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

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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.
“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 inter-relationship and interdependency between sustainability and historic preservation...but much less so in the United States... We have not broadly connected the dots.” –Don Rypkema
“The greenest building...”
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.”

Image Source: http://www.thegreenestbuilding.org/
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.

Source:
On to the importance of retrofitting green...

• Research on the energy performance of existing buildings has produced some interesting results. It turns out that commercial buildings constructed before 1920 are actually more energy efficient than buildings from any other period of time, except after the year 2000 (when people began to think about energy use again).

• This comes as a surprise to many, but it makes sense. Older buildings were constructed with sensitivity to siting, high thermal mass, passive heating and cooling. And, as an added bonus, they were built to last.

• But, not all older and historic buildings are energy efficient. However, there are many products and processes available to increase the efficiency of those buildings to make them competitive with newer ‘green’ buildings.

<table>
<thead>
<tr>
<th>Average energy consumption Btu/sq. ft</th>
<th>Commercial Buildings (non malls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1920</td>
<td>80,127</td>
</tr>
<tr>
<td>1920 – 1945</td>
<td>90,234</td>
</tr>
<tr>
<td>1946 – 1959</td>
<td>80,190</td>
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<tr>
<td>1960 – 1969</td>
<td>90,976</td>
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<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>
</tr>
<tr>
<td>2000 – 2003</td>
<td>79,703</td>
</tr>
</tbody>
</table>

Source: Commercial Building Energy Consumption Survey, 2003
U.S. Department of Energy
Recovery time: about 40 years to start saving energy for a new office building and that expands to 65 years if an existing building was torn down to build it due to demolition and disposal cost for energy extend the recovery period.

For new residences, it takes 13 years to recover the lost energy assuming that a new environmentally efficient home is similarly sized as the old one. However, given the ballooning of the average size of the American home, this recovery time (based on doubling the size) reaches 28 years.

Shari Shapiro: green sprawl: building green structures in unsustainable contexts.

Refocus from green design to green planning to look at the bigger picture.

Sustainability begins with preservation (Whole Building Design Guide)
Aluminum siding was removed, exterior brickwork was repaired and cleaned, and roofing was replaced.
This image demonstrates one of the largely unrecognized aspects of sustainability with regards to historic preservation: Historic Preservation reduces the amount of demolition and construction wastes and mitigates the use of new replacement materials.

Case 1 data represents the approximate material streams (new materials + demolition wastes) that occurred in the G. H. Schettler House project. Building a new house in the suburbs (Case 2) would have a material stream approximately four times greater than the G. H. Schettler House project. Meanwhile, tearing down and building a comparable replacement house (Case 3) would increase the material streams by more than seven times the base case.

The approximate weights of each material installed or demolished were computed and tabulated based on area takeoffs from the drawings or room surface measurements. Note: Case 3 would not likely occur as an exact replacement but instead would more likely occur as a “monster” house of significantly larger size.
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 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
- IEBC 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

Let the Numbers Convince You: Do the Math

<table>
<thead>
<tr>
<th></th>
<th>$500*</th>
<th>$550*</th>
<th>$550*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tilt-Up Sash Doors</td>
<td>Storm window</td>
<td>New single-pane</td>
<td>New double-pane</td>
</tr>
<tr>
<td>Original window</td>
<td>1.10</td>
<td>0.58</td>
<td>0.35</td>
</tr>
<tr>
<td>Single-pane window</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ANNUAL ENERGY SAVINGS
722,248 Btu

ANNUAL ENERGY USE WINDOW
625,022 Btu

$5450/

$13.00

SIMPLE PAYBACK
4.5 Years

$500/S3.20 =

$5450/S17.07 =

40.5 Years

$5500/S18.07 =

34 Years

$5500/S16.10 =

240 Years

Source: Keith Salonen, Ph.D, AIA
Fallingbrook, Ontario, Sector Commission

*Cost of 3 x 5 window installed
**According to heat at 80.94/hr
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
Green Sprawl is the construction of sustainable buildings in non-sustainable contexts. For example, building a sustainable building in a location that causes the need to commute using fossil fuels which rapidly negate any energy savings. Alternatively, “wasting” a building resource through its complete demolition, discarding the materials in a landfill, and forcing the creation of new building products and materials using materials (e.g., aluminum, vinyl, polymers) that have significantly higher Life Cycle Assessment as compared to the original existing materials. Construction waste comprise 40-60% of landfill contents and building recycling centers are not redirecting the significant portion of the demolition wastes to be effective in the long term without significant further refinement of the diversion and reuse of material flows.
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

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

NARRP: Nationally Applicable Recommended Rehabilitation Practices, HUD 1997
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, 1959

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