Stewardship of the Built Environment: 
The Next Steps for Preservation "Beyond Green" 

Sustainability 
Defined by the Brundtland Commission (1988) as: 
"development that meets the needs of the present without compromising the ability of future generations to meet their own needs" 
And the Whole Building Design Guide further states: 
“Sustainability begins with preservation.” 

“Three Legged Stool”
SEE 
Social (Social Equity) 
Environment 
Economics
“Three Legged Stool”
Preservation can be seen as the interconnection and reinforcement of all three legs

What is Stewardship of the Built Environment?

“Stewardship of the built environment” balances the needs of contemporary society and their impact on the built environment with their ultimate effects on the natural environment

Important points to ponder

“The greenest building is one that has already been built.”—Carl Elefante

“Much of the world has begun to recognize the interrelationship and interdependency between sustainability and historic preservation… but much less so in the United States… We have not broadly connected the dots.”—Don Rypkema
How can older buildings be Green?

Older and historic buildings possess inherent green qualities that are often underestimated, overlooked, or undervalued with regards to:

- Embodied energy
- Energy Utilization Index (EUI)
- Impacts of demolition/replacement
- Regional/climate-based design
- Low technology comfort mechanisms
- Original walkable communities

Embodied Energy

First discussed by the National Trust for Historic Preservation in the late 1970s and still a mainstay in their sustainability initiative today:

"The sum total of all the energy used to acquire raw materials, transform them into building materials, transport them to the building site, and construct the building."
Embodied Energy: A Closer Look

- **INITIAL** embodied energy includes non-renewable energy used in the acquisition of raw materials, their processing, manufacturing, transportation to site, and construction. This energy has two components:
  - **Direct energy**: the energy used to transport building products to the site, and then to construct the building; and
  - **Indirect energy**: the energy used to acquire, process, and manufacture the building materials, including any transportation related to these activities.

- **RECURRING** embodied energy includes non-renewable energy consumed to maintain, repair, restore, refurbish or replace materials, components or systems during the life of the building.

Energy Utilization Index (EUI)

Many historic buildings are already energy efficient

<table>
<thead>
<tr>
<th>Year</th>
<th>Average energy consumption Btu/sq. ft</th>
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<tbody>
<tr>
<td>Before 1920</td>
<td>80,127</td>
</tr>
<tr>
<td>1920 – 1945</td>
<td>90,234</td>
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<tr>
<td>1946 – 1959</td>
<td>80,198</td>
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<tr>
<td>1960 – 1969</td>
<td>90,976</td>
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<tr>
<td>1970 – 1979</td>
<td>94,968</td>
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<tr>
<td>1980 – 1989</td>
<td>100,077</td>
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<tr>
<td>1990 – 1999</td>
<td>88,834</td>
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<tr>
<td>2000 – 2003</td>
<td>79,703</td>
</tr>
</tbody>
</table>

Source: Commercial Building Energy Consumption Survey, 2003
U.S. Department of Energy

Impact of Demolition/Replacement

- Actual recovery time of embodied energy costs
- Demolition cost/energy
- Materials flows
Case 1: Rehabilitate Original House
New Materials Needed: 24.5 tons
Construction Waste: 22.8 tons
Total Material Stream: 47.3 tons
85.9% recycled content from original construction.

Case 2: Build New House in the Suburbs
New Materials Needed: 173.5 tons
Construction Waste: 88.4 tons
Total Material Stream: 261.9 tons ~4X Case 1
0% recycled content (no original construction to reuse).

Case 3: Demolish House and Rebuild Comparable New House (but not a "McMansion")
New Materials Needed: 173.5 tons
Construction Waste: 178.3 tons
Total Material Stream: 351.8 tons ~7.4X Case 1
0% or only nominal recycled content from original construction.

Regional/Climate-Based Design
• Design worked with factors commonly understood within the local climate
• Vernacular solutions
• Local materials
Low Technology Comfort Mechanisms

- Thermal mass
- Passive thermal control
- Daylighting
- Convective Cooling

Low Technology

- Thermal Mass
- Passive Thermal Control

Daylighting

- Letting the light in
Convective Air Flow
- Warm air rises
- Cross ventilation

Original Walkable Communities
- Source of New Urbanism precedents
- Source of Transit Oriented Development precedents

“...Connect the dots...”
Social and Economic Considerations
- Education and marketing
- LEED
- Building codes
- Secretary of the Interior Standards
- Economic Incentives
- Life cycle cost assessment
- Economic Analysis
- Community Revitalization: “Smart Growth”

Education and Marketing
- Project an enhanced image for preservation
- Dispel the “myths”
- Build relationships

Project an Enhanced Image for Preservation
- Moving from iconic museums to vital communities
Build Relationships
Work proactively with public, oversight agencies and boards, and multiple stakeholders

Build Relationships
Acknowledge complexity but seek clarity and create collaborative models

Dispel the Myths
Define feasible solutions that meet multiple criteria
LEED ↔ Preservation
Big-D Construction Headquarters, Salt Lake City, UT
• First LEED Gold building in Utah
• Among the first LEED-Gold/Preservation Tax Credit projects in the country
• RDA Financing
Dispel the Myths

Big-D Construction Headquarters

- Sustainable Sites 8
- Water Efficiency 1
- Energy & Atmosphere 5
- Materials & Resources 9
- Indoor Environmental Quality 12
- Innovation & Design Process 4
- Total 39

“GOLD”

Dispel the Myths

Big-D Construction Headquarters

- Laminated glass replacement windows

Dispel the Myths

Win-Win solutions

- McDonald's, Freeport, ME
- Rite Aid, Camden ME
LEED and Other Rating Systems

In addition to LEED, other rating systems are available and in use.

- Become familiar with and proactively engage the scoring system.
- Use as first step not the final solution.
- Advise on new metrics development.

Building Codes

- Form based codes → historic/vernacular precedents.
- High performance building codes and smart codes → accommodate older and historic buildings.
- LEBC alternate compliance → make code officials aware.
- Reasonable accommodation versus exemptions → find solutions rather than simply denying the problem.

Secretary of the Interior Standards

The basis for many local design guidelines needs to reconsider:

- Sustainable design issues
- Smart codes
- High performance building standards
- Interface with LEED and other performance metrics
Life Cycle Cost Assessment

The present value of all cash flows over the lifetime of a building:

- First cost
- Operating cost
- Maintenance cost
- Cyclical replacement cost
- Disposition cost
- Includes factors for time value of money

“Triple Bottom Line” *

Used in business parlance to describe three crucial aspects:

- People
- Planet
- Profit

* John Elkington, Cannibals with Forks, 1998

Economic Analysis

In lieu of the more complex LCCA, simple payback analysis may be more readily understood by the public, practitioners, and public officials.

**Simple payback**: period of time needed to recover additional money spent based on energy savings alone.

Generally accepted simple payback period is 3-5 years.
Economic Analysis

Simple payback: recovery period based on energy savings recovered due to additional money spent.

Economic Incentives

Even under current conditions and forecasts, there are funding incentives:

- Community Development Block Grants (CDBG)
- Energy and Environmental Block Grants (EEBG)
- Historic Preservation Tax credits
- Historic Preservation Incentives
- Low Income Housing Tax Credits
- New Market Tax Credits
- Redevelopment opportunities

Community Revitalization: “Smart Growth”

- Main Street and beyond
- Walkable Communities
- LEED-ND
- Job Creation
- Local impacts
- Avoid “Green Sprawl”
Impact of Various Economic Activities

<table>
<thead>
<tr>
<th></th>
<th>Highway Construction</th>
<th>New Construction Buildings</th>
<th>Rehabilitation of Historic Buildings</th>
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<tbody>
<tr>
<td>Jobs</td>
<td>33.6</td>
<td>36.1</td>
<td>38.3</td>
</tr>
<tr>
<td>Household Income</td>
<td>$1,197,000</td>
<td>$1,223,000</td>
<td>$1,302,000</td>
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<tr>
<td>State Taxes</td>
<td>$101,000</td>
<td>$103,000</td>
<td>$110,000</td>
</tr>
<tr>
<td>Local Taxes</td>
<td>$85,000</td>
<td>$86,000</td>
<td>$92,000</td>
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</table>

Beyond Green...

- Preservation is sustainability personified
- Public perception needs to be shifted
- Analytical tools are available for exploring energy and fiscal aspects
- Success partnership models of collaborative practice need to be made more well known

Beyond Green... Next Steps

- Professional “Grass Roots” activism
- Collaborative partnerships
- LEED and other metrics
- Building codes
- Secretary of the Interior Standards
- Best practices for post-war housing
- Best practices for mid-century modern
- Best practices for treating materials of the recent past
Professional “Grass Roots” Activism

- Educators/Practitioners
- Public Officials
- Public

Collaborative Partnerships

- Landscape Architect
- Architect
- Interior Designer
- Contractor
- Mechanical Engineer
- Regulatory Agencies
- Electrical Engineer
- Structural Engineer
- Facility Manager
- Utility Companies
- Construction Manager
- Civil Engineer
- Structural Engineer
- Collaborative

Develop collaborative expertise through:

- Private/public partnerships
- Joint operating agreements
- Inter-agency agreements
LEED and Other Metrics
- Continue educating the USGBC and other metric forming agencies
  - AIA COTE
  - AIA HRC

Building Codes
- Enhance awareness of opportunities and constraints for solutions

Secretary of the Interior Standards
- Reassessment and evolution
Best practices for Post-War Housing
- Establish a sorting rationale for historic designation
- Publish case studies and results of analyses

Farnsworth House, 1951
Arapahoe Acres, 1949

Best practices for Mid-twentieth Century Modern
- Rehabilitation vs restoration
- Authentic vs aesthetic
- Adaptive reuse feasibility

Best practices for Mid-twentieth Century Modern
- Technical remediation processes and innovations
- Non-Destructive Testing (NDT)
- Building Information Modeling (BIM)
- Computer simulation and visualization methods
- Publish case studies and results of analyses
Best Practices for Treatment of Materials of the Recent Past

- Identify “historic” materials and production processes
- Publish case studies and results of analyses

Plastic Laminate:
Europe, 1950s;
USA, 1960s

EIFS:
Europe, 1950s;
USA, 1960s

Dalle de Verre:
Europe, 1920s;
USA, 1950s

Closing thought

“...we’re on the threshold of a new phase as growing numbers of people are concerned about the degradation of the environment and our relentless consumption of irreplaceable energy and natural resources. Preservation certainly isn’t the solution to these problems, but it can be—and should be—an important part of the solution.”

Richard Moe
NTHP President