the requirements are steeper because they require a fair amount of future planning. 6-points may be gained through the successful implementation of all three parts of credit 2, but they also build on each other, and require a fair amount of planning and implementation before applying for LEED certification.

# Appendix D: Applying LEED rating to existing buildings

EA Credit 3.1: Performance Measurement-Building Automation System: 1 Point

The goal of this credit is to provide information towards ongoing support for the accountability and optimization of building energy performance and to identify opportunities for additional energy-saving investments.

- A computer-based building automation system (BAS) must be in place that monitors and controls major building systems, including at a minimum, heating, cooling, ventilation, and lighting.
- A preventive maintenance program must be in place that ensures BAS components are tested and repaired or replaced according to the manufacture's recommended interval.

The infrastructure required for putting this credit into use is the greatest barrier to implementing this credit. Once in place, this system will add value to the building by helping future owners maintain optimal efficiency, and will save the current owners money through more efficient energy monitoring and use.

EA Credit 3.2: Performance Measurement-System-Level Metering: 1-2 Points

The goal of this credit is to provide energy-use information to support energy management and identify opportunities for additional energy-saving improvements.

- Develop a breakdown of energy use in the building. This can be done in concurrence with credits 2.1 and 2.2 or by doing other metering to determine the energy consumption of major mechanical systems.
- This analysis must have been conducted within two-years prior to the date of application for LEED certification.
- Based on energy-use breakdown, employ system-level metering covering at least 40% or 80% of the total expected annual energy consumption of the building. Permanent metering and recording are required.
- Demonstrate that metering is in place covering the percentage level minimum chosen.
- Demonstrate that the largest energy-use categories from the breakdown report outlined in the table are covered by at least 80% (ex. If energy use in the 2 or 3 largest categories is each 100 Btus/year, at least 80 Btu/year in 1 or 2 of them must be metered).

System Level Metering Requirements

| Percentage of Total Annual Energy Consumption to be Me- | Number of Largest Energy Use Categories to be Covered by 80% or more | Points |
|---|---|---|
| 40% | 1 of 2 | 1 |
| 80% | 2 of 3 | 2 |

A cost/benefit analysis will be helpful for understanding the level of potential gain and the total cost for monitoring electricity levels.

Monitoring must be ongoing and data logged, and reports must be compiled monthly and annually.

EA Credit 4: On-Site and Off-Site Renewable Energy: 1-6 Points

The goal of this credit is to encourage and recognize increasing levels of on and off-site renewable energy with the intention of decreasing environmental and economic impacts related to fossil fuel energy use.

- Renewable energy creation must be demonstrated during the performance period, and points are earned in the below chart based on the percentage of renewable energy created.
- There are certain requirements that define acceptable off-site energy sources, which are based on the Center for Resource Solutions Green-e Energy program's products certification requirements.
- If the green power is not Green-e Energy certified, equivalence must exist for both major Green-e Energy program criteria: 1) current green power performance standards 2) independent third-party verification that those standards are being met by the supplier over time.
- There is a 6-point limit, and combinations can be utilized that are allocated the full amount of points for each area. For example, if you receive 4.5% of your energy on-site you will earn 2-points and if you receive 50% of your energy from off-site you will get an additional 3-points, for a total for 5-points.

# Appendix D: Applying LEED rating to existing buildings

Point allocation is as follows:

| On-site renewable energy | | Off-site renewable energy certificates | Points |
|---|---|---|---|
| 3% | or | 25% | 1 |
| 4.5% | or | 37.5% | 2 |
| 6% | or | 50% | 3 |
| 7.5% | or | 62.5% | 4 |
| 9% | or | 75% | 5 |
| 12% | or | 100% | 6 |

Renewable energy options are discussed in the Energy Production section of this publication.

EA Credit 5: Enhanced Refrigerant Management: 1 Point

The goal of this credit is to reduce ozone depletion and minimize direct contributions to global climate change.

Option 1:

Do not use any refrigerants in base building heating, ventilation, air conditioning, and refrigeration (HVAC&R) systems.

OR

Option 2:

Select HVAC&R equipment that minimizes or eliminates the emission of compounds that contribute to ozone depletion and climate change

Compliance is based on a rather complex mathematical formula derived on calculations found on page 215 of the LEED Reference Guide for Green Building Operations and Maintenance, 2009 Edition. Please reference this book when having additional inquiries about this credit.

EA Credit 6: Emissions Reduction Reporting: 1 Point

The goal of this credit is to document the emissions reduction benefits of building efficiency measures.

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- Identify all building performance changes made that reduce conventional energy use and emissions, quantify total reductions and report them in a formal tracking program.
- Track and record emissions reductions delivered by energy efficiency, renewable energy and other building emissions reduction measures (including reductions from purchase of renewable energy).
- Report emissions reductions using a third-party voluntary reporting or certification program (ex. U.S. EPA Climate Leaders).

**Materials and Resources:**

This section is focused on minimizing waste generated from building construction and maintenance. This includes choosing sustainable materials, recycling whenever possible, and thus reducing pollution into the air, water, and earth.

It is important to note that many of the credits discussed in this appendix, and particularly those found in this section, require little to no change to the physical structure. What they do promote is a change in the way that buildings operate. Operating procedures that promote sustainable practices will not only help you gain credits, but over time they are also likely to save you money.

MR Credit 1: Sustainable Purchasing-Ongoing Consumables: 1 Point

The goal of this credit is to reduce the environmental and air quality impacts of the materials acquired for use in the operations and maintenance of buildings.

-A sustainable purchasing program must be in place that includes materials with a low cost per unit that are regularly used and replaced through the course of the business. This includes: paper, toner cartridges, binders, batteries, and desk accessories.

-1 credit is applied when projects achieve sustainable purchases of at least 60% of total purchases (by cost) during the performance period.

-Sustainable purchases meet one or more of the following:

- Purchases contain at least 10% postconsumer and/or 20% postindustrial material.
- Purchases contain at least 50% rapidly renewable materials.
- Purchases contain at least 50% materials harvested and processed or extracted and processed within 500 miles of the project.
- Purchases consist of at least 50% Forest Stewardship Council (FSC) certified paper projects
- Batteries are rechargeable.

Each purchase can receive credit for each criterion met. Example: a $200 purchase that contains 50% rapidly renewable materials and includes rechargeable batteries equates to a total of $400 of sustainable purchasing.

Sustainable options for each of these categories have become increasingly available for purchase, and all records should be kept of purchases made.

# Appendix D: Applying LEED rating to existing buildings

MR Credit 2.1-2.2: Sustainable Purchasing-Durable Goods: 1-2 Points

The goal of this credit is to reduce the environmental and air quality impacts of the materials acquired for use in the operations and maintenance of buildings.

- A sustainable purchasing program must be maintained covering items available at a higher cost per unit and durable goods replaced infrequently and/or may require capital program outlays to purchase.

MR Credit 2.1 (one point): Electric-Powered Equipment

- At least 40% of total purchases of electric-powered equipment (by cost) must be sustainable purchases during the performance period.
- These items may include, but are not limited to, office equipment (computers, monitors, copiers, printers, scanners, and fax machines), appliances (refrigerators, dishwashers, and water coolers), external power adapters, and televisions and other audiovisual equipment.

**Sustainable purchases meet the following criteria:**

- The equipment is Energy Star© qualified

The equipment replaces conventional gas-powered equipment.

***Having more efficient electronic equipment, a component of historic buildings that is often replaced and updated, is always recommended before altering the buildings historic fabric.***

AND/OR

MR Credit 2.2 (one point): Furniture

- At least 40% of furniture purchases made during the performance period must have been sustainable.
- Sustainable furniture purchases are those that meet one or more of the following criteria:

-Purchases contain at least 10% postconsumer and/or 20% postindustrial material.

-Purchases contain at least 70% material salvaged from off-site or outside the organization (this could include reclaimed furniture from an architectural salvage or second hand shop).

-Purchases contain at least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program (this is a particularly preservation minded option, which encourages the reuse of historic interior features, which can add to the value and overall aesthetic of historic structures).

-Purchases contain at least 50% rapidly renewable material.

-Purchases contain at least 50% Forest Stewardship Council (FSC) certified wood.

-Purchases contain at least 50% material harvested and processed or extracted and processed within 500 miles of the project.

Each purchase can receive credit for each criterion met. For example, a $200 purchase that contains 70% re-claimed off-site material and contains 10% postconsumer material counts twice, for a total of $400 in sustainable purchasing.

***The credit promotes the reuse of historic interior features. If original interior features are no longer on the site, reclaiming them can both help in fulfilling this credit and in creating a historically accurate interior that adds to the aesthetics and integrity of the interior space.***

MR Credit 3: Sustainable Purchasing-Facility Alterations and Additions: 1 point

The goal of this credit is to reduce the environmental and air quality impacts of the materials acquired for use in upgrade of buildings.

- A sustainable purchasing program must be in place covering materials for facility renovations, demolitions, refits, and new construction additions.
- This applies only to materials permanently or semipermanently attached to the building itself, and does not include any furniture, fixtures, or equipment. In addition, mechanical, electrical, and plumbing components and specialty items such as elevators are also excluded from this credit.
- Sustainable purchases must be 50% of total purchases (by cost) during the performance period. Sustainable purchases must meet one or more of the following criteria:

  -Purchases contain at least 10% postconsumer and/or 20% postindustrial material.

  -Purchases contain at least 70% material salvaged off-site or outside the organization.

  -Purchases contain at least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program.

  ***Once again, the reuse of historic building materials can be both beneficial for earning this credit, and for creating an aesthetically pleasing environment.***

  -Purchases contain at least 50% rapidly renewable material.

  -Purchases contain at least 50% Forest Stewardship Council (FSC) certified wood.

-Purchases contain at least 50% material harvested and processed or extracted and processed within 500 miles of the project.

-Adhesives and sealants have a VOC (volatile organic compound) content less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, or sealants used as fillers meet or exceed requirements of the Bay Area Air Quality Management District Regulations 8, Rule 51.

-Paints and coatings have VOC emissions not exceeding the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

-Noncarpet finished flooring is FloorScore-certified and constitutes a minimum of 25% of the finished floor area.

-Carpet meets the requirements of the CRI Green Label Plus Carpet Testing Program.

-Carpet cushion meets the requirements of the CRI Green Label Plus Carpet Testing Program.

-Composite panels and agrifiber (composite wood) products contain no added urea-formaldehyde resins.

-Materials must be purchased during the performance period and each purchase can receive credit for multiple areas. For example, a $200 purchase that utilizes both 50% rapidly renewable material and 50% material harvested from within 500 miles will count twice, for a total of $400 of sustainable purchasing.

MR Credit 4: Sustainable purchasing-Reduced Mercury in Lamps: 1 Point

The goal of this credit is to establish and maintain a toxic material source reduction program to reduce the amount of mercury brought onto the building site through purchasing of lamps.

- A lighting purchasing plan must be developed that specifies maximum levels of mercury permitted in mercury-containing lamps purchased for the building and associated grounds. This includes both hardwired and portable fixtures.
- The purchasing plan must specify a target for the overall average of mercury content in lamps of 90 picograms per lumen-hour or less. At least 90% of lamps purchased during the performance period (measured by total number of lamps bought) must comply with the target.

The importance of historic period lighting must be taken into account while planning for this credit. Historic lighting that is in good condition and is important to the integrity and character of the building should be retained. Not-from-period lighting, lighting that is too damaged to repair, and lighting being placed in non-historic additions should be considered first for replacement with reduced mercury lamps.

MR Credit 5: Sustainable Purchasing-Food: 1 Point

The goal of this credit is to reduce environmental and transportation impacts associated with food production and distribution.

- Sustainable purchases of at least 25% of total combined food and beverage purchases (by cost) must be achieved during the performance period.
- Sustainable purchases are those which meet one or both of the following criteria:

-Purchases are labeled USDA Organic, Food Alliance Certified, Rainforest Alliance Certified, Protected Harvest Certified, Fair Trade or Marine Stewardship Council's Blue Eco-Label.

-Purchases are produced within a 100-mile radius of the site.

Food products must be purchased during the performance period, and food products can receive credit for each criterion met. For example, a $200 purchase that is both USDA Organic and from within a 100 mile radius counts twice in calculation, for a total of $400 of sustainable purchasing.

This a great opportunity to earn a point that requires no change to the physical structure. In addition, supporting local businesses, particularly local farms of all kinds, will promote the preservation of open farmland, which enhances the look of the area as a whole. In addition, supporting and promoting organic and local foods will attract clientele who may be willing to pay more for the security of knowing what is in their food and where it comes from.

# Appendix D: Applying LEED rating to existing buildings

MR Credit 6: Solid Waste Management-Waste Stream Audit: 1 Point

The goal of this credit is to reduce the ongoing waste and toxin generation of building occupants and building operations. This will limit the amount ending up in landfills or incineration facilities. Materials include metals, plastics, paper, and batteries to name a few.

What types of materials can be recycled depends on available facilities in your area, and local waste management authorities should be contacted to learn more about the recycling in your area.

- This requires conducting a waste stream audit of the building's entire ongoing consumables waste stream.
- Results from the audit are then used to establish a baseline that identifies the types of waste that are found and the amounts of each.
- The results are then used to help identify opportunities for increased recycling and waste diversion
- The audit must be performed during the performance period.

Composting can be done on site. In addition many waste management companies offer credit or reduced rates for using recycling containers. There are many incentives available for the promotion of recycling and composting. It is advised to check with local waste management authorities in your area to understand local incentives.

MR Credit 7: Solid Waste Management-Ongoing Consumables: 1 Point

Similarly with Credit 6, the goal of this credit is to facilitate in the reduction of waste and toxins. The difference is that this credit refers to the implementation of a waste reduction program instead of focusing on the audit process which will inform you on the creation of said program.

- A waste reduction and recycling program must be in place that addresses materials with a low cost per unit that are regularly used and replaced.
- Materials included at a minimum are: paper, toner cartridges, glass, plastics, metal cardboard, and food waste.
- 50% of the ingoing consumables waste stream must be reused, recycled, or composted.

- Implementing a battery recycling program. The program must have a target of directing at least 80% of discarded batteries from the trash. This performance must be verified annually.

Once again, local recycling options must be considered in your area. Composting is most often an option on site, unless there are strong restrictions on available space, and recycling should be available for most common recyclable containers and packaging materials.

MR Credit 8: Solid Waste Management-Durable Goods: 1 Point

The goal of this credit is to facilitate in the reduction of waste and toxins generated from the use of durable goods by building occupants and operations. This will decrease the amount of waste hauled to and disposed of in landfills or incineration facilities.

- A waste reduction and recycling program must be in place that addresses durable goods that are replaced infrequently.
- These include at a minimum: office equipment (computers, fax machines, printers, etc.), appliances (refrigerators, dishwashers, etc.), external power adapters, television, and other audiovisual equipment.
- 75% of durable goods must be recycled or reused during the performance period.

MR Credit 9: Solid Waste Management-Facility Alterations and Additions: 1 point

The goal of this credit is to divert construction and demolition debris from landfills and incineration facilities.

- At least 70% of waste (by volume) generated by facility alterations and additions must be diverted from landfills and incineration facilities.
- This applies only to building elements that are permanently or semipermanently attached to the building that enter into the waste stream from alterations, addition, etc.
- These include at a minimum: building components and structures (i.e. wall studs, insulation, doors, and windows), panels, attached finishings (drywall, trim, ceiling panels), carpet and other flooring materials, adhesives, sealants, paints and coatings.

It is always advised to reuse existing historic building materials before replacing them. Not only is this good for the environment, but it will also save money. If alterations, or partial demolitions are going to occur on site, it is advised that these changes occur in the non-historic sections of the building, on less prominent façades, and that quality historic materials that are in good condition are maintained.

# Appendix D: Applying LEED rating to existing buildings

**Indoor Environmental Quality:**

This section is focused on creating healthier indoor air and ventilation. In addition, daylight and customizable indoor features that help in saving energy are also promoted. Most of the credits are fairly non-intrusive to historic structures and can improve the health of indoor environments.

IEQ Credit 1.1: Indoor Air Quality Best Management Practices-Indoor Air Quality Management Program: 1 Point

The goal of this credit is to enhance indoor environmental quality by optimizing practices to prevent the development of indoor air quality (IAQ) problems, correcting problems when they do occur, and maintaining the well-being of the building's occupants.

-An IAQ management program must be implemented on an ongoing basis based on the EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM), available at:

http://www.epa.gov/iaq/largebldgs/i-beam/index.html

IEQ Credit 1.2: Indoor Air Quality Best Management Practices-Outdoor Air Delivery Monitoring: 1 Point

The goal of this credit is to provide capacity for ventilation system monitoring to help maintain occupant comfort and well-being.

-A continuous monitoring system must be installed that provides feedback on ventilation system performance to ensure that the ventilation systems maintain minimum outdoor airflow rates under all operating conditions.

AND

Case 1. Mechanical Ventilation Systems

Provide a device that is capable of measuring (and, if necessary, controlling) the minimum outdoor airflow rate during all expected conditions within 15% of the design minimum outdoor rate. Monitoring must occur at at least 80% of the building's total outdoor air intake flow serving occupied spaces.

There must be an alarm system in place which warns the system controller if the minimum outdoor air rate falls more than 15% below the design minimum rate.

Case 2. Mechanical Ventilation Systems that Predominantly Serve Densely Occupied Spaces

Provide a CO2 sensor or sampling location for each densely occupied space and compare it with outdoor ambient CO2 concentrations. Specifications are required for these sensors including that they be tested and calibrated at least every 5 years.

# Appendix D: Applying LEED rating to existing buildings

For specific details on this process please see page 361 of the LEED Reference Guide for Green Building Operations and Maintenance (2009).

Case 3. Natural Ventilation Systems

Provide CO2 sensors in the breathing zone of every densely populated room and natural ventilation zone.

Sensors must provide an audible or visual alarm when CO2 levels are found to be greater than 530 ppm (parts per million) above outdoor CO2 levels or 1,000 ppm in total.

Calibrations must follow manufactures recommended intervals, and may not exceed 5 years in between.

This credit allows for a safer indoor environment with a low-cost approach that requires no physical change to the building, thus it is recommended highly for historic structures.

IEQ Credit 1.3: Indoor Air Quality Best Management Practices-Increased Ventilation: 1 point

The goal of this credit is to provide additional outdoor air in ventilation in order to improve indoor air quality (IAQ). This will improve occupant comfort, health and productivity.

Case 1. Mechanically Ventilated Spaces

Increase outdoor air ventilation rates for all air-handling units serving occupied spaces by at least 30% above the minimum required by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Standard 62.1-2007.

Case 2. Naturally Ventilated Spaces

Decide whether natural ventilation will be an effective strategy for the project. This will require using Figure 2.8 of the Chartered Institution of Building Services Engineers (CIBSE) Application Manual 10: 2005, Natural Ventilation in Non-domestic Buildings.

AND

Option 1.

Demonstrate that the natural ventilation systems design meets the recommendations set forth in the CIBSE manuals appropriate for the project and space.

-Path 1: CIBSE Applications Manual (AM) 10: 2005, Natural Ventilation in Non-domestic Buildings.

-Path 2: CIBSE AM 13: 2000, Mixed Mode Ventilation.

OR

Option 2.

Use a macroscopic, multizone, or analytic model in order to predict that room-by-room airflows will effectively naturally ventilate. This is defined by the minimum ventilation rates required by ASHRAE Standard 62.1-2007 Chapter 6 for at least 90% of occupied spaces.

Many historic structures have ventilation systems that are already in place. Many times these systems are obscured or altered, which decreases their effectiveness. This may include the painting over of windows, the inoperability of original skylights, the filling in of historic windows, or the lowering of a ceiling that once provided for natural hot air to rise and exit through louvers or windows. It is important to understand how the building was originally designed in order to use the original plan with maximum efficiency. Natural ventilation will save money and cause less harm to the environment.

IEQ Credit 1.4: Indoor Air Quality Best Management Practices-Reduce Particulates in Air Distribution: 1 Point

The goal of this credit is to reduce building occupant's exposure to potentially hazardous particulate containments. These may adversely affect air quality, human health, building systems, and the environment.

-Filtration media (material) needs to be in place that has a minimum efficiency reporting value (MERV) of 13 or greater for all outside air intakes and inside air recirculation returns during the performance period.

-Regular maintenance and replacement must be performed according to manufacturer's recommendations.

IEQ Credit 1.5: Indoor Air Quality Best Management Practices-Indoor Air Quality Management for Facility Additions and Alterations: 1 Point

The goal of this credit is to prevent indoor air quality (IAQ) problems resulting from any construction or renovation project. This will help to sustain the comfort and well-being of construction workers and building occupants.

**An IAQ management plan must be developed and implemented for the construction and occupancy phases which includes:**

-During construction: meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

-If the building undergoes tenant improvements (meaning that interior spaces need to be altered for a change in use or tenants), an IQA management plan must be developed and implemented for the preoccupancy phase. This includes changing the filtration media after construction has finished and flushing out the finished space.

-Protecting absorptive materials from water damage, which can lead to later problems including mold.

-If permanently installed air-handlers must be used during construction, filtration media with a MERV of 8 must be used at each return grille.

-After construction, HVAC and lighting systems must be returned to the designed sequence of operations.

IEQ Credit 2.1: Occupant Comfort-Occupant Survey: 1 Point

The goal of this credit is to assess the building occupant's comfort as it relates to thermal comfort, acoustics, indoor air quality (IAQ), lighting levels, building cleanliness, and other comfort issues.

-A survey and complaint response system must be implemented that collects anonymous responses about thermal comfort, acoustics, IAQ, lighting levels, building cleanliness, etc.

-The total survey sample must equal 30% of the total occupants, and include an assessment of overall satisfaction with building performance and identify comfort-related issues.

-Survey results must be documented and corrective actions to be addressed must be identified.

-At least one survey must be conducted during the performance period.

Not only is this credit non-intrusive, it can also help the building owner to plan for future needs, meet the needs of customers, and help attract new tenants through improvements called top the owners attention.

IEQ Credit 2.2: Controllability of systems-Lighting: 1 Point

The goal of this credit is to provide a high level of lighting system control by individual occupants or groups in multi-occupant spaces (ex: classroom or conference rooms). This will promote productivity, comfort, and well-being of occupants.

-At least 50% of the building occupants must be able to use lighting controls that enable adjustments for individual needs in at least 50% of individual workstations, and 50% of multi-occupant space must have this ability as well.

This is slightly more intrusive in that it will require the alteration of existing lighting, and possibly the wiring of said lighting. In most cases, the lighting is historic buildings has already been altered from its original materials and wiring, but if original lighting fixtures remain it is important to understand their historical importance and how they relate to the building's overall historic character before making changes that could not be reversed in the future.

IEQ Credit 2.3: Occupant Comfort-Thermal Comfort Monitoring: 1 Point

The goal of this credit is to support building operations and maintenance so that buildings and their systems continue to meet target building performance goals for the long term. This will support occupant well-being and productivity.

-A system of continuous tracking and optimization must be in place that regulates comfort and indoor quality conditions (temperature, humidity, etc.). A permanent monitoring system must be in place to ensure ongoing building performance to the desired comfort criteria as determined by ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy.

-The building must establish the following:

- A continuous monitoring of, at a minimum, air temperature and humidity in occupied spaces.
- Periodic tests of air speed and radiant temperature in occupied spaces.
- Alarms for conditions that require system adjustments of repair. A list must be submitted that shows the sensors, zone set points, and minimum levels that would trigger an alarm.
- Procedures that will deliver prompt adjustments or repairs in response to problems identified.
- All monitoring devices must be calibrated as often as the manufacturer recommends.

This credit will require the placement of additional electrical components and will require monitors, equipment, alarms, and other items to be placed on the walls. This may hurt the integrity of the building if placed in a character defining space. It is always advised to locate electrical, mechanical, or other modern equipment in secondary spaces, new additions, and in spaces that will not obscure original materials, workmanship, or artistry.

IEQ Credit 2.4: Daylight and Views: 1 Point

The goal of this credit is to provide building occupants with a connection between indoor and outdoor spaces through the introduction of daylight and views into the regularly occupied spaces.

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This credit will be most applicable to historic resources in two scenarios:

1) Windows and skylights already exist that conform to the requirements of this credit. Many historic buildings have skylights and windows that allow in large quantities of light. These existing features may already conform to the requirements of this credit based on the formulas shown below which come from the LEED Reference Guide for Green Building Operations and Maintenance (2009).

2) Windows or skylights are being utilized in an addition to the historic property that will be conforming to the pre-mentioned requirements for this credit. This can easily be done, and will allow light into these spaces.

What is not recommended is taking the existing building and changing the windows and skylights to conform to these requirements simply to gain the 1 point available for this credit. The reasoning is two-fold. First, the cost for altering the windows is unlikely to make up the benefit of altering the windows for the soul purpose of letting in more light. Second, altering the windows dramatically-including altering the size of openings and placement-will significantly alter the historic character of buildings. If the soul purpose of altering the windows is to let in more light, the historic importance of the existing windows must be examined first to limit permanent changes to the integrity of the building.

The project must achieve performance thresholds in either the daylight or views requirements below:

Option 1: Daylight

Path 1. Simulation

Be able to demonstrate through computer simulation that 50% or more of regularly occupied space achieves daylight illuminance levels of a minimum of 25 footcandles (fc) and a maximum of 500 fc in a clear sky condition on September 21st at 9 a.m. and 3 p.m. Designs that *incorporate view-preserving automated shades for glare control may demonstrate compliance for only the minimum 25fc illuminance level.

OR

Path 2. Prescriptive

Using a combination of side-lighting and/or top-lighting a total daylighting zone must be achieved that is at least 50% of all the regularly occupied spaces.

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More on side-lighting, top-lighting, and daylighting can be found in the Lighting section of this publication.

For the Sidelighting Daylight Zone:

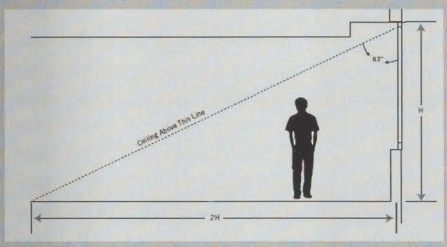
-Achieve a value, calculated as the product of the visible light transmittance (VLT) and window-to-floor area ratio (WFR) of the daylight zone, of between .150 and .180. The window area included in the calculation must be at least 30 inches above the floor

.150 < VLT X WFR < .180

-The ceiling must not obscure a line in section that:

- Joins the window-head to a line on the floor that is parallel to the plane of the window;

Is twice the height of the window-head above the floor in distance from the plane of glass as measured perpendicular to the plane of the glass.




Source: LEED Reference Guide for Green Building Operations and Maintenance (2009), p. 410

This visual helps to show the minimum level that light is allowed to be obscured by the ceiling.

- Provide sunlight redirection and/or glare control devices that ensure daylight effectiveness.

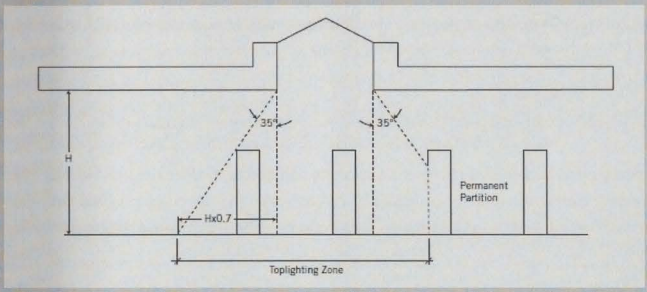
For Toplighting Daylight Zone:

-The daylight zone under a skylight is the outline of the opening beneath the skylight, plus in each direction the lesser of:

70% of the ceiling height
OR

½ the distance to the edge of the nearest skylight, or the distance to any permanent opaque (light transmitting) partition farther away than 70% of the distance between the top of the partition and the ceiling.

# Appendix D: Applying LEED rating to existing buildings




Source: LEED Reference Guide for Green Building Operations and Maintenance (2009), p. 410

This visual helps to show the minimum distance that light should project into the room from the skylight. It also shows that opaque partitions within that space may exist as long as light can show through.

-Achieve skylight roof coverage between 3% and 6% of the roof area with a minimum .5 VLT (visible light transmittance) for the skylights.

-The distance between the skylights must not be more than 1.4 times the ceiling height.

OR

Path 3. Measurement

-It must be demonstrated through indoor light measurements that a minimum daylight illumination level of 25fc is achieved in at least 50% of all regularly occupied areas.

OR

Path 4. Combination

-Combining any of the above calculation methods to document the minimum daylight illumination in at least 50% of all occupied spaces. All methods and measuring points must be recorded.

-In all cases, only the square footage associated with the portions of rooms or spaces meeting the requirements may be applied toward the 50% of total area calculation required to qualify for this credit.

Option 2: For Views

-Achieve a direct line of sight to the outdoor environment through glazing (window glass) between 30-90 inches above the finished floor for building occupants in 45% of all regularly occupied areas.

Once again, this credit requires very specific placement, size, and usage of windows and skylights. If existing widows conform to this design the credit should be utilized. If not, the credit can be used in planning additions to the property or in secondary elevations where the historic windows have already been altered.

IEQ Credit 3.1: Green Cleaning-High Performance Cleaning Program: 1 Point

The goal of this credit is to limit building occupants and maintenance personnel to exposure of potentially hazardous chemical, biological, and particulate contaminants. These can adversely affect air quality, human health, building finishes, building systems, and the environment.

-During the performance period, a high-performance cleaning program must be in place. This program is supported by a green cleaning policy that addresses the following:

- Provides a staffing plan
- Implementing the training of personnel in the hazards, use, maintenance, disposal, and recycling of cleaning chemicals, dispensing equipment and packaging.
- Using chemical concentrations with appropriate dilution systems to allow for minimal chemical use.
- Using sustainable cleaning materials, products, equipment, janitorial paper products, and trash bags.
- Using sustainable cleaning and hard floor and carpet care products meeting the sustainability criteria outlined in IEQ 3.3.

Using cleaning equipment meeting the sustainability criteria outlined in IEQ 3.4

Not only are these requirements better for the environment, on many situations historic materials can be disfigured or damaged if harsh cleaning products are used. It is always best to use the least invasive cleaning processes possible first with historic materials, and following the above requirements can add to the longevity of historic materials like wood, metal and masonry.

IEQ Credit 3.2: Green Cleaning-Custodial Effectiveness Assessment: 1 Point

The goal of this credit is to reduce building occupants and maintenance personnel's exposure to potentially hazardous chemical, biological, and particulate contaminants. These adversely affect air quality, human health, building finishes, building systems, and the environment. This requires implementing, managing, and auditing cleaning procedures and processes.

## Appendix D: Applying LEED rating to existing buildings

-This requires conducting an audit in accordance with APPA Leadership in Educational Facilities' "Custodial Staffing Guidelines" to determine the appearance level of the facility.

-The facility must score a 3 or less based on those guidelines. More information on this is in the LEED guidelines on p. 434.

IEQ Credit 3.3: Green Cleaning-Purchase of Sustainable Cleaning Products and Materials: 1 Point

The goal of this credit is to reduce the environmental impacts of cleaning products, disposable janitorial paper products, and trash bags.

-Sustainable purchasing of cleaning materials and products, disposable janitorial paper products, and trash bags must be implemented. Purchases include items used by in-house staff or outsourced service providers. One point is awarded if 30% of the total annual purchasing of these products (by cost) meets at least 1 of the sustainability criteria for each area of purchase. The areas include:

- Cleaning products
- Disinfectants, metal polish, floor finishes, or paint strippers
- Disposable janitorial paper products and trash bags
- Hand soaps

The items above must meet one of the criteria listed on pages 439-440 of the LEED Reference Guide for Green Building Operations and Maintenance (2009).

IEQ Credit 3.4: Green Cleaning-Sustainable Cleaning Equipment: 1 Point

The goal of this credit is to reduce building occupants and maintenance personnel's exposure to potentially hazardous chemical, biological, and particulate contaminants. These may adversely affect air quality, human health, building finishes, building systems, and the environment.

-A program must be implemented for janitorial equipment that reduces building contaminants and minimizes environmental impact. The program must require the following:

- Vacuum cleaners certified by the Carpet and Rug Institute "Green Label" Testing Program for vacuum cleaners and operate at sound levels of less than 70dBA (decibels).
- Carpet extraction equipment used for deep cleaning is certified by the Carpet and Rug Institute's "Seal of Approval" Testing Program for deep-cleaning extractors.

- Powered floor maintenance equipment operates with a sound level of less than 70dBA.
- Propane-powered floor maintenance equipment has high-efficiency, low-emissions engines and mufflers that meet California Air Resources Board (CARB) or EPA standards for engine size, and operate at a sound level of less than 90dBA.
- Automated scrubbing machines are equipped with variable-speed feed pumps and on-board chemical metering to optimize fluid use. In addition, they only use tap water with no added cleaning products.
- Battery-powered equipment uses environmentally preferred gel batteries.
- Powered equipment is ergonomically designed to minimize vibration, noise, and user fatigue.
- Equipment is designed with safeguards, such as rollers or rubber bumpers, to avoid potential of damaging building surfaces.

A log must be kept of all cleaning equipment which includes documentation of purchase. Not only will this credit aid in environmentally friendly cleaning, it will also minimize the impact that cleaners and cleaning has on historic materials and finishes.

IEQ Credit 3.5: Green Cleaning-Indoor Chemical and Pollutant Source Control: 1 Point

The goal of this credit is to reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants. These can have adverse effects on air quality, human health, building finishes, building systems, and the environment.

-Permanent entryway systems need to be employed (grilles, grates or mats) at least 10 feet long in the primary direction of travel to capture dirt and particulate matter from entering the building at all public building entry points, and create associated cleaning strategies for these areas.

-Provide contaminant drains plumbed for appropriate disposal of hazardous liquid wastes in places where water and chemical mixing occurs for laboratory purposes.

This will aid in cleaning of the building, while also limiting in the destruction of flooring materials (or slowing the destruction) by limiting its exposure to dirt and other potentially abrasive or staining elements.

# Appendix D: Applying LEED rating to existing buildings

IEQ Credit 3.6: Green Cleaning-Indoor Integrated Pest Management: 1 Point

The goal of this credit is to reduce building occupants and maintenance personnel's exposure to potentially hazardous chemical, biological, and particulate contaminants. These may adversely affect air quality, human health, building finishes, building systems, and the environment.

-An indoor pest management (IPM) plan must be established, developed, and maintained. It must manage indoor pests in a way that protects human health and the surrounding environment and that improves economic returns through the most effective, least-risk option. This includes using least-toxic chemical pesticides, minimum use of chemicals, use only in targeted locations, and use for targeted species. It must include the following components:

- Integrated methods, site or pest inspections, pest population monitoring, evaluation of the need for pest control and 1 or more pest control methods, including sanitation, structural repair, mechanical and living biological controls, and other nonchemical methods. If nontoxic options are unreasonable and have been exhausted, a least-toxic pesticide may be integrated.
- Specifications of what circumstances under which an emergency application of pesticides can be used in the building and on the surrounding grounds.
- A communication strategy directed to building occupants that addresses universal notification, which requires 72 hour advanced notice before a pesticide and 24 hours for an emergency application of a pesticide (other than the least-toxic pesticide), is applied in the building and on surrounding grounds.

Products used must meet the requirements of IEQ Credit 3.3.

The implementation of this credit will prove safer for building occupants and may also limit unnecessary costs associated with the over-use of pesticides.

# Appendix D: Applying LEED rating to existing buildings

**Innovation in Operations:**

Because strategies are constantly evolving and changing related to sustainable building practices, new technologies must continually be introduced. The goal of this section is to recognize projects for their innovative and exemplary building features or practices that generate environmental benefits beyond those expressed in the previous credits described.

IO Credit 1: Innovation in Operations: 1-4 Points

The goal of this credit is to provide building operations, maintenance, and upgrade teams with the opportunity to achieve additional benefit beyond those addressed in the previous credits.

Credit can be achieved through any combination of the following:

Path 1. Innovation in Operations (1-4 points)

-Achieving measurable, significant environmental performance using operations, maintenance or system upgrades not already described in the previous credits.

One point is awarded for each of the following, and no more than 4 points total may be earned through this path.

The following must be identified in writing:

- The intent of the proposed innovation credit
- The additional environmental benefit that will be delivered
- The proposed requirements for compliance
- The proposed performance metrics to demonstrate compliance and the approached used to meet requirements

The proposed requirements met during the performance period
Path 2. Exemplary Performance (1-3 points)

-Achieve exemplary performance in an existing LEED category (one of the credits already described).

-One point is awarded for each exemplary performance achieved, with a limit of 3 points.

Path 3. Pilot Credit (1 point)

Attempt a pilot credit available in the Pilot Credit Library: www.usgbc.org/pilotcreditlibrary

-Registration is required as a pilot credit participant, including completed documentation.

-Projects may pursue more than one pilot credit, but a maximum of 1 point may be earned.

# Appendix D: Applying LEED rating to existing buildings

This credit allows for flexibility on how to implement sustainability into existing buildings. It allows for the owners of historic buildings to take measures specifically tailored to their buildings' needs and allows for the LEED system to be further added to, modified, and creatively adjusted.

IO Credit 2: LEED Accredited Professional: 1 Point

The goal of this credit is to support and encourage the operations, maintenance, upgrade, and project team integration required by LEED to streamline the application and certification process.

At least 1 principal participant of the project team shall be a LEED Accredited Professional (AP).

Many historic preservation specialists are becoming LEED accredited, and it may be possible to find a professional in your area who can be a consultant for both LEED credit application and historic rehabilitation information. This would allow for a blending of both goals that could potentially save money.

IO Credit 3: Documenting Sustainable Building Cost Impacts: 1 Point

The goal is to document the total sustainable building cost impacts.

- Document overall building operating costs for the previous 5 years and track changes in overall building operating costs during the performance period

This will allow the U.S. Green Building Council to better understand the total impact that utilizing LEED credits can have on buildings. In addition, it can help building owners better understand how much money will potentially be saved in the future.

# Appendix D: Applying LEED rating to existing buildings

**Regional Priority:**

Regional environmental issues exist that require special attention at specific sites. The goal of this credit is to encourage design teams to focus on issues that are particularly important near a project site.

The USGBC (U.S Green Building Council) regional councils have identified distinct environmental zones within their areas and allocated 6 credits that address each zones' prioritized issues.

A project that earns a Regional Priority credit automatically earns 1 point in addition to any points awarded for that credit. Up to 4 points can be earned this way, with no more than 1 point per credit.

For more information about the Regional Priority credits for your region please see: www.usgbc.org

RP Credit 1: Regional Priority: 1-4 Points

The goal of this credit is to provide an incentive for the achievement of credits that address geographically specific environmental priorities.

-Earn 1 of the 6 Regional Priority Credits available in your area.

-One point is awarded for each Regional Priority Credit achieved. No more than 4 credits may be earned.

-Only valid on projects inside of the U.S.

This credit may be extremely valuable for historic structures because of the importance of historic local materials and local weather patterns on the wear of those materials.

# Appendix E: Additional Resources: Annotated Bibliography

**ENVIRONMNTAL SUSTAINABILITY**

"Cambridge City Hall Annex." Oikos: Green Building Source. 13 Feb 2004. Iris Communications Inc. 3 Mar 2009 <http://www.oikos.com/library/showcase/cambridge/index.html>.

This is a case study looking at an historic brick commercial building in Cambridge, Massachusetts. The building was admired for its aesthetic qualities, as well as its inherent Victorian minded functionality. The article describes how many of the features originally designed in the building (transoms, light wells, etc.) made the building worth saving and maintaining. It describes what parts had to go (some heavily deteriorated windows were repaired or replaced) and what was found (skylight which had been painted over were restored to create natural light). This audience for this source was broad, and could be easily understood if used as a case study.

Carroon, Jean. *Sustainable Preservation: Greening Existing Buildings*. Hoboken: Wiley and Sons, 2010.

This source provides a wide array of information relating to making existing buildings more sustainable. Information is broken into sections (ie. lighting, heating, and energy production), and information is accompanied with supporting case studies, a detailed glossary, and information on finding additional sources. Though technical at times, this source is a very valuable tool for understanding current sustainability trends and how they relate to preservation.

Craig, Kathryn. "Green Streets in Iowa". National Trust for Historic Preservation. *Main Street Now*, March/April 2010.

This source, an article from a periodical targeting preservation-minded individuals, provided valuable insight on two case studies. Woodbine and West Union Iowa both utilized Main Street (and additional) funding to provide energy audits to business owners in their downtowns. The information gathered was then used to help business owners make targeted changes to their buildings that would make the biggest impact for the least money, while also keeping in mind the character and individuality of each building. The article looks at skepticism from owners, how funding was acquired, documents actual money savings that was seen, and would be approachable to a board audience. This source is also going to provide for valuable case studies to be utilized later.

Frey, Patrice. "Making the Case: Historic Preservation as Sustainable Development". October 2007. National Trust for Historic Preservation. 5 November 2011 <http:// www.preservationnation.org/ issues/sustainability/additionalresources/ DiscussionDraft_10_15.pdf>.

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**ENVIRONMNTAL SUSTAINABILITY**

This source is very good at breaking down the holistic approach associated with 'green' preservation. The author begins with an overview of many misconceptions about what is 'green' and then breaks down the environmental, economic and social sustainability of preservation practices. Many great sources can be gained from this paper, along with information on life-cycle analysis, window restoration, preservation job creation, and the need for psychological well-being. It is a very good introduction to the subject, covers many approaches, includes useful sources, but does not go into great depth on any one subject. The audience is focused on preservation minded people, and has a preservation bias.

"Green Home Tips." Preservation Magazine Jan/Feb (2008): 1.

This source is extremely helpful for seeing how preservation goals and energy efficiency goals can be paired to utilized to help homeowners. Tips are broken down by areas of the home, including windows, insulation, chimneys, doors, etc. There is a helpful visual, along with very user friendly information that one could utilize without a preservation/architecture background. This is a good case study for how preservation best practices can be targeted to business owners, who also probably don't have a background in preservation/architecture.

*The Greenest Building.* Directed by Jane Turville. Gladstone, OR: Wagging Tale Productions,

2011. DVD, 60 min.

This movie, which looks at the holistic approach to preservation sustainability, was directed and written in a way that allows it to be accessible to all people in all fields. The way that issues are described, with information from many important sources working with the topic today, allows for the viewer to get an idea of the issues, and an overview of misconceptions. The movie does not go into great depth about any one area of preservation sustainability, but it does introduce the topic very well. In addition, it can be used as a valuable source for seeing how information can be presented in an unbiased (mostly), straight forward way.

Historic Chicago Bungalow Association. "Windows: Cost & Savings of Window Rehab Choices."

Bungalow Brief 12 (2006): 1.

The Historic Chicago Bungalow Association is a non-profit organization with the goal of preserving Chicago Bungalows. They have created briefs and guidelines that help bungalow owners better understand the realm of preservation. Several tips are given on increasing the efficiency of well-maintained windows and their cultural and historic importance. One shortcoming of this article is that it has such a narrowed focus, and following of proud home owners, that it is less applicable when looking at ways to disseminate information to owners who may not even know that their building is historic.

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**ENVIRONMNTAL SUSTAINABILITY**

"How to Find and Avoid Toxic Vinyl (PVC) in Your Home." GreenPeace USA. 28 May 2003. GreenPeace. 14 February 2009. <http://www.greenpeace.org/usa/news/how-to-find-and-avoid-toxic-vi>.

This source is very valuable for understanding how prevalent vinyl is in many aspects of our lives. The article focuses on construction and breaks down the information on a user friendly level, while maintaining integrity by presenting facts and scientific data. The article makes it clear that even though the manufacturing, and decomposition of these disposable materials is toxic to both the planet and ourselves, manufacturing companies do not make those facts clear when they try to promote their product as 'green'. This article will prove very helpful for showing exactly why preservationists need to go to the source, building owners, because they are more likely to find misleading data from profit-seeking companies.

James, Brad, Andrew Shapiro, Steve Flanders and Dr. David Hemenway. "Testing the Energy Performance of Wood Windows in Cold Climates." A Report to the State of Vermont Division for Historic Preservation. 30 August, 1996. www.ncptt.nps.gov/PDFfiles/1996-08.pdf

This source is a case study that looked at the energy efficiency and cost balance between multiple options when renovating old windows. Storms, double glazing and basic maintenance options like weather-stripping were all looked at, and the data showed that renovating, depending on the condition of the existing window, would always be cheaper than replacement, and that there are many options available. They also broke down the life-cycle analysis of historic windows versus replacement windows, and talked about how the choice should always be made with multiple viewpoints in mind, and that you should not listen to only one source. This source is helpful for seeing the dissemination of information, but it is still not very approachable by someone who does not have a preservation/architecture background, though it does provide many important facts and examples.

Kooles, Kimberly. National Trust for Historic Preservation. "Adapting Historic District Guidelines for Solar and Other Green Technologies." 2009. http://www.preservationnation.org/issues/sustainability/solar-panels/additional-resources/NTHP-Forum-Article-2009-Solar-and-HD.pdf

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This source broke down exactly how this sensitive topic needs to be addressed. Historic Preservation and sustainability have the ability to come together to create change, and that will not happen without practical advice like that found in this article. Interesting new technologies are discussed, including their pros, cons, and areas where further research needs to be done, one example is photovoltaic shingles. Though they are still very expensive, they have a very long life (+40 years) and look like slate (which may be a good fit for specific structures). The article stresses that even though new technologies need to be utilized, the long range effects on the integrity of the property needs to be addressed. For example, though the photovoltaic shingles appear to be a great idea, we still know very little about how they are going to affect the structural integrity of older roofs. The audience for this article was general, but it may come off as too technical for someone with no experience in preservation/architecture.

Kwok, Alison G., and Walter T. Grondzik. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Oxford: Architectural, 2007.

This source is incredibly valuable for understanding 'green' design trends being taught to architecture students today. The textbook only looks at environmental sustainability, and is more designed for someone planning a new project, but still has many helpful design ideas that could be utilized by preservation minded projects. The authors do not look at incorporating their ideas into existing buildings, but many of the tools described are still very valuable, and have a range options to look at. For example, a water catchment system could be utilized by an existing building with their existing roof, but the book then goes on to describe many water catchment systems, many of which are very expensive and require excavation (and would probably alter the fabric of the existing building more). A very helpful segment of this book is the glossary in the back. The authors break down many of the major 'green' rating systems used today, along with many technical terms and materials being utilized in 'green' projects. Thus, this source is valuable for gathering information, but not for witnessing its dissemination.

Maryland Department of Housing and Community Development. "Going Green Downtown Guide: A Sustainability Guide for Maryland's Main Streets." 2011. http://www.mdhousing.org/websiteDocuments/green_guide.pdf

This source looks at the ecological and economic impacts of new construction versus rehabilitation. The no-nonsense, to-the-point approach is very effective. The article talks about green roofs, LEED certification, recycling, and water conservation. Interesting downtown-wide implementations are discussed, including pocket parks, drainage, motion sensing lights, etc. One point made was that downtowns need to rally support from all sides, and be vocal and present in the community. The link with local products and services is also utilized.

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For example, for every $100 spent at a chain store $14 is invested back into the community, but for every $100 spent locally $45 is invested back in the community. The audience being targeted is business owners and citizens who already have a vested interest in their community. The article has a preservation biased voice.

Mattinson, Bill, Ross DePaola, and Dariush Arasteh. "What Should I do About My Windows?"

Home Energy July/Aug (2002): 24-31.

This source is very good for understanding the holistic approach to deciding to renovate or replace historic windows. Energy saving, comfort, condensation, installation cost, and aesthetics are just a few of the things that the article urges you to consider before making such a drastic move. Technical information is presented through a software program that looks at the home energy costs of various types of windows. Energy costs are also broken down by window type, which is a very user friendly tool. The audience for this article, by nature of the most likely reader of this periodical, is someone already interested in energy efficiency, but the information presented is still very clear and approachable.

Myers, John H. "Preservation Brief 9: The Repair of Historic Wooden Windows." National Park

Service Preservation Briefs. Washington D.C.: 1981.

This technical brief is essential for understanding the National Park Services stance of wood window maintenance, repair and importance. Though it is full of incredibly useful, hands-on information it is not necessarily very user friendly, and should be used as a guiding tool once preservation has already been chosen as the best option. A building owner who doesn't have a great deal of experience learning about preservation sustainability issues may need to supplement this source with additional information.

Sedovic, Walter, and Jill H. Gotthelf. "What Replacement Windows Can't Replace: The Real Cost

of Removing Historic Windows." APT Bulletin: Journal of Preservation Technology 36.4

(2005):25-29.

This source looks at the issue of historic window replacement from a holistic approach. The author discusses the topics of embodied energy, environmental costs, u-factor analysis and performance of multiple window types, lowered maintenance costs, and long-term value and energy savings. It is also stressed that the issue is, more often than not, not even an issue of the windows themselves, but of air infiltration.

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**ENVIRONMNTAL SUSTAINABILITY**

Storm windows, double insulated glass, and low-emissivity glass coatings are all looked at as options before considering a complete replacement. Lastly, the author touches on the issue of aesthetics, which is less important to some property owners, but is still important to bring up for a well-rounded discussion. This source targets preservation minded people, but much of the information could be re-worded to target building owners without a preservation background.

Smith, Baird and Carl Elefante. "Sustainable Design in Historic Buildings: Foundations and the Future." APT Bulletin. Vol. 40, No. 3/4 (2009). Pg. 19-26.

This source talks about the history of Historic Preservation's connection with sustainability. The story begins with the Oil Embargo of 1973, and looks at many great energy savings options that have been developed and discovered in the past thirty or so years. The article talks about the inherent value of the infrastructure around downtowns and also talks about the benefits of sustainable growth. What I like about this article is that it is very broad and covers a great time period, but none of the issues brought up are very well developed, and quantitative data is not supplied. This article is good for an introduction to the topic and has lots of topics that could be further researched, but by itself it offers only a superficial glance at the subject. Thus, it could be related to by a general audience, but alone does not develop the subject fully.

"Sustainable America: A New Consensus for the Prosperity, Opportunity and a Healthy Environment for the Future". President's Council on Sustainable Development. Feb. 1996.

This is one of many publications created under the Clinton Administration that states the US Government's view on and goals for making America more sustainable. It outlines ten goals for a sustainable future which closely align with the holistic approach to sustainability taken by many preservation professionals. The goals are broad but one key connection is the need to preserve America for future generations. This aligns very closely with the goals of the NHPA of 1966. Many of the goals talk about economic, environmental and social sustainability, and goal 6 emphasizes the need for healthy community spaces. This information will be helpful when showing precedence for the need to become sustainable, and shows validation for the holistic approach being promoted. The source was also designed for a general audience.

Yagid, Rob. "Should Your Old Wood Windows be Saved?" Fine Home Building. April/May 2010, pg. 40-43.

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**ENVIRONMNTAL SUSTAINABILITY**

This source is a very user friendly guide that helps break down myths and misconceptions about historic windows. The guide directs readers to look at the condition and integrity of their existing windows, while also keeping in mind that you cannot believe everything a manufacturer tells readers. In addition, the article has a problem/solution approach that urges readers to look at the source of issues, which may be small, life-extending treatments that could save thousands of dollars. This source is a very good example for how to reach property owners, while also giving them enough information for your facts to be believable.

**ECONOMIC SUSTAINABILITY**

Biran, A. *Segmenting Future Visitors to Heritage Sites: Perceptions, Motivations, and Expectations.* University of Negev: Department of Hotel and Tourism Management (2005).

This paper looks at the motivations and expectations of heritage visitors and the implications of these two factors in heritage tourism. Heritage tourism plays a significant role in the economic support of preservation, and this article adds to knowledge previously lacking in the field on how people choose sites to visit, and what makes them likely to return. In the business world, a repeat customer is the best customer, and thus this information is key for understanding how to target an historic resource to others. This source has a very general audience and does not have a preservation bias.

Clark, David. "Historic Property Districts and Home Sale Prices: Evidence from the Sacramento Housing Market". *Review of Regional Studies*, vol. 27 no. 1, 1997.

Even though zoning and land use restrictions are often misconceived as expensive, time consuming, and limiting, this article shows that protective historic districts with associated protective land-use regulations do not hurt the value of the property. According to the author, designation increased the value of Sacramento properties, based on the author's gathering of information in the field. The audience for this article targeted real estate professionals, but could easily be understood by the general public, and lends credibility to the economic sustainability of preservation.

Cuti, Celeste. "Rehabilitation Best Practices of Portland Commercial Properties." MS Terminal Project, University of Oregon, March 2011.

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**ECONOMIC SUSTAINABILITY**

This terminal project was done from the perspective of a Historic Preservation student with the intended audience of developers and building owners in the Portland area. Though much of the information provided could be utilized in other cities and states, this project is focused on Portland. The author shows in a multi-step guidebook how a preservation re-development project can be framed. Players, financial avenues, tenant procurement, and many other issues are described. This project is very helpful for seeing how a booklet aimed at reaching building owners could be laid out most effectively. The aim of the project, which is towards multi-million dollar projects on protected properties, is more limited than i plan on being, but does have a very user-friendly appeal. Many of the logistical organizational elements of this thesis could be utilized as a model for information dissemination.

Glisson, Linda, Luke Vanbelleghem and Carl Hoffman. "Incubators: Nurturing Small Business Growth." *Main Street News* 210 (September 2004): 1-10.

This source looks at how historic resources can be used for small business development. There are multiple examples, and each talks about how lessening the startup costs of the company was crucial. Financing and results are discussed that help show the value of historic resources for small businesses. The article does have a preservation bias, as it comes from a source that promotes preservation practices.

Narwold, Andrew, Jonathon Sandy, Charles Tu. "Historic Designation and Residential Property Values". *International Real Estate Review 2008*, vol. 11 no. 1.

This article, written from the perspective of real estate agents, shows through a succession of previous case studies and the authors' own case study that homes designated as historic tend to have higher property values. The focus is almost entirely on residential, and does not look at commercial. The source describes the Mills Act in California, where property owners are able to save on average 49% on property taxes. What the source also shows is that the tax incentives alone are not the only reason why the value of the buildings had risen (on average about 17%). The audience for this source is real estate professionals, but is still very helpful as a focused study within the real estate field.

Oregon Main Street. "Annual Report." 2010.

http://www.oregon.gov/OPRD/HCD/SHPO/docs/OMS-2010annlRpt.pdf?ga=t

# Appendix E: Additional Resources: Annotated Bibliography

**ECONOMIC SUSTAINABILITY**

This report looks at the economic benefits of preservation. These include job creation, tax revenue and community pride. According to the reading, preservation can increase property taxes, raise rents, increase sales, and bring in more income tax revenue. The report analyzes the multiplier effect of the money spent on preservation, and shows its long-range value. The remainder of the report is dedicated to showing positive examples of preservation in practice. Main streets around the state are recognized for their achievements over the past year, including Astoria's educational services and dedication to renting out the second-floors of downtown buildings. There are also many resources, assistance, and training described in the report, and it would be very approachable to many people.

Rypkema, Donovan. "Evaluating the Downtown Real Estate Opportunity". National Trust for Historic Preservation: 1987.

This source, written with a biased preservation perspective and targeted towards preservation and real estate professionals provides valuable insight into deciding whether a preservation project is feasible in a specific location. The publication goes step-by-step through the factors that need to be considered, and is meant to be a guide for city governments and business owners. Though the mode of information dissemination would not be applicable for my guide, this source does provide good information that could be re-worked in order to be explained to a more general audience.

Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide". Washington D.C.: National Trust for Historic Preservation, 1994.

Donovan Rypkema is perhaps the most valuable source currently available on the economics of historic preservation. He utilizes statistics, case studies, and explains resources that can be utilized to make preservation both economic and sustainable. He takes a holistic approach as well when talking about the impact on jobs, the environment and social connectivity and 'sense of place'. His work is more aimed at a preservation and development audience, but is written in such a way that it could be understood by a lay person interested in the subject. Thus, much of Rypkema's work can be used as a model for information dissemination.

Washington Department of Archaeology and Historic Preservation. "The Economic Benefits of Historic Preservation in Washington State: Summary Report." 2006. http://www.dahp.wa.gov/sites/default/files/EconomicDevStudySummaryReport.pdf

# Appendix E: Additional Resources: Annotated Bibliography

**ECONOMIC SUSTAINABILITY**

This source is very helpful for detailed facts on the benefits of preservation. Direct and indirect benefits are broken down, and jobs, taxes, local benefits, and community distinction are appreciated. Historic Preservation jobs bring in higher wage labor, give back more in taxes, and generate funds that on average stay closer to the community. The economic benefits are brought down to a personal level, and the reading would be very approachable to a business owner who does not have knowledge of preservation. This article too looks at the increased tax revenue, multiplier effect, and ability to utilize heritage tourism. Another interesting point is the inclusion of volunteer hours, and their economic impact. This is a very good point, as developers and for-profit groups aren't able to tap into that resource. The audience for this source was very general, and thus it can be used a s a good model for information dissemination.

**SOCIAL SUSTAINABILITY**

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Rypkema, Donovan. "The Economics of Historic Preservation: A Community Leader's Guide".

Washington D.C.: National Trust for Historic Preservation, 1994.

Donovan Rypkema is perhaps the most valuable source currently available on the economics of historic preservation. He utilizes statistics, case studies, and explains resources that can be utilized to make preservation both economic and sustainable. He takes a holistic approach as well when talking about the impact on jobs, the environment and social connectivity and 'sense of place'. His work is more aimed at a preservation and development audience, but is written in such a way that it could be understood by a lay person interested in the subject. Thus, much of Rypkema's work can be used as a model for information dissemination.

"Sustainable America: A New Consensus for the Prosperty, Opportunity and a Healthy

Environment for the Future". President's Council on Sustainable Development.

Feb. 1996.

This is one of many publications created under the Clinton Administration that states the US Government's view on and goals for making America more sustainable. It outlines ten goals for a sustainable future which closely align with the holistic approach to sustainability taken by many preservation professionals. The goals are broad but one key connection is the need to preserve America for future generations. This aligns very closely with the goals of the NHPA of 1966. Many of the goals talk about economic, environmental and social sustainability, and goal 6 emphasizes the need for healthy community spaces. This information will be helpful when showing precedence for the need to become sustainable, and shows validation for the holistic approach being promoted. The source was also designed for a general audience.

# Appendix E: Additional Resources: Annotated Bibliography

**HISTORIC PRESERVATION**

Historic Preservation League of Oregon. "Healthy Historic Districts." 2010.

http://www.historicpreservationleague.org/images/SpecRpt2010sm.pdf

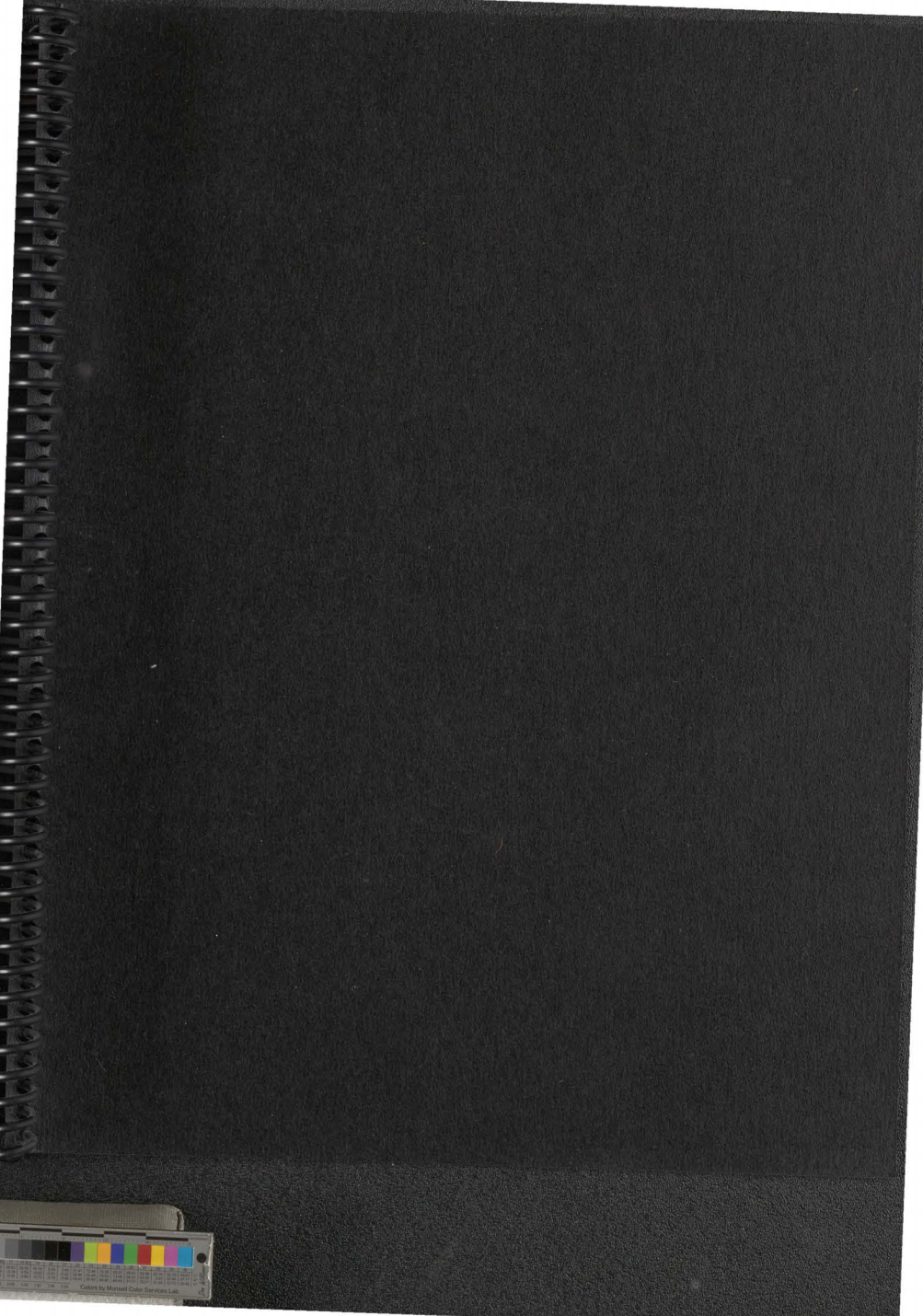
This source shows multiple perspectives on issues related to historic preservation and historic designation. The perspectives included business owners, preservationists, and other interested individuals. The article describes, in fairly general terms, how an historic district could go about implementing a preservation plan that includes everyone, has the ability to change and be molded, and has clear, consistent regulations. Many of the people involved realize how much the 'red tape' of preservation can lead to people ignoring the needs of their structure in order to avoid issues. The best point that the article made was that local business, and local craftsmanship are undeniably linked with preservation goals, and that preservation, 'green', and local need to come together. There are many good local examples, and the positive message of the article allowed me to begin thinking of ways to implement these plans on a local level.

"The Secretary of the Interior's Standards for Rehabilitation & Illustrated Guidelines on

Sustainability for Rehabilitating Historic Buildings." 2011. http://www.nps.gov/history/

hps/tps/download/guidelines-sustainability.pdf

This source was valuable on a practical level, and could be used as a guide by home or business owners. Topics include: looking at the inherently efficient aspects of your home that could be utilized, maintaining features before replacing, and easy ways to weatherize and insulate. Different energy collecting devices are discussed, including solar and wind. Instead of negating their uses, the article promotes utilizing them while maintaining the character of the building. I could not find weaknesses with this article, as it describes both how and why you should utilize original features, but the idea of gutting interior finishes as a preservation option could have potential downfalls. The audience, by nature of it being an NPS publication, is narrow, but a general audience would most likely understand the information described.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D50 Illuminant, 2 degree observer
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