# Historic Preservation and Sustainability Working Together!

Metropolitan Washington
Council of Governments
Environment and Energy Advisory
Committee – February 16, 2017

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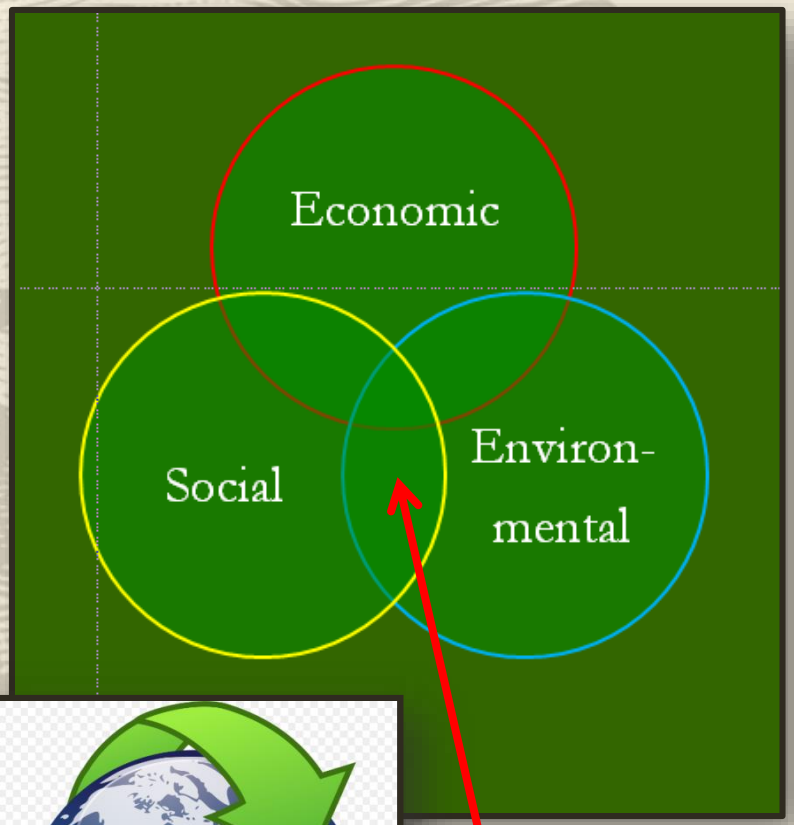
Technical Preservation Services
National Park Service
Washington, DC

The National Parks Service deals with the preservation of:

public property…

…and private property.

# Saving historic buildings is the best recycling program around!



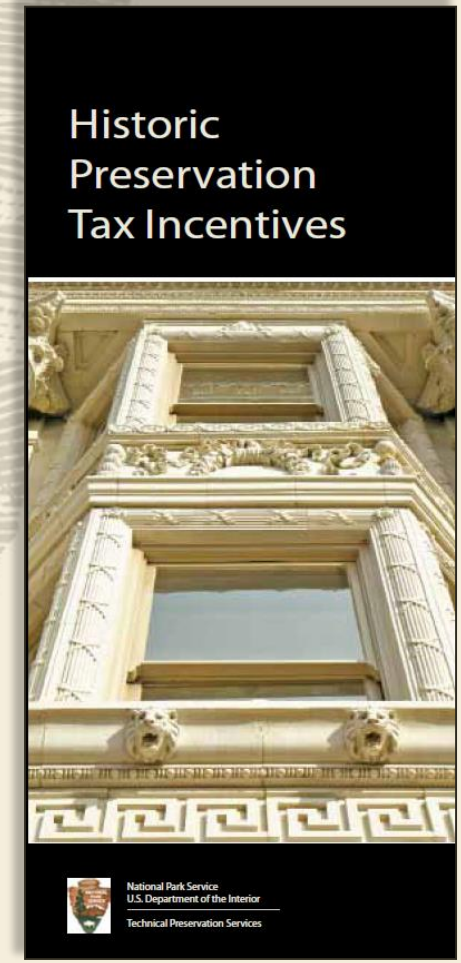

Historic Preservation

A common sense approach that:

- ✓ Saves energy by reusing what is already there (buildings and infrastructure).
- ✓ Preserves our cultural heritage.
- ✓ Stimulates the economy (a great community revitalization tool).

# Federal Historic Preservation Tax Credits

The Federal government offers financial incentives to private property owners for saving eligible historic buildings.



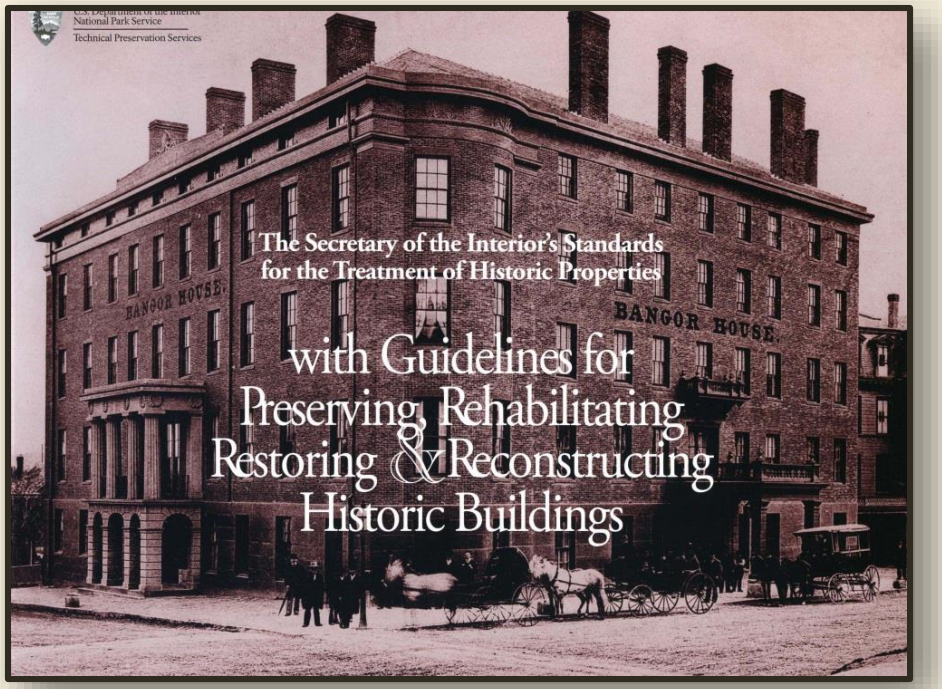

## FY 2015 at a glance

- 1,283 proposed projects and $6.63 billion in rehabilitation work approved
- 870 completed projects and $4.47 billion in rehabilitation work certified
- 85,058 jobs created by completed projects
- 8,096 new low and moderate income housing units / 23,569 new or renovated housing units overall

# Secretary of the Interior's Standards

4 Treatment Standards

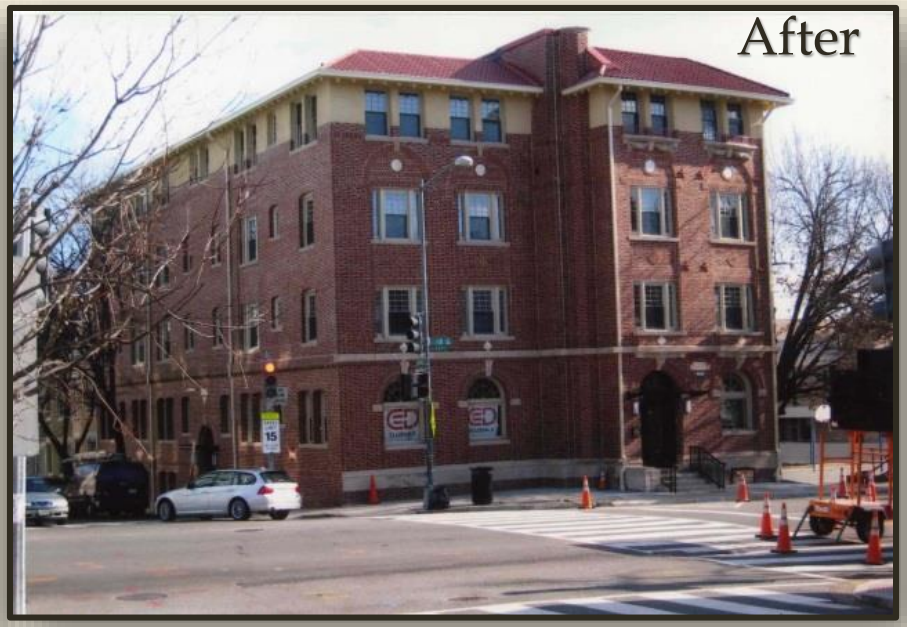
- Preservation
- ✓Rehabilitation
- Restoration
- Reconstruction




To be revised!!

# Rehabilitation Standards

- Apply to all properties, all building types, sizes, uses, materials.
- Apply to exteriors AND interiors.
- Apply to the building site and environment, landscape, attached and adjacent new construction.


The Sorrento Apartments - Washington, DC

# Meeting the Standards

- #1 – *Retain and repair rather than replace*; replace to match.

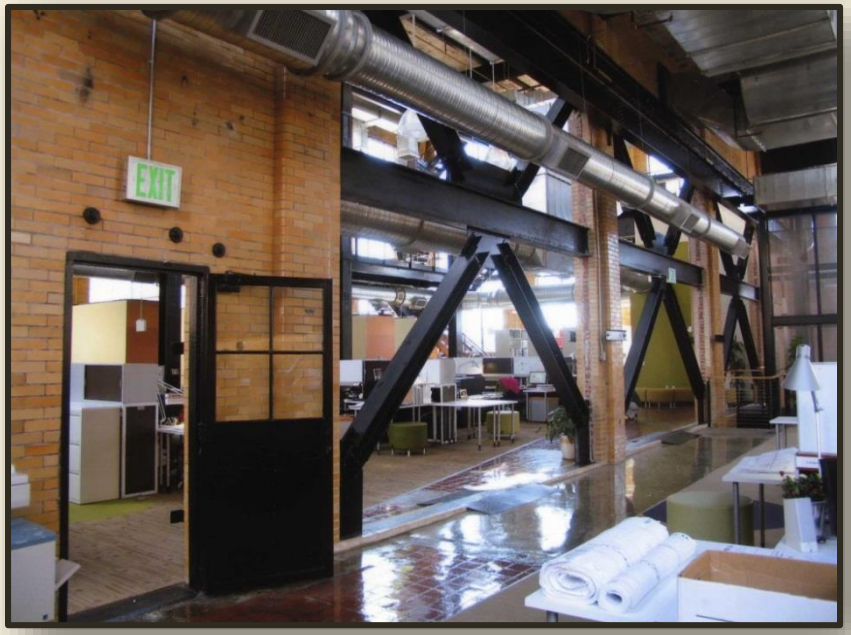
Howe Farm
Creamery Building,
VT

1694 House, Lincoln, MA

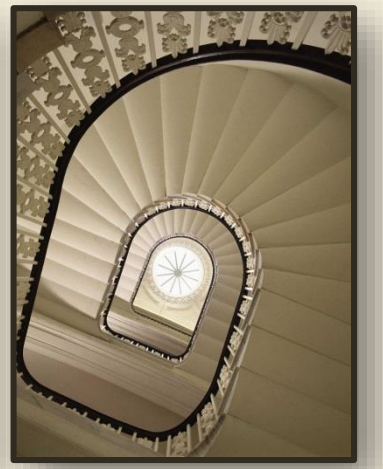
# Meeting the Standards

- #2 - *Retain historic character*, even when use changes.

Industrial Character



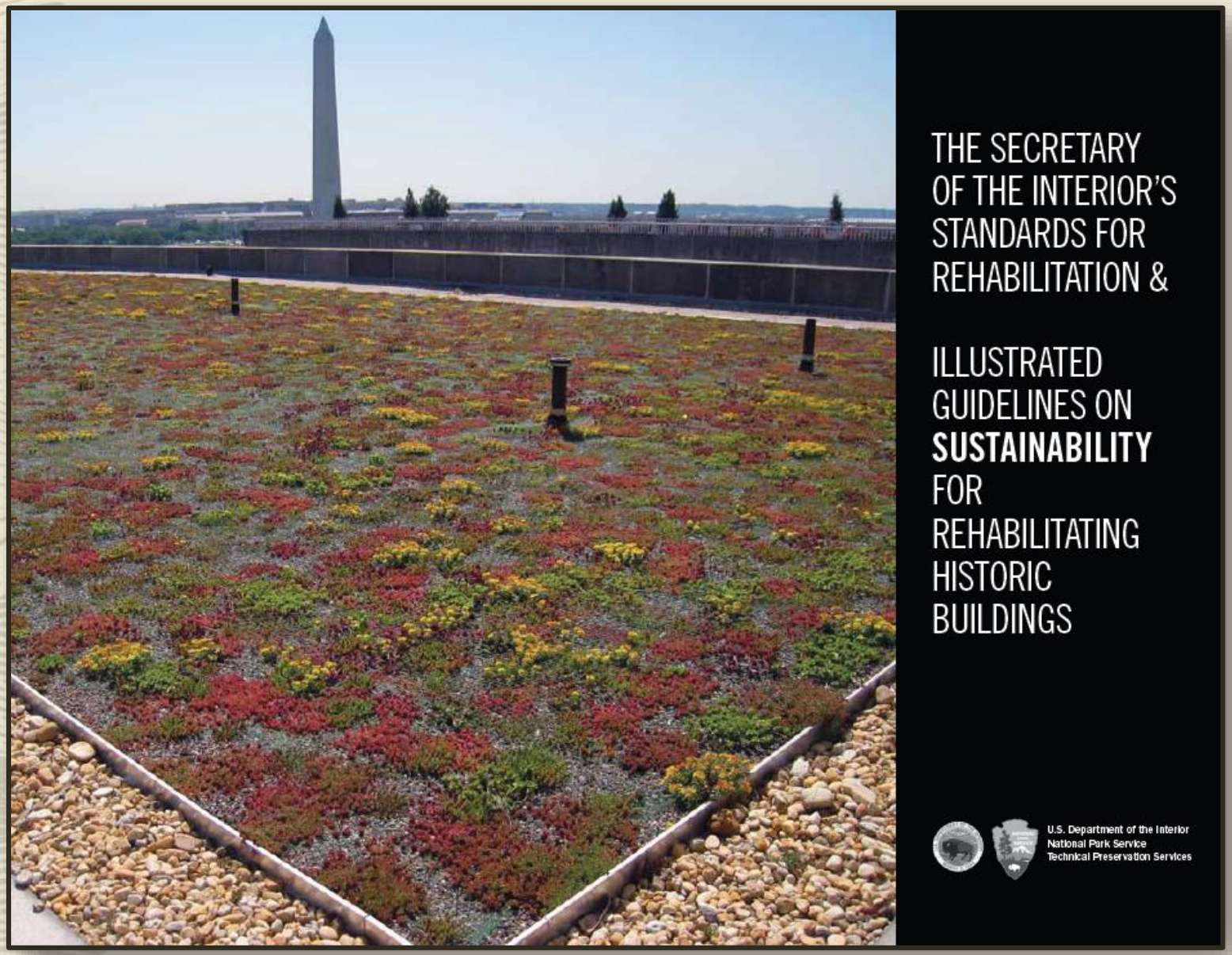

Finished Spaces



# Meeting the Standards

- #3 - *Design Compatible Additions.*

New addition




http://www.nps.gov/tps/sustainability.htm

44

**Recommended:** [44-45] A blower door test is a useful tool to help identify air infiltration in a historic building before undertaking weatherization or retrofit treatments. *Top Photo: Robert J. Cagnetta, Heritage Restoration, Inc.*

45

**Recommended:** [46] A hand-held infrared scanner reveals areas that are not well insulated and that allow heat transfer through the walls of a building.

46

**Recommended:** [47-48] Insulation should be installed first in unfinished areas such as attics, crawl spaces and basements of residential buildings.

## WEATHERIZATION AND INSULATION

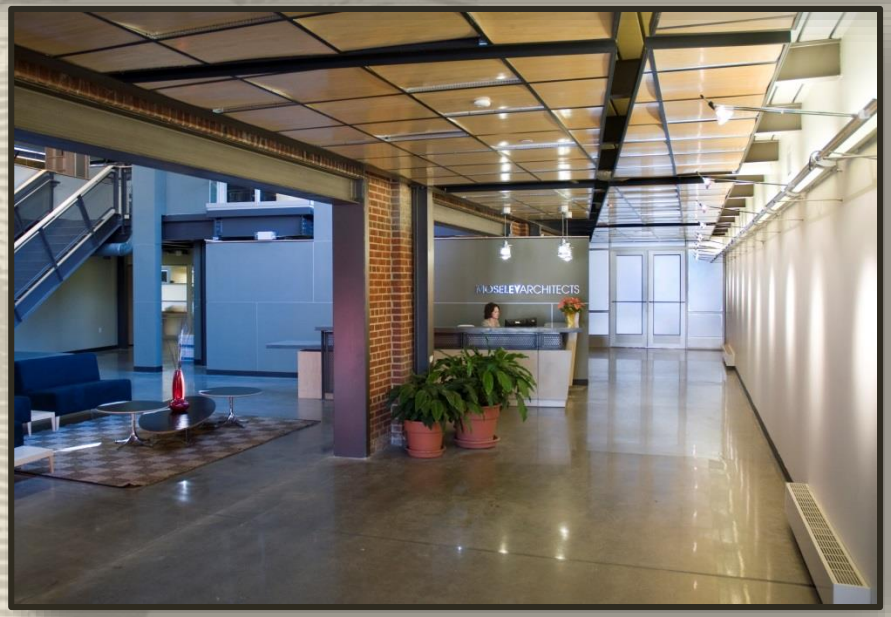
| RECOMMENDED | NOT RECOMMENDED |
|---|---|
| Using a variety of analytical tools, such as a comprehensive energy audit, blower door tests, infrared thermography, energy modeling or daylight modeling, to gain an understanding of the building's performance and potential before implementing any weatherization or retrofit treatments. | Implementing energy-retrofit measures without first diagnosing the building's performance and energy needs. |
| Developing a weatherization plan based on the results of the energy analysis of the building's performance and potential. | |
| Eliminating infiltration first, beginning with the least invasive and most cost-effective weatherization measures, such as caulking and weather stripping, before undertaking more invasive weatherization measures. | Undertaking treatments that result in loss of historic fabric, for example, installing wall insulation that requires removing plaster, before carrying out simple and less damaging weatherization measures. |
| Understanding the inherent thermal properties of the historic building materials and the actual insulating needs for the specific climate and building type before adding or changing insulation. | |
| Insulating unfinished spaces, such as attics, basements and crawl spaces, first. | Insulating a finished space, which requires removing historic plaster and trim, before insulating unfinished spaces. |

47

48

"Recommended"/"Not-Recommended" format

# Common Rehabilitation and Sustainability Issues

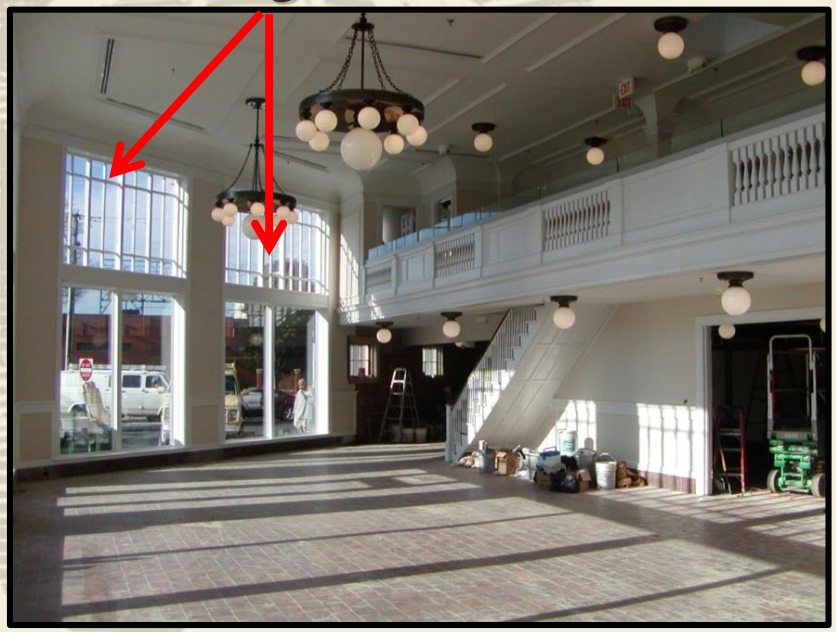

1700 Highpoint Avenue, Richmond, VA – LEED Platinum

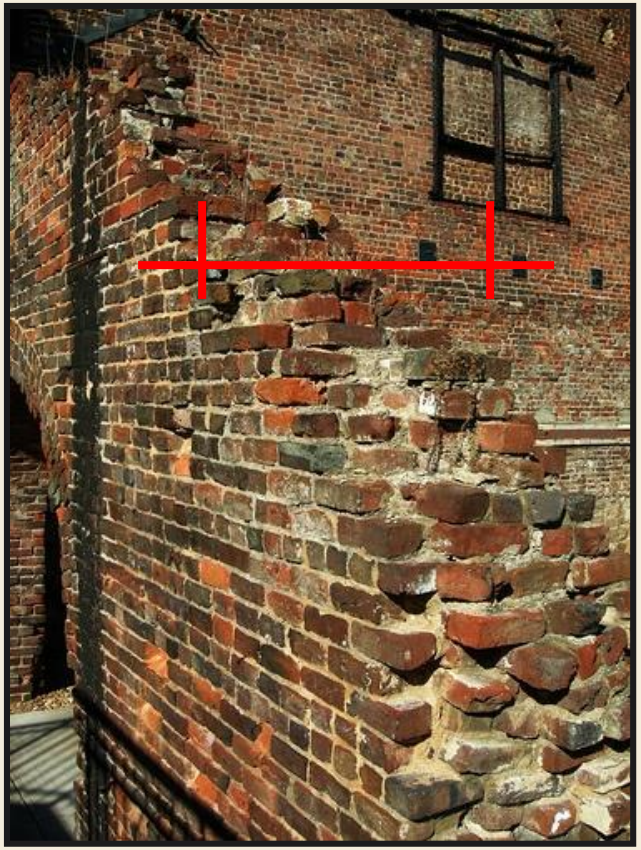
# Planning & Maintenance

Recommended:

- Integrated sustainability team - should include preservation professional.
- Analyze condition of inherently-sustainable features.
- Undertake regular maintenance. Repair durable historic materials.

Overhangs, operable windows & mature vegetation cool buildings.





Thick walls = insulation

# HISTORIC BUILDINGS ARE INHERENTLY SUSTAINABLE

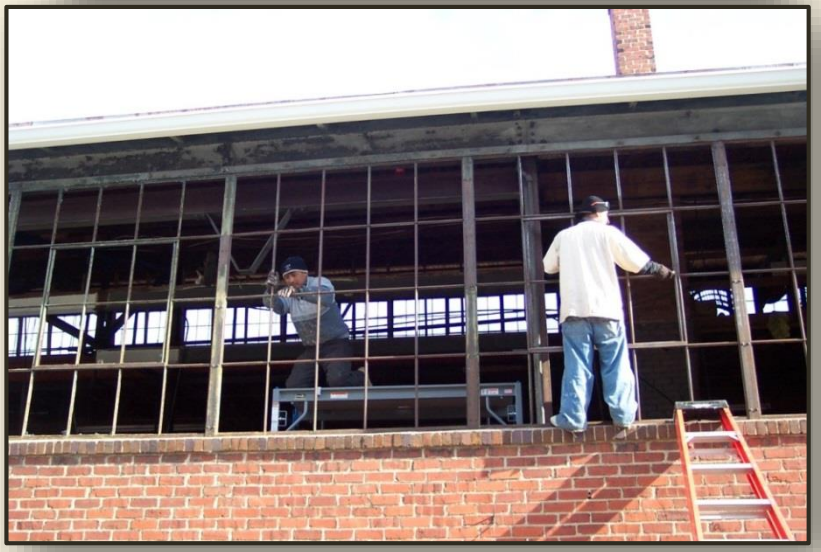
Large windows provide daylight.

# Planning & Maintenance

Not Recommended:

- Delaying maintenance, which may result in loss of fabric.
- Removing durable historic materials and replacing them with "greener" products.

# Windows



Retain and repair historic windows whenever possible…their energy efficiency can be bolstered!

# Windows

Recommended:

- Maintain windows on a regular basis, repair when deteriorated.
- Make weather tight w/ caulk, weather stripping
- Install storm windows
- When necessary, install compatible, energy efficient replacement windows.
- Maintain and repair existing transoms and shutters.

Historic window retrofitted for double-glazing



Historic storm windows

# Windows



Historic windows were protected over time by storm windows


Assessing storm window options

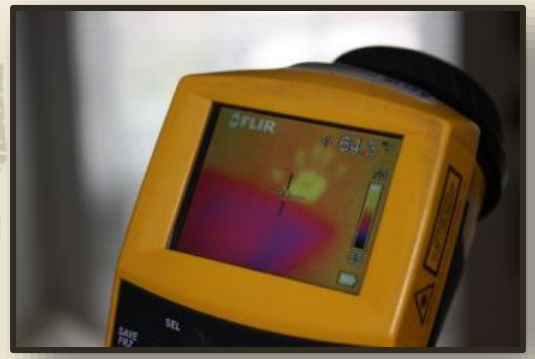
Greysolon Hotel, Duluth, MN

Installing new storm windows over *repaired* historic windows in this 1925 hotel prevented *hundreds* of windows from ending up in the landfill. The existing windows below the storms were in excellent condition.

# Weatherization & Insulation

Recommended

- Use tools such as energy audits and energy modeling.
- Develop weatherization plan.




# Weatherization & Insulation

Recommended:

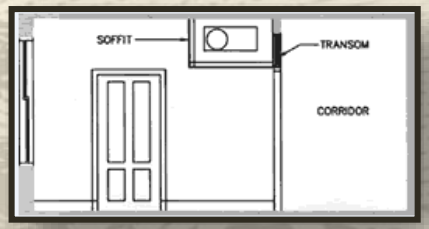
- Eliminate air infiltration first.
- Insulate in unfinished spaces, attics, basements and crawlspaces.

Not Recommended:
Installing insulation that results in a wall that is too thick and alters the relationship of the wall to the historic trim and windows.

# HVAC & Air Circulation

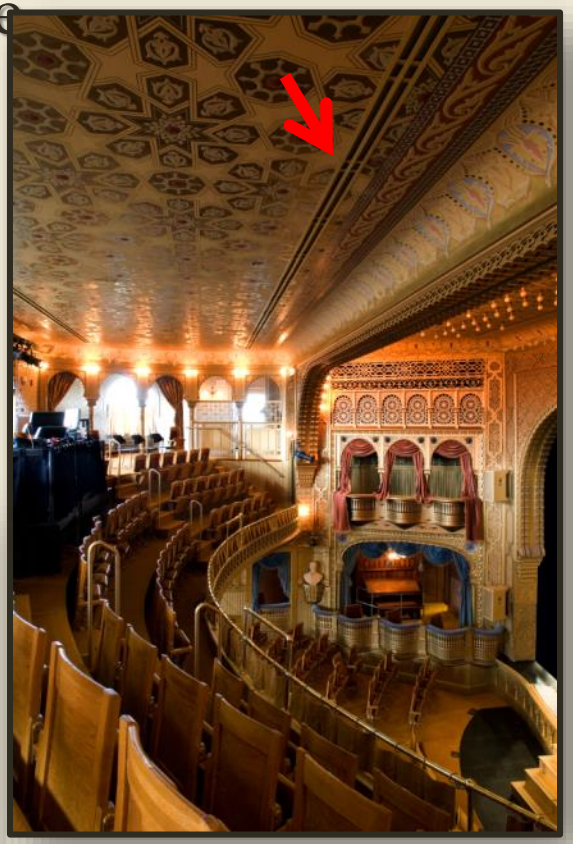
Recommended: Installing systems appropriate to the historic character.

Not Recommended: Installing systems that change character or damage historic fabric.




Incompatible duct installation.

Compatible duct installation in an industrial interior.



Sensitively installed (and hidden) duct system

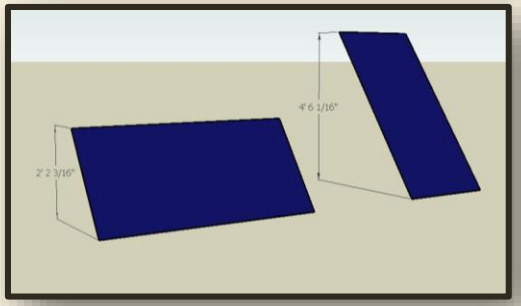
# Solar Technology

Recommended

- Installing solar devices in a compatible location on site, or on a non-historic building or addition. Installing low-profile devices to minimize visibility.

Low-profile solar panels installed on a large flat roof

Not recommended!



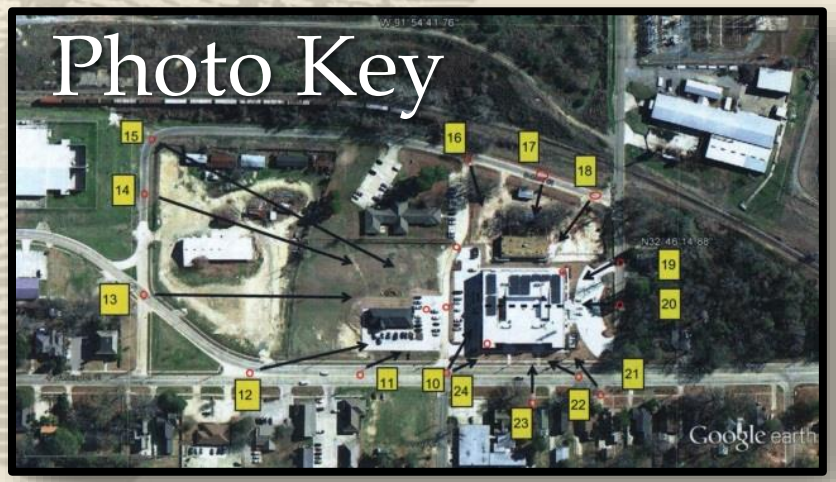
# Solar Technology

Recommended

- Constructing physical mock-ups to determine visibility of solar panels *prior* to installation.

  Mock-ups should be photographed from near and far.

  Exercise demonstrates solar panels will not be visible when installed.



# Solar: Inappropriate Installation

At left, solar panels are clearly visible from public view; angle of panels was lowered, which successfully reduced their prominence.

# Solar Technology

Recommended:

- Not changing the character of a property when placing solar panels.
- Not Recommended: Placing solar devices in highly visible locations where they negatively impact the property.

# Ground-mounted Array

# Roofs - Green

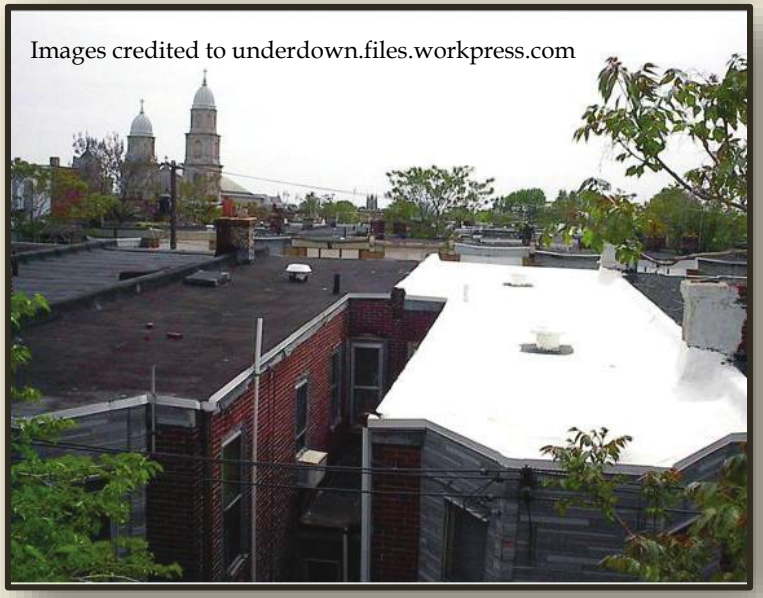
Recommended:

- Install green roofs on flat roofed buildings to limit visibility.
- Ensure historic building can accommodate added weight of green roof.
- Ensure roof is water tight and drainage systems functional
- Select appropriately scaled vegetation.


# Cool Roofs

Recommended:

- Install cool roofs on flat roofed buildings to limit visibility; white paint on gabled roofs is problematic.
- Ensure historic roof features – such as skylights – are not adversely affected.

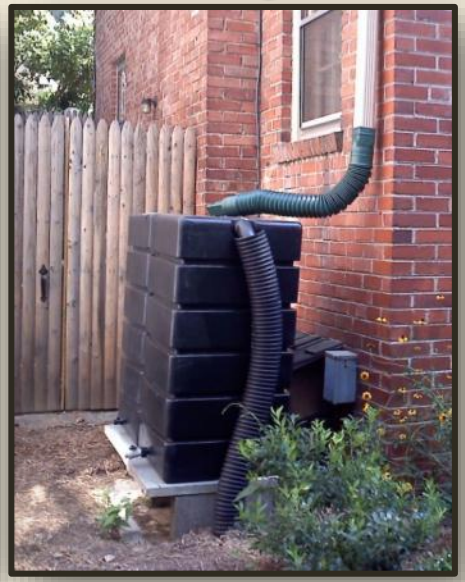


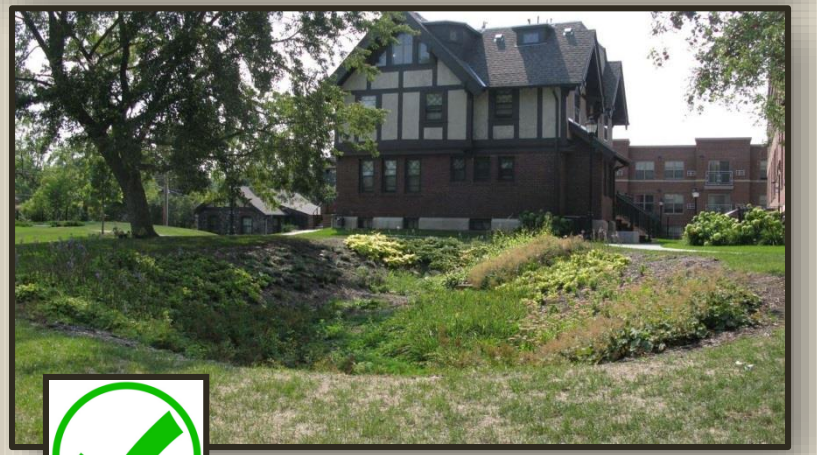
Images credited to underdown.files.workpress.com

# Site Features & Water Efficiency

Recommendations:

- Respect cultural landscapes and character-defining site features.
- When compatible, add bioswales, rain gardens, rain barrels, collection tanks and cisterns to enhance storm water management

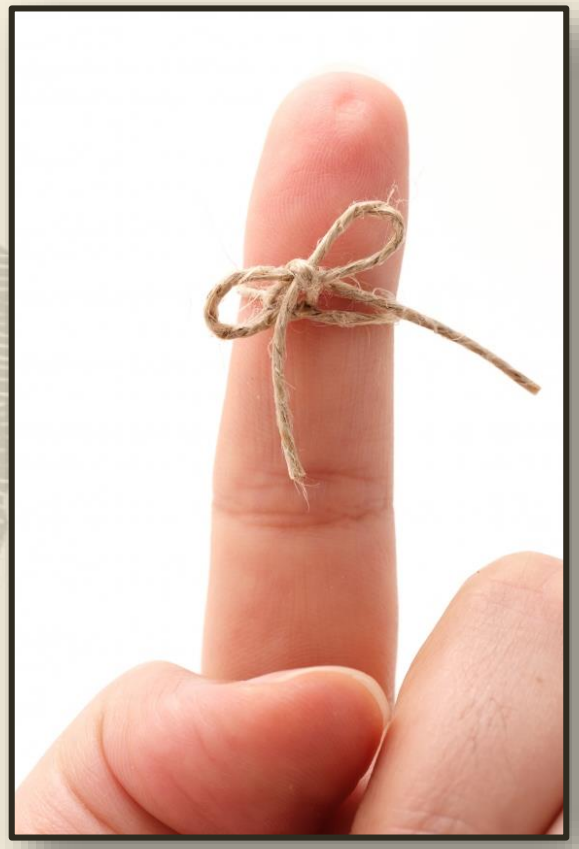




# New Wind Turbines

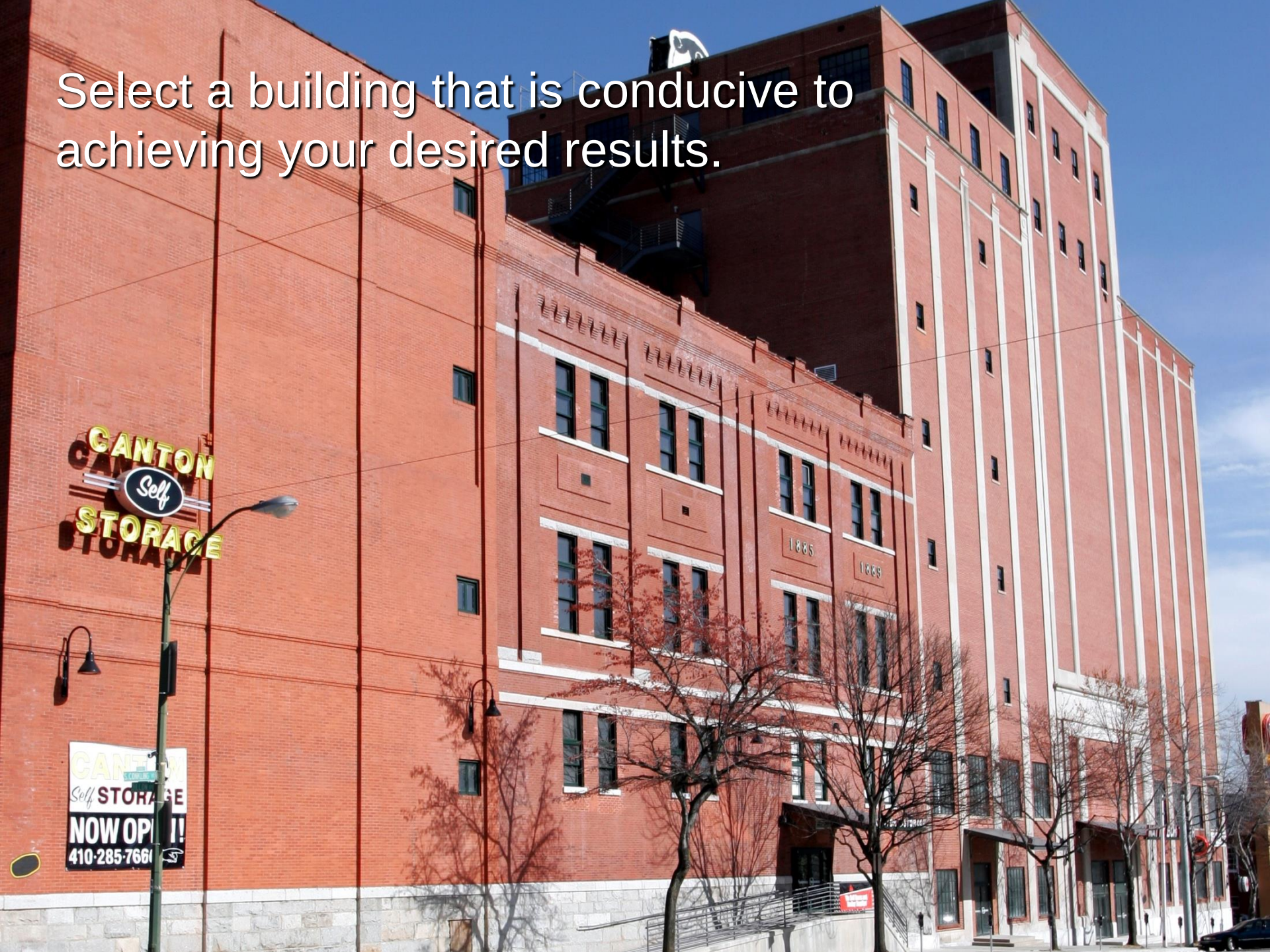
Most appropriate:

- At agricultural, industrial or utilitarian sites.
- Where there is precedent for turbines
- In areas with limited visibility.
- Located remotely from historic resources.
- When properly scaled to limit prominence.



A few more things to remember…

# Historic Preservation and Sustainability Recap!!


Select a building that is conducive to achieving your desired results.
CANTON
Self
STORAGE
1885
1889
Self STORAGE
NOW OPEN!
410-285-7660

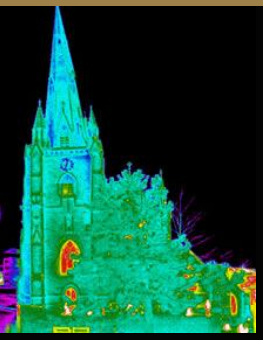
# Assemble an experienced project team…with a preservation professional present.

Preservation Consultants

Green Globes Personnel Certification

National Society of Professional Engineers®

Do your homework to understand the inherent green design features of the building and use them to your advantage.

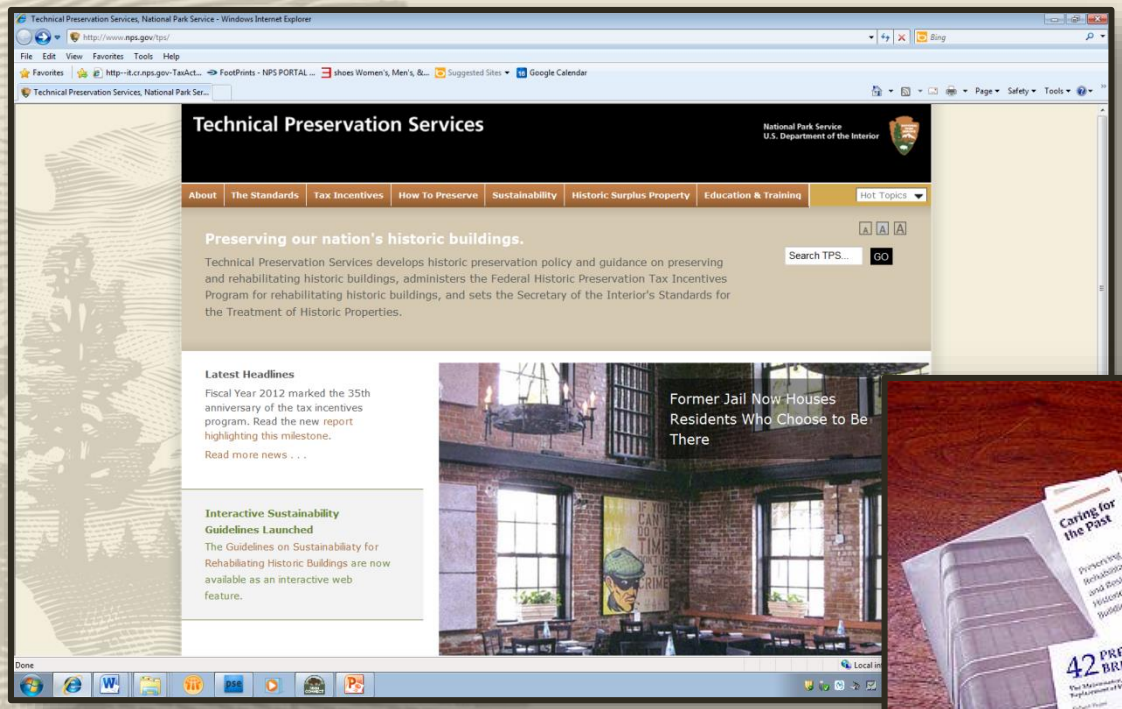


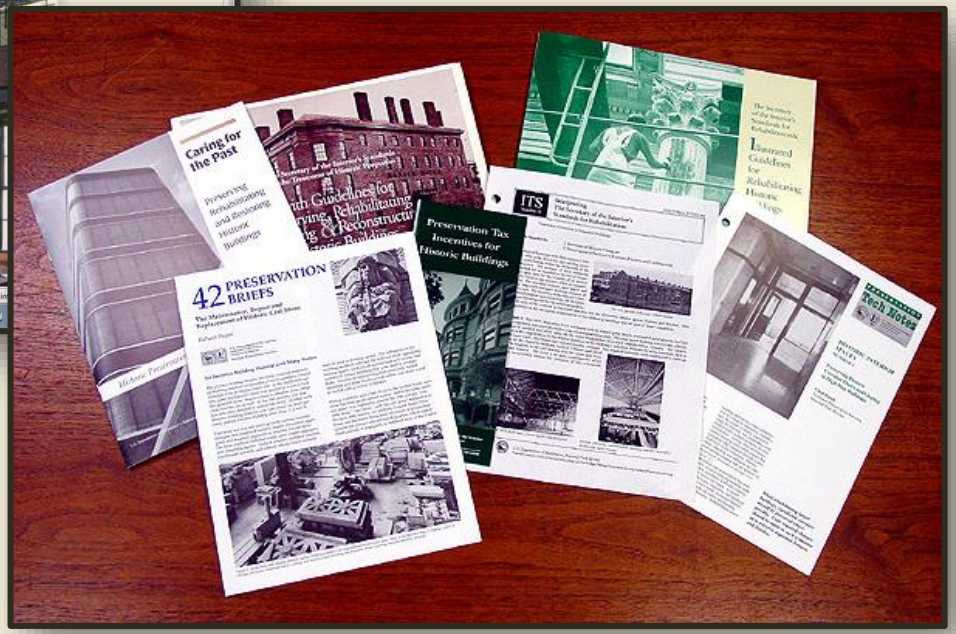
Make decisions based upon specific building characteristics by utilizing energy audits and models to evaluate costs vs. benefit.


Don’t “over-green” your historic building!

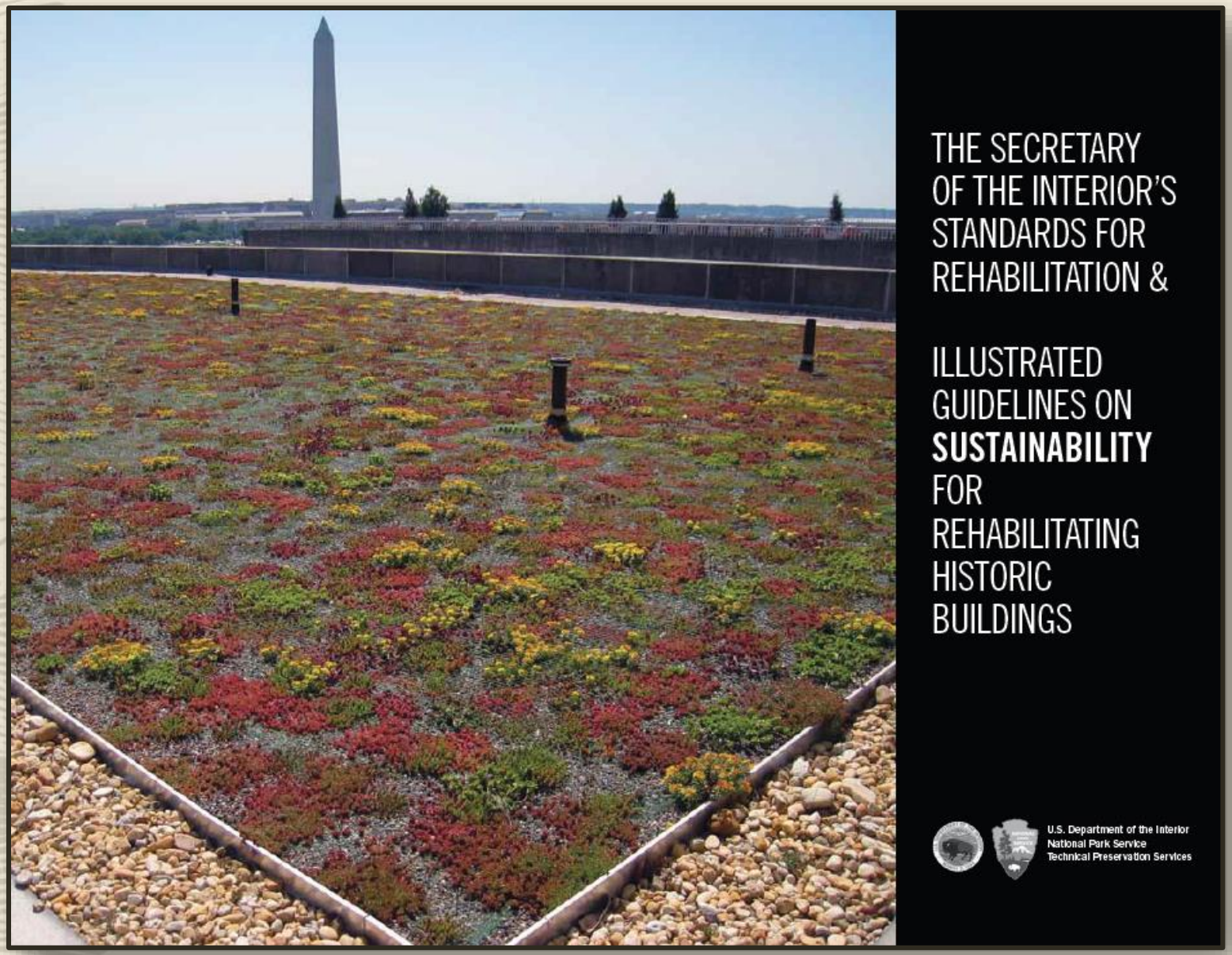

Educate contractors and sub-contractors about protecting the historic building and site.

# National Park Service Guidance




https://www.nps.gov/tps/sustainability.htm



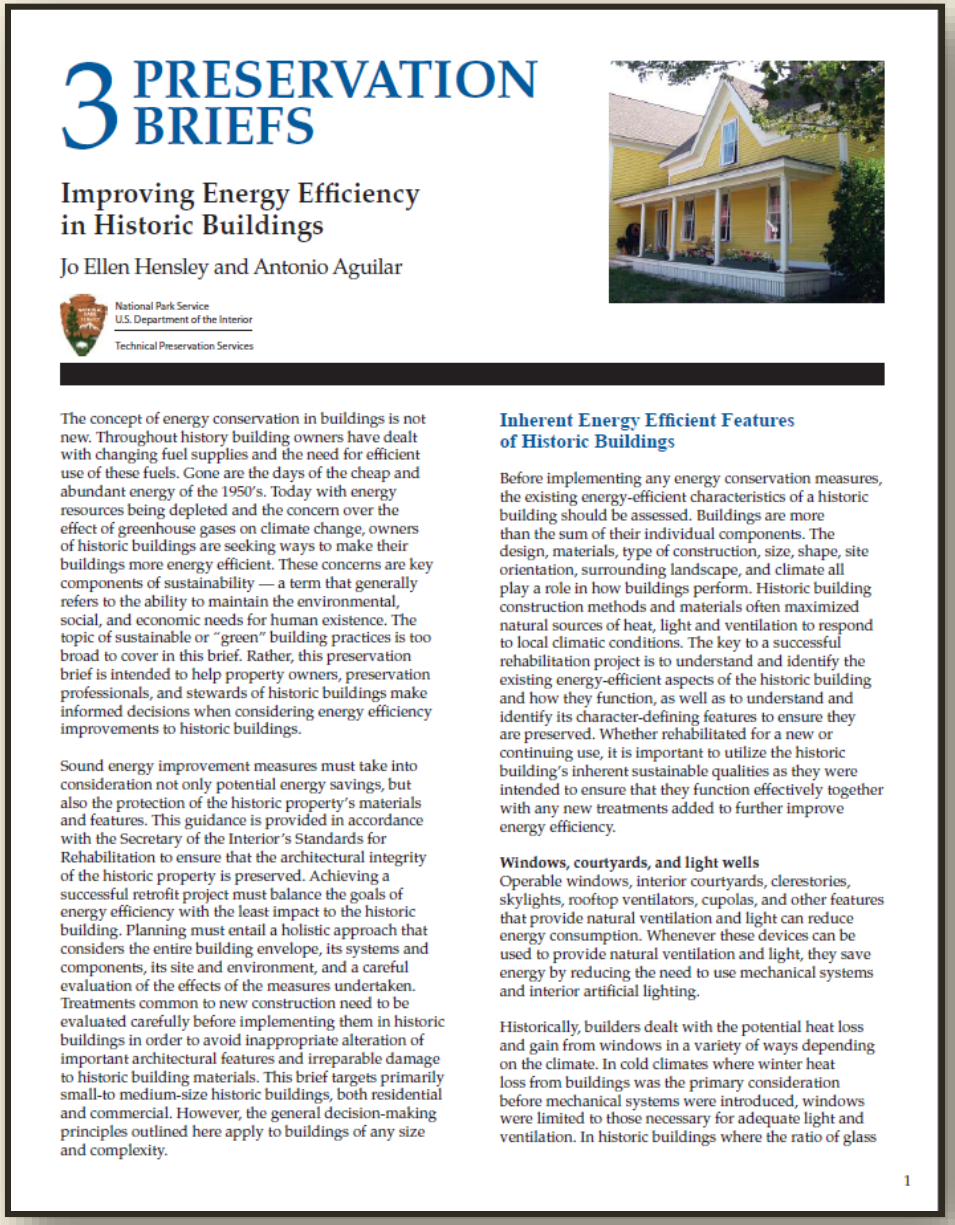

http://www.nps.gov/tps/sustainability.htm

# NPS Preservation Brief 3

Addresses:

- Inherently sustainable features
- Energy audits
- Improving energy efficiency
- Insulation

http://www.nps.gov/tps/how-to-preserve/briefs.htm



3 PRESERVATION BRIEFS

Improving Energy Efficiency in Historic Buildings

Jo Ellen Hensley and Antonio Aguilar

National Park Service
U.S. Department of the Interior
Technical Preservation Services

The concept of energy conservation in buildings is not new. Throughout history building owners have dealt with changing fuel supplies and the need for efficient use of these fuels. Gone are the days of the cheap and abundant energy of the 1950's. Today with energy resources being depleted and the concern over the effect of greenhouse gases on climate change, owners of historic buildings are seeking ways to make their buildings more energy efficient. These concerns are key components of sustainability — a term that generally refers to the ability to maintain the environmental, social, and economic needs for human existence. The topic of sustainable or "green" building practices is too broad to cover in this brief. Rather, this preservation brief is intended to help property owners, preservation professionals, and stewards of historic buildings make informed decisions when considering energy efficiency improvements to historic buildings.

Sound energy improvement measures must take into consideration not only potential energy savings, but also the protection of the historic property's materials and features. This guidance is provided in accordance with the Secretary of the Interior's Standards for Rehabilitation to ensure that the architectural integrity of the historic property is preserved. Achieving a successful retrofit project must balance the goals of energy efficiency with the least impact to the historic building. Planning must entail a holistic approach that considers the entire building envelope, its systems and components, its site and environment, and a careful evaluation of the effects of the measures undertaken. Treatments common to new construction need to be evaluated carefully before implementing them in historic buildings in order to avoid inappropriate alteration of important architectural features and irreparable damage to historic building materials. This brief targets primarily small-to medium-size historic buildings, both residential and commercial. However, the general decision-making principles outlined here apply to buildings of any size and complexity.

## Inherent Energy Efficient Features of Historic Buildings

Before implementing any energy conservation measures, the existing energy-efficient characteristics of a historic building should be assessed. Buildings are more than the sum of their individual components. The design, materials, type of construction, size, shape, site orientation, surrounding landscape, and climate all play a role in how buildings perform. Historic building construction methods and materials often maximized natural sources of heat, light and ventilation to respond to local climatic conditions. The key to a successful rehabilitation project is to understand and identify the existing energy-efficient aspects of the historic building and how they function, as well as to understand and identify its character-defining features to ensure they are preserved. Whether rehabilitated for a new or continuing use, it is important to utilize the historic building's inherent sustainable qualities as they were intended to ensure that they function effectively together with any new treatments added to further improve energy efficiency.

**Windows, courtyards, and light wells**
Operable windows, interior courtyards, clerestories, skylights, rooftop ventilators, cupolas, and other features that provide natural ventilation and light can reduce energy consumption. Whenever these devices can be used to provide natural ventilation and light, they save energy by reducing the need to use mechanical systems and interior artificial lighting.

Historically, builders dealt with the potential heat loss and gain from windows in a variety of ways depending on the climate. In cold climates where winter heat loss from buildings was the primary consideration before mechanical systems were introduced, windows were limited to those necessary for adequate light and ventilation. In historic buildings where the ratio of glass

# Weatherizing Historic Properties

Technical Preservation Services

National Park Service
U.S. Department of the Interior

About | The Standards | Tax Incentives | How To Preserve | Sustainability | Historic Surplus Property | Education & Training | Hot Topics

Home > Sustainability > Energy Efficiency > Weatherization

**Weatherization**

- Overview
- Energy Audit
- Modify User Behavior
- Develop a Plan
- Air Infiltration
- Windows & Doors
- Efficient Systems
- Install Insulation
- Efficient Appliances
- Shading Devices

**Did You Know?**

There are tax incentives available for improving the energy efficiency of your historic building. Not only could your project qualify for a historic preservation tax credit, but it may also be eligible for federal income tax incentives for energy efficiency. Learn more about these credits from the non-profit Tax Incentives Assistance Project.

## Weatherizing and Improving the Energy Efficiency of Historic Buildings

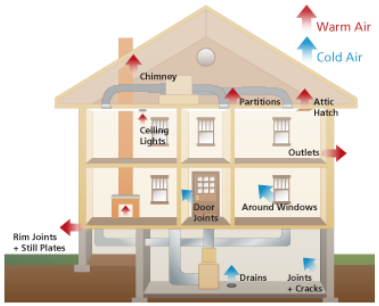
Weatherization means implementing cost-effective measures to make a building's envelope more energy efficient. Weatherizing a historic building requires undertaking those measures in ways that have minimal impact on the historic building's design and materials.

### Energy Audit

An energy audit should be undertaken before energy-improvement measures are implemented. The audit evaluates the building's current thermal performance and identifies any deficiencies in the building envelope or mechanical systems.

### Modify User Behavior

User behavior and climate have a great effect on energy use and should be considered before developing a weatherization and energy efficiency plan.




**Common Air Leaks**
Air infiltrates into and out of a home through every hole and crack. About one-third of this air infiltrates through openings in ceilings, walls, and floors.

### Develop a Plan

Developing a plan tailored specifically to your building, site, climate, and occupancy will be an effective tool in reducing energy consumption.

### Air Infiltration

Air infiltration is the exchange of air through cracks and gaps in the outside shell of a building. There are many simple, low-cost improvements that can reduce air infiltration in your historic building, such as caulking and weather-stripping.

http://www.nps.gov/tps/sustainability/energy-efficiency.htm

# Interpreting the Standards Bulletins

National Park Service
U.S. Department of the Interior
Technical Preservation Services

ITS
Number 52

Interpreting
The Secretary of the Interior's Standards for Rehabilitation

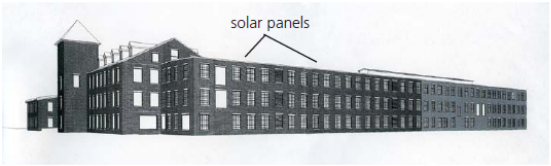
**Subject:** Incorporating Solar Panels in a Rehabilitation Project

**Applicable Standards:**
2. Retention of Historic Character
9. Compatible Additions/Exterior Alterations

**Issue:** Enhancing the energy efficiency of a historic building is important. To that end, it is often possible to install features such as solar panels and photovoltaic cells provided they are installed in a sensitive manner. Because these elements must be positioned to take advantage of unobstructed sunlight, the roof of a historic structure is an obvious location. The roofline of a historic building is often a distinctive feature. Therefore, the installation of solar panels should conform to guidance regarding rooftop additions, i.e. that they be minimally visible, to avoid altering the historic character of the building. Historic buildings with a flat roof or parapet can usually accommodate solar panels because the panels will be hidden, while properties with a hipped or gabled roof are generally not good candidates for a rooftop solar installation. Solar panels on historic buildings should not be visible from the public right of way such as nearby streets, sidewalks or other public spaces.

In circumstances where solar collectors are not placed on rooftops, they should only be positioned in limited or no-visibility locations in secondary areas of the property. Vegetation or a compatible screen may also be an option to further reduce the impact of these features on a historic property. For some historic buildings, it may not be possible to incorporate solar panels and meet the Secretary of the Interior's Standards for Rehabilitation.

**Application 1** (*Compatible treatment*): The rehabilitation of this mid-nineteenth century mill incorporated a large, roof-mounted photovoltaic installation. Although the historic building does not have a parapet wall at the roofline, the height of the building and the arrangement of the panels render the entire installation invisible from the ground. It is important to note that the panels are placed horizontally. Had the panels been installed with a vertical tilt, the angle required to maximize efficiency would have caused the panels to extend significantly higher above the roof. Simply changing the direction in which the panels are tilted can affect their visibility and reduce their impact




*Because of the size of this historic mill, a large array of solar panels could be installed on the flat roof without being seen from the ground.*

Solar Panels

Green Roofs

...nterior
...ervices

Interpreting
The Secretary of the Interior's Standards for Rehabilitation

Installing Green Roofs on Historic Buildings

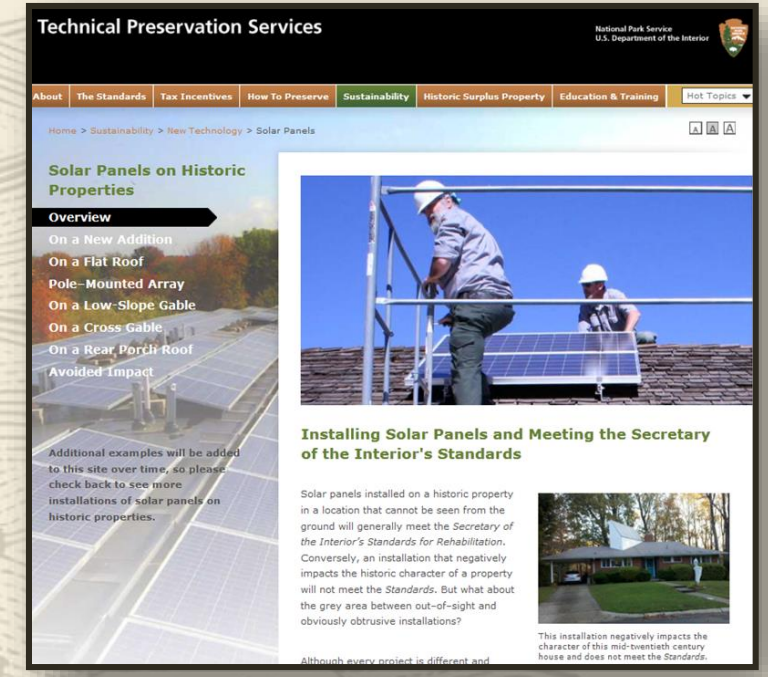
...ards:
2. Retention of Historic Character
9. Compatible New Additions/Alterations
10. Reversibility of New Additions

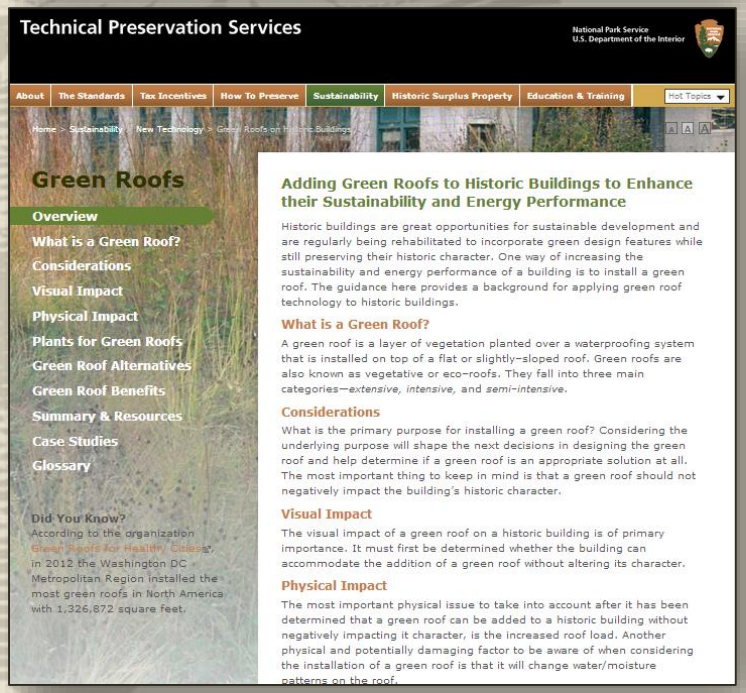
...ngs are promoted as ...ronmentally friendly, ...e way of increasing ...building is to install ...n roof is a thin layer ...over a waterproofing ...on top of an existing ...oof. A green roof helps ...the surrounding urban ...collect and filter storm ...odiversity; and provide ...ding vegetable gardens, ...for building occupants.

Enhancing the energy-efficiency and sustainability of a historic building is as important as incorporating energy-efficient features into new structures. While a green roof is not a compatible feature for many

*The location of the green roofs as well as water collecting tanks and graywater redistribution systems are illustrated in this rendering of the brewery complex.*

https://www.nps.gov/tps/sustainability.htm




More information on installing solar panels on historic buildings…

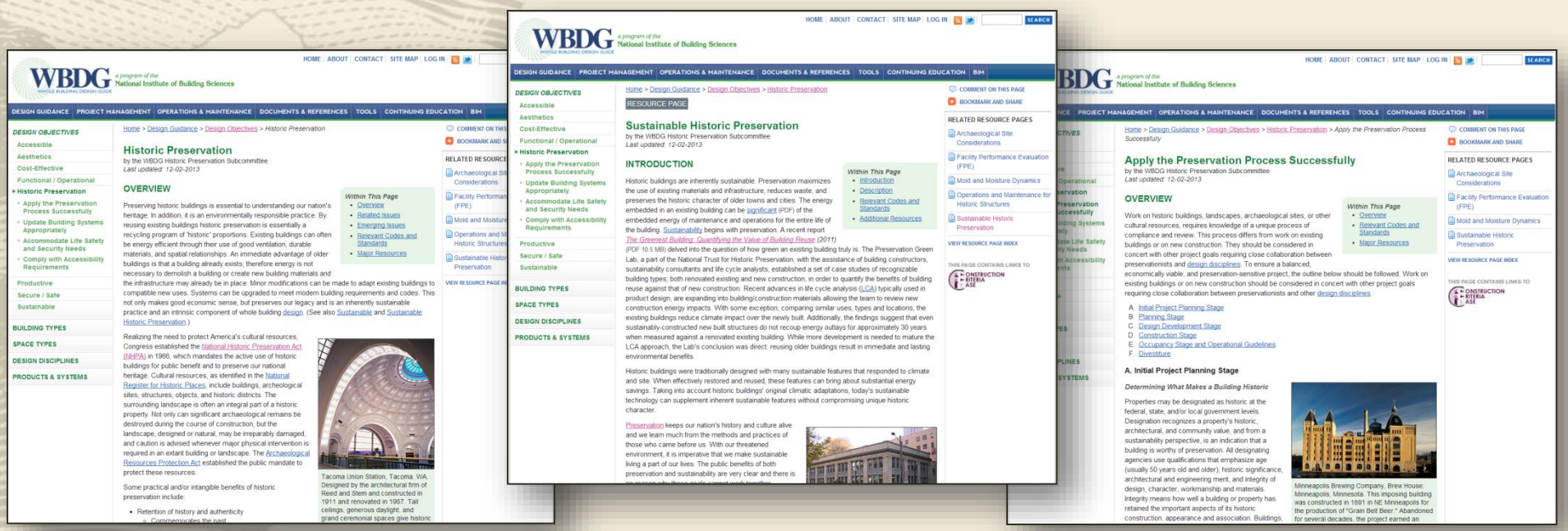
https://www.nps.gov/tps/sustainability/new-technology/solar-on-historic.htm

…and on green roofs

https://www.nps.gov/tps/sustainability/new-technology/green-roofs.htm

# Whole Building Design Guide

- Web-based portal with access to building-related guidance from a 'whole building' perspective.
  - Comprehensive site provides guidance on design, project management and maintenance.
  - Also includes guidance on historic preservation.




www.wbdg.org/design/historic_pres.php

Audrey and pal, Queen Victoria!

# Historic Preservation and Sustainability Working Together !!

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