




The final roof you'll ever need!



**Life cycle cost analysis (LCCA)
in the United States
green building industry.**

Sean Sanborn

Impact of the built environment

- 40% of the world's energy
- 25% of the timber harvested
- 16% of the fresh water used
- 50% ozone depleting CFC's
- 30% of raw materials used
- 35% of CO₂ emissions
- 40% of landfill waste



Green Building

“An integrated framework of design, construction, operations, and demolition practices that encompass the environmental, economic, and social impacts of buildings.”

“Building practices recognizing the interdependence of the natural and built environment and seek to minimize the use of energy, water, and other natural resources while providing a healthy and productive indoor environment.”



Barriers to Green

- Codes
- Education
- Cost
- Products not available
- Breaking tradition



Reasons to Build Green

- Mandated
- Market demands
- Occupant comfort and health
- Save \$
- Environmental responsibility



Reasons to Build Green

“Building to code means that if a building were designed any worse it would be against the law.”

Randy Croxton, Architect

Life Cycle Cost Analysis

Economic assessment of alternatives that considers all of the significant costs of ownership over the useful life expressed in equivalent dollars.

- initial costs
- maintenance cost
- energy load impact
- financing costs
- disposal cost & impact



LCCA Applied to Buildings

1970's--U.S. General Accounting Office applied LCC to hospital facilities.

- Operation and Maintenance costs equal initial investment costs in 1-3 years.
- Focused primarily on energy costs.
(Arab oil embargo)



LCCA Characteristics

LCCA treats design decisions as investments in buildings and building components.

LCCA compares the estimated costs of different options taking into account both initial capital costs as well as costs that may be incurred over the life cycle.



LCCA Objectives

To provide an analytical tool that can establish the interaction between planning and design decisions and long term costs.

To promote interdisciplinary communication and look at the building as a whole and not merely its component parts.



Statement of the Problem

Green building initiatives are predicated on the fact that benefits accrue over the life of the building.

Use of LCCA is needed to increase adoption of green building practices.



Conclusions

Why do you suspect you are not using or under utilizing LCCA on the LEED project you are associated with?

- Shift costs/ budget
- Lack of expertise/user friendly tools
- Lack of time



Federal Policies and Programs that Support Green Building

- Federal Laws that Support Green Building Include:
 - The National Environmental Policy Act (NEPA), 1969
 - Clean Air Act 1970, amended 1990
 - Resource Conservation and Recovery Act (RCRA), 1976, amended 1994
 - Energy Policy Act, 1992



Federal Policies and Programs that Support Green Building

- Executive Order 13101: Greening the Government through Waste Prevention, Recycling, and Federal Acquisition in response to RCRA 6002 (e) requires EPA to (1) designate items that are or can be made with recovered materials and (2) prepare guidelines to assist procuring agencies in complying with affirmative procurement requirements. Federal agencies (and state or local agencies using federal funds) are required to purchase those items.



Federal Policies and Programs that Support Green Building

- **Executive Order 13123: Greening the Government through Efficient Energy Management** encourages government agencies to promote energy efficiency, water conservation, and the use of renewable energy products by mandating the reduction of federal facility energy consumption per gross square foot by 35 percent by 2010 compared to the 1985 base year. EO 13123 also mandates federal agencies obtain 2.5 percent of electricity equivalent through purchasing renewable power and installing renewable technologies. Recommended energy management strategies include sustainable building design.



Federal Policies and Programs that Support Green Building

- **Executive Order 13134: Developing and Promoting Biobased Products and Bioenergy** aims to triple the national use of bioenergy and biotechnology by the year 2010. It is anticipated that meeting this objective will reduce greenhouse gas emissions by 100 million tons. Through the coordination of federal efforts, technology will be developed that converts trees, plants, and other organic material into energy, while petroleum-based products will be increasingly replaced.



Federal Policies and Programs that Support Green Building

- Executive Order 13148: Greening the Government through Leadership in Environmental Management makes the head of each federal agency responsible for ensuring that actions are taken to integrate environmental accountability into agency day-to-day decision making and long-term planning processes. Goals include Environmental Management, Environmental Compliance, Right-to-Know, Pollution, Prevention, Toxic Chemicals Release Reduction, Toxic Chemicals and Hazardous Substances Use Reduction, Reductions in Ozone-Depleting Substances, and Environmentally and Economically Beneficial Landscaping.



Federal Policies and Programs that Support Green Building

- **Build America** is a DOE partnership that provides energy solutions for production housing. The program aims to produce homes on a community scale that use 30 to 50 percent less energy, implement innovative energy and material saving technologies, and help home builders reduce construction time and waste by as much as 50 percent.



Federal Policies and Programs that Support Green Building

- EPA's ENERGY STAR is a government/industry partnership that offers businesses and consumers energy-efficient solutions. Introduced in 1992 as a voluntary labeling program to identify and promote energy-efficient products, ENERGY STAR works with more than 7,000 public and private sector organizations to improve the energy performance of homes, businesses, appliances, office equipment, lighting, consumer electronics, and residential heating and cooling equipment. Organizations have committed to improve the energy performance of approximately 12 percent of U.S. commercial building space through ENERGY STAR.



Federal Policies and Programs that Support Green Building

- DOE's Federal Energy Management Program (FEMP) works to reduce the cost and environmental impact of the federal government by advancing energy efficiency and water conservation, promoting the use of distributed and renewable energy, and improving utility management decisions at federal sites. FEMP provides analytical software tools that perform complex energy consumption analyses and modeling, as well as comparative life-cycle costing analyses. For example, the Building Life-Cycle Cost Program provides computational support for the analysis of capital investments in buildings.



Federal Policies and Programs that Support Green Building

- U.S. Department of Education's Healthy and High-Performance Schools program, enacted by Congress in 2001 and advised by EPA and DOE, helps states develop information and grant incentives for green design and engineering of school renovations. (The program has not yet been funded.)



Federal Policies and Programs that Support Green Building

- Partnership for Advanced Technology in Housing (PATH) is a national effort launched in 1994 to improve the quality, durability, environmental impact, energy efficiency, and affordability, and decrease the disaster risk of America's homes.



Federal Policies and Programs that Support Green Building

- **Rebuild America** focuses on accelerating energy-efficiency improvements in existing commercial, institutional, and multifamily residential buildings through private-public partnerships created at the community level. Today this DOE program helps communities across the country sort through an often overwhelming array of options for building improvements and develop and implement an action plan.



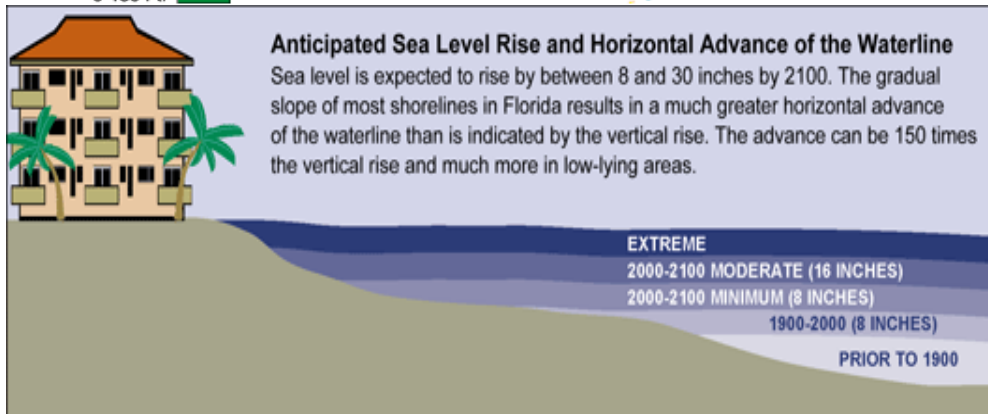
Federal Policies and Programs that Support Green Building

- DOE's Zero Energy Home is part of a national initiative funded by the National Renewable Energy Laboratory (NREL). The Zero Energy Home initiative aims to launch the concept into the mainstream home building industry, especially into the single-family home market.

Your Choices Our Coatings Reflect the Future



- 8-10 million tons of toxic waste result from roof tear-offs annually
- Waste generated from roof tear-offs account for 15-20% of total landfill
- Over 90% of the roofs in the US are dark colored (150-200+degrees)
- Florida is ground zero for global warming
- A rise of sea level of 12'' would flood real estate up to 1000' inland
- 10,000 years of global warming was compressed into the 100 years



25 year old delaminated leaking asphalt roof
submerged under water:



Roof successfully restored will FINAL FLAT ROOF



Before



After

