2011 UMass Wood Structures Symposium

Green Building Certification Systems/
Energy Standards in US

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www.umass.edu/cp
Outline

• Green Building in Context
• Overview of Building and Energy Codes
• Overview of Standards and Rating Systems
• USGBC LEED Rating Systems
• LEED for Homes
• UMass Sustainability Initiative
Global Climate Change

Human activity is destroying life sustaining resources

Earth Impacts
- Climate disturbance
- Species extinction
- Mineral and resource depletion
- Ozone depletion
- Air pollution
- Water pollution
- Scarcity and unreliability of rain fall
- Depletion of soil quality
<table>
<thead>
<tr>
<th>Multifaceted Problem</th>
<th>Multifaceted, Systemic Change</th>
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<tbody>
<tr>
<td>Knowledge and Attention</td>
<td>= Advocacy</td>
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<tr>
<td>Technology and Design</td>
<td>= Expertise in green building, energy, transportation, etc.</td>
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<td>Time and Money</td>
<td>= Business Development, Finance and Accounting</td>
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<td>Skills and Capacities</td>
<td>= Education and Training</td>
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<td>Politics and Power</td>
<td>= Leadership and Organizational Culture</td>
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<td>Organizational Limitations</td>
<td>= Social Marketing Techniques</td>
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<td>Failure to Understand Systemic Reality</td>
<td>= Systems Thinking</td>
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Based on chart by Leith Sharp
The Solution Must Be System Based

<p>| Institutional Drivers | Institutional Systems | Global Environmental Systems | Global Environmental Systems |</p>
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<thead>
<tr>
<th>Institutional Drivers</th>
<th>Institutional Systems</th>
<th>Create Relationship between Earth + Institution</th>
<th>Earth Systems</th>
<th>Earth Impacts</th>
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<tr>
<td>Mission</td>
<td>Material supply and disposal</td>
<td>Make hidden upstream &amp; downstream environmental impacts known</td>
<td>Ecosystems</td>
<td>Species extinction, increase in infectious vectors</td>
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<td>Leadership</td>
<td>Food supply</td>
<td>Develop learning organization capacities</td>
<td>Climate systems</td>
<td>Climate disturbance</td>
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<td>Mission alignment between teaching, research &amp; operations</td>
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<td>Building Design and Construction, Mechanical systems, Occupancy</td>
<td>Align Finance &amp; accounting systems to support long term health</td>
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<td>Rising sea levels, deep ocean current changes, fisheries depletion</td>
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<td>Water pollution, scarcity of rain fall</td>
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<td>Academic Planning</td>
<td>Landscaping</td>
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<td>Soil quality depletion</td>
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<td>Campus Planning</td>
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<td>build up of toxins</td>
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Based on work by Leith Sharp
Green Building Progress Toward Sustainability

UMass Amherst

Campus Planning

U.S. Green Building Council  May 2011
Green Building Progress Toward Sustainability

U.S. Green Building Council  May 2011
Traditional Building Codes

- Systematic statement of a body of rules that govern and constrain the minimum level of design, construction alteration & repair of buildings
- Based on requirements for safety, health, environment & quality of life of building users & community
- Model codes are developed by states, professional societies & trade associations
- State or municipal authorities adopt codes as law
International Code Council

• 50 states & DC have adopted a number of I-codes

• International Building Code
• International Energy Conservation Code
• International Existing Building Code
• International Fire Code
• International Fuel Gas Code
• International Mechanical Code
• ICC Performance Code

• International Plumbing Code
• International Private Sewage Disposal Code
• International Property Maintenance Code
• International Residential Code
• International Wildland Urban Interface Code
• International Zoning Code
Green Building Codes


Energy Codes

• ICC—International Energy Conservation Code 2009 – model code; makes allowances for different climate zones

• CA Title 24 1978 – Energy Efficiency Standards for residential and non-residential buildings; updated periodically (CALGreen)
Green Building Standards

• ANSI/ASHRAE 189.1-2009 Standard for the Design of High-Performance Green Buildings (ANSI Approved; USGBC and IES Co-sponsored)

• International Living Institute/ Cascadia Green Building Council: Living Building Challenge
Energy Standards


• New Buildings Institute – Advanced Buildings™ Core Performance Guide (prescriptive)
Green Building Rating Systems

• USGBC Leadership in Energy & Environmental Design LEED™
• Green Point Rating System (for new & existing homes; CA Title 24, 2005 +15%)
• National Association of Home Builders: NAHB Green Guidelines
• Green Globes (Green Building Initiative in collaboration with NAHB)
• Collaborative for High Performance Schools (CHPS)
**MISSION**

Buildings and communities will regenerate and sustain the health and vitality of all life within a generation.

**VISION**

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy and prosperous environment that improves the quality of life.
USGBC LEED™ Rating Systems

• New Construction (NC)
• Existing Buildings: Operations & Maintenance (EB: O&M)
• Commercial Interiors (CI)
• Core & Shell (CS)
• Schools (SCH)
• Retail
• Healthcare (HC)
• Homes & Multi-family Midrise
• Neighborhood Development (ND)
LEED for Homes Alliances

National Programs

Local and Regional Programs

ENERGY STAR Homes

green communities

Earth Craft House

Alliance for environmental sustainability

Building America

ENVIRONMENTS FOR Living

Earth Advantage

Scottsdale

Built Green

Vermont green builds greener
Local Delivery System

Design Support

Green Consultants

Home Designers

Verification Support

Provider

10-20 Green Raters

1,000-2,000 LEED Homes
The Rating System: Simple & Streamlined

3 documents
136 points
45-point entry
Applicable Building Types
UMass Amherst Sustainability Initiative

- 2007: ACUPCC Signatory
- 2008: Environmental Performance Advisory Committee (EPAC)
- 2009: First Sustainability Coordinator Hired
- 2010: Completed Climate Action Plan
- AASHE STARS Gold
- www.umass.edu/green
Student Involvement is Key

- Student representatives on every subcommittee
  - Interns
  - Students-at-large

- Providing energy and institutional support

- Community Education
  - Eco-Rep Program
LEADING BY EXAMPLE
In April of 2007, Governor Deval Patrick signed Executive Order 484 which mandates all new government buildings earn LEED certification and implement other sustainable design practices.

In November of 2007, President Jack Wilson signed the Presidents’ Climate Commitment which includes the expectation that all new building projects achieve LEED Silver Certification or better.

The UMA Campus Climate Action Plan of 2010 aligns campus goals with those of the Commonwealth.

GOING BEYOND
LEED is one tool in the quest for a more sustainable built environment. The GBC is using LEED to help steer sustainable design and building on campus. However, the GBC is aware that LEED is a limited approach to sustainable building. For this reason, we continue to look beyond LEED, towards more integrative and holistic environmental design.
UMass Green Building Guidelines

• http://www.umass.edu/fp/projectmanagement/designguidelines/
• http://www.umass.edu/fp/projectmanagement/sustainabledesign/
Key to the Credit Pages

LEED v3 2009 for New Construction

**LEED Categories**

- **Sustainable Sites**
- **Water Efficiency**
- **Energy + Atmosphere**
- **Materials + Resources**
- **Indoor Environmental Quality**
- **Regional Priority**
- **Innovation in Design**

**Priority Levels**

**High** = Credit strategy should influence design.

**Medium** = Credit should be pursued when it is practical for the program.

**Low** = Credit is achieved if possible.

**Feasibility Levels**

**Easy** = Current policy/existing infrastructure makes credit compliance automatic.

**Moderate** = Minor adjustments to the status quo.

**Difficult** = Requires a specific approach during design/construction and/or significant changes to the current campus structure.
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<th>Feasibility</th>
<th>Category</th>
<th>Points</th>
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<td>Credit 1  Site Selection</td>
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<td>Credit 2  Development Density + Community Connectivity</td>
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<td>Credit 7  Alternative Transportation—Parking Capacity</td>
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<td>Credit 1  Water usage reduction: 20%</td>
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High Priority Credit as defined by Green Building Guidelines
MR 7: CERTIFIED WOOD

LEED CREDIT INTENT
To encourage environmentally responsible forest management.

LEED CREDIT REQUIREMENTS
Use a minimum of 50% of wood-based materials that are certified in accordance with the Forest Stewardship Council’s principles and criteria.

- structural framing
- dimensional framing
- flooring
- sub-flooring
- wood doors
- finishes

Wood purchased for temporary use (construction) on the project may be included at the discretion of the team.

An additional point can be earned if 95% or more of the project’s new wood is FSC-certified.

UMA CREDIT DISCUSSION
UMA is committed to sustainable forestry and building practices should reflect that commitment. The use of FSC certified wood throughout projects is a high priority. Research in the Building Construction Technology department is closely linked with local sustainable forestry efforts. This credit does not establish a minimum quantity of wood, and most UMA projects use very little wood. Therefore, the use of 50% FSC certified wood should be specified early in the design process.
Massachusetts Woodlands Cooperative

Massachusetts Woodlands Coop in South Deerfield, MA

Where You'll Find Us

- Our Farm Stand

Farm Stand

- Massachusetts Woodlands Cooperative
  1 Sugarloaf Street
  South Deerfield, MA (map)
  (413) 367-8800

Call for more information.

Founded in 1999, Massachusetts Woodlands Coop is run by...

1 Sugarloaf Street
South Deerfield, MA

(413) 397-8800 preferred

Web
www.masswoodlands.org

1 mile from South Deerfield, 01373

A little about Massachusetts Woodlands Coop
A cooperative of landowners responsibly managing their woodlands and strengthening the local economy through production and marketing of FSC-certified, HomeGrown Wood™ products.

Wood

- Flooring
- Timber + Lumber
- Wood products

Bold foods are in season now according to our Harvest Calendar. Call to find out exact availability. Every farm and every season are unique. Most farms are also residences. Unless Farmstand or Pick Your Own hours are noted, please be respectful and call ahead before going to the farm.

CISA regularly revises the Local Food Guide with new information. Let us know if something is inaccurate.
LEED CREDIT INTENT
To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

LEED CREDIT REQUIREMENTS
Demonstrate a reduction in energy costs using 1 of 3 compliance options:
1) Whole Building Energy Simulation: ASHRAE 90.1 (1-19 points)
2) Prescriptive: ASHRAE Advanced Energy Design (1 point)
   • Only for offices, retail or warehouses.
3) Prescriptive: Advanced Buildings Core Performance (1-3 points)
   • Only for buildings under 100,000 sf, health care and labs are ineligible.

UMA CREDIT DISCUSSION
The University favors the Whole Building Simulation (i.e. “energy modeling”) path for a number of reasons. First, energy modeling has the potential for optimizing building design in a way that a prescriptive path may not. Second, as an academic institution, the ability to compare predicted performance to actual performance is valued. Third, more LEED points are available to projects using this path.

Meeting the requirements of Executive Order 484 - a 20% reduction in energy costs - will earn projects 5 points under EAc1. Design teams are encouraged to go beyond the 20% reduction, although specific targets will vary by building type and function. More important than a numerical objective is the process by which project teams integrate the design and energy modeling to ensure that buildings are as energy efficient as possible within the project scope and budget. Designers and energy modelers should maintain a continuous cycle of designing and modeling that begins in the pre-design stage and has iterations through the final construction documents.

All campus projects must consider the future flexibility of building programming. The University recognizes that this requirement may at times impede attainment of the maximum energy cost reduction. However, it will help ensure that buildings have the longest lifecycle possible, one of the fundamental considerations in sustainable building and design.
**LEED CREDIT INTENT**
To encourage and recognize increasing levels of on-site renewable energy self-supply to reduce environmental and economic impacts associated with fossil fuel energy use.

**LEED CREDIT REQUIREMENTS**
Use on-site renewable energy systems to offset building energy costs.

Use the building annual energy cost calculated in EA Credit 1 or the U.S. Department of Energy’s Commercial Buildings Energy Consumption Survey database to determine the estimated electricity use.

Eligible systems include: photovoltaic, wind, solar thermal, bio-fuel electric, geothermal heat/electric, low-impact hydroelectric, and wave and tidal.

**UMA CREDIT DISCUSSION**
All Commonwealth agencies are required to meet the target of 15% of annual electric usage procured from renewable sources by 2012¹, and the University is aligned with this goal.²

New projects are ideal candidates for renewables, the most viable options being photovoltaic and solar thermal. (There is not enough wind in the region to make wind power practical for the campus.) Design teams should consider integrating pilot projects featuring renewable technologies developed by faculty researchers. Building site and design should be assessed to ensure a best fit for the chosen technology. It is also expected that teams will incorporate strategies - such as day lighting - that reduce the overall energy load so that less energy generation is required. Consider alternatives to the standard applications of renewable technologies, for example, PV panels that also function as a shading system for windows or landscape. For roof-mounted installations, teams should coordinate closely with the roofing contractor to ensure guarantee of the roof warranty.

Creativity is encouraged when it comes to potential financial structures for the funding of renewable energy generation.

¹ Executive Order 484  ² Climate Action Plan  ³ Campus Solar Radiation Study
Campus Analysis: Solar Potential
UMass Sustainability Viewer (Work in Progress)
Remember the Big Picture

• We have but one planet
• Reducing environmental impacts can be cost effective
• It is our job as thought leaders to find creative ways to serve both our organizations and our planet
Questions?

Contact Me: lpavlova@cp.umass.edu