

Green Building: Designing with Wood

SLMA Spring Meeting

Atlanta, GA

March 4, 2009

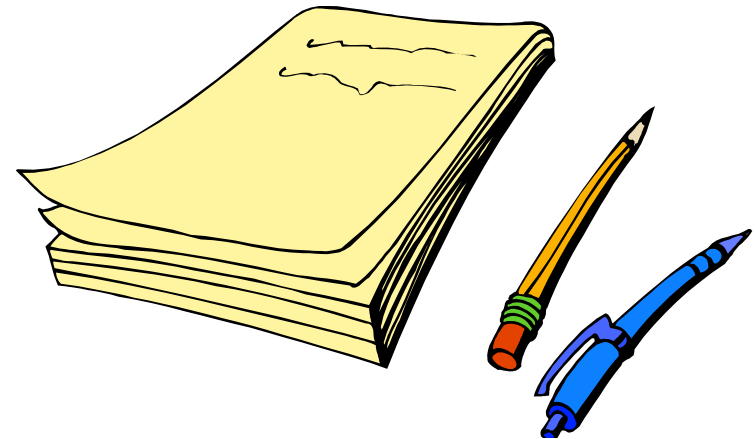


Michael Virga
Executive Director, Forestry
American Forest & Paper Association



Outline

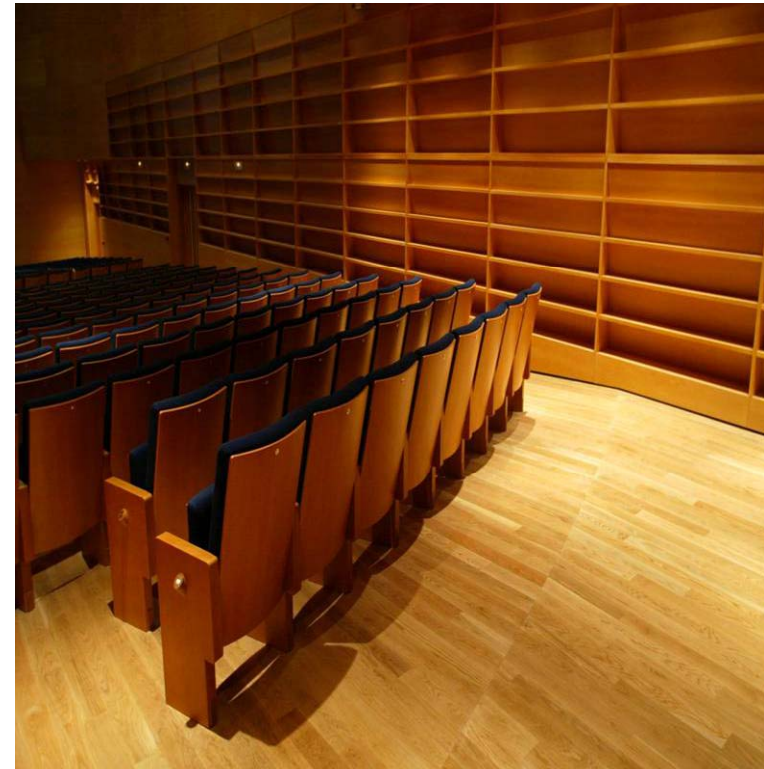
- Why Wood?
- LCA
- Rating Systems
 - Green Globes
 - NAHBGreen
 - LEED





Wood as an Advanced Material

- Wood outperforms all other building products:
- Releases less effluents during manufacture
- Requires less energy
- Better insulator
- Stores carbon



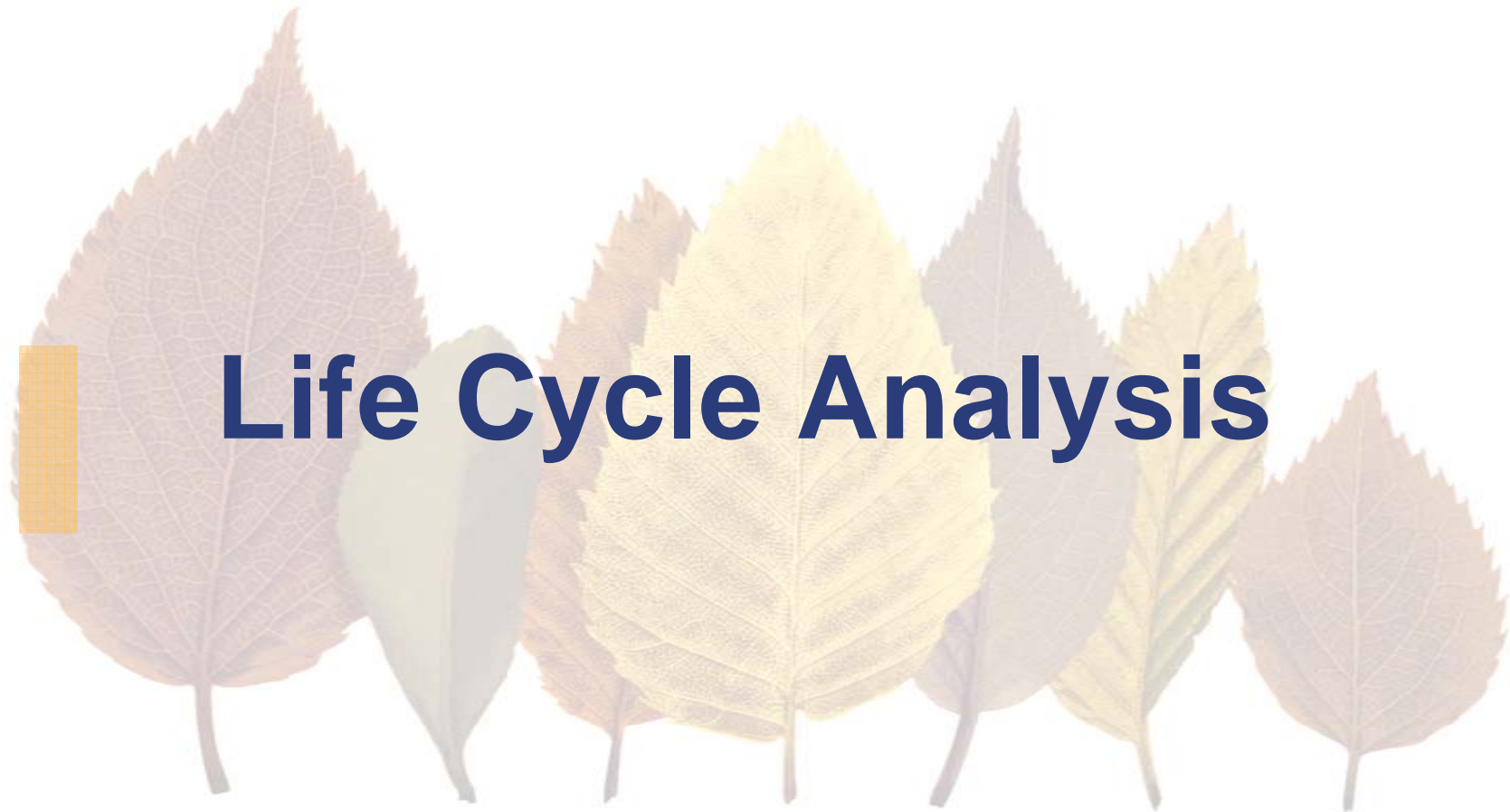


“Encouraging the use of wood products can act as a greener alternative to more fossil-fuel intensive materials.

Substituting a cubic metre of wood for other construction materials (concrete, blocks, or bricks) results in the significant average of 0.75 to 1.0 tonnes CO₂ savings.”

International Institute for Environment and Development, Using Wood Products to Mitigate Climate Change, 2004





Life Cycle Analysis

AF&PA®





BEES[®] - Element Level Analysis

- ***Building for Environmental and Economic Sustainability***
 - National Institute of Standards and Technology (NIST)
 - <http://www.bfrl.nist.gov/oe/bees.html>

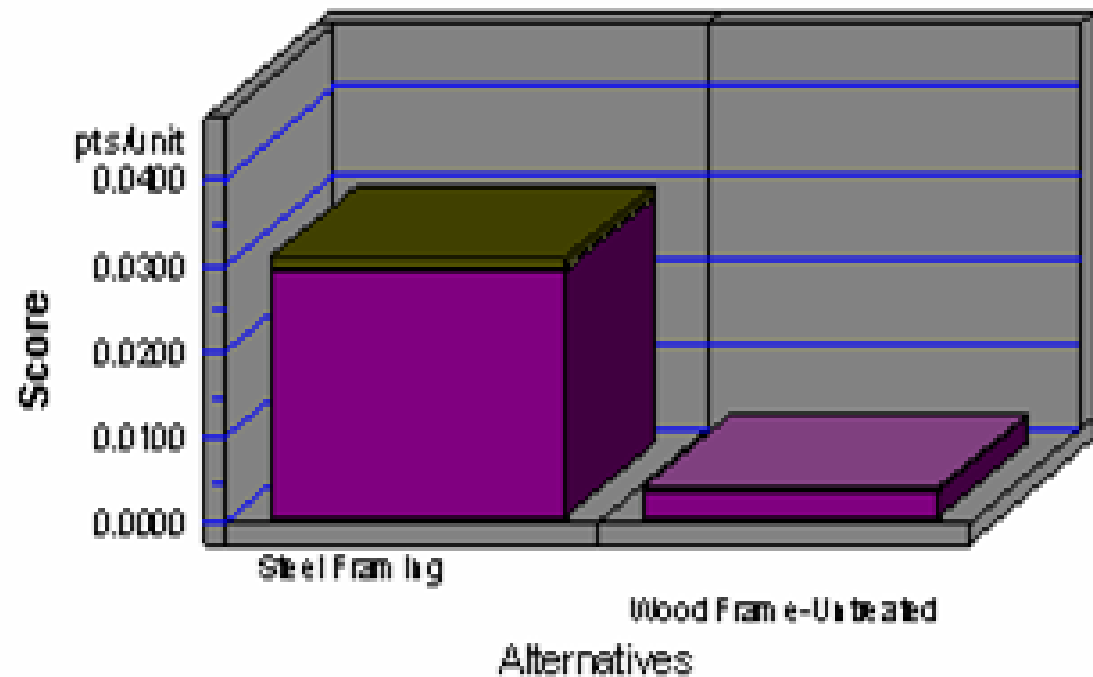




■ BEES Comparison - wood stud to a steel stud

Environmental Performance

■	Acidification
■	Cr. L. Air Pollutants
■	Ecological Toxicity
■	Eutrophication
■	Fossil Fuel Depletion
■	Global Warming
■	Habitat Alteration
■	Human Health
■	Indoor Air
■	Ozone Depletion
■	Smog
■	Water Intake



Note: Lower values are better



EcoCalculator – Building Assembly Analysis

- Spreadsheet format
- Compares typical assemblies – Floors, Walls, Roofs
- Based on Environmental Impact Estimator
 - Embodied primary energy
 - Global warming potential
 - Air and water pollution





EcoCalculator

Example results

TOTAL IMPACTS BY BUILDING COMPONENT	Primary Energy (MMBtu) TOTAL	GWP (tons) TOTAL	Weighted Resource Use (tons) TOTAL	Air Pollution Index TOTAL	H2O Pollution Index TOTAL
COLUMNS & BEAMS	31	1	11	263	2.16
INTERMEDIATE FLOORS	5	0	2	62	0.83
EXTERIOR WALLS	10	1	1	151	0.07
WINDOWS	262	16	24	4477	0.93
INTERIOR WALLS	14	1	2	198	1.16
ROOF	293	15	49	3239	1.46
WHOLE BUILDING	615	34	90	8390	6.60





Athena - Whole Buildings Analysis

Athena Environmental Impact Estimator

- Based on extensive LCI database
- Simulates over 1,000 different assembly combinations
- Can model 95% of the building stock
- <http://www.athenasmi.ca>





Consortium for Research on Renewable Industrial Material's (CORRIM)

**University of Washington
Oregon State University
Washington State University
Purdue University
University of Minnesota
University of Idaho
North Carolina State University
Louisiana State University
USFS Forest Products Laboratory
Mississippi State University
Virginia Polytechnic Institute**





CORRIM Assessment In Terms of Performance Indices

- **Embodied Energy**
- **Global Warming Potential**
- **Air Emissions**
- **Water Emissions**
- **Solid Waste**
- **Resource Use**





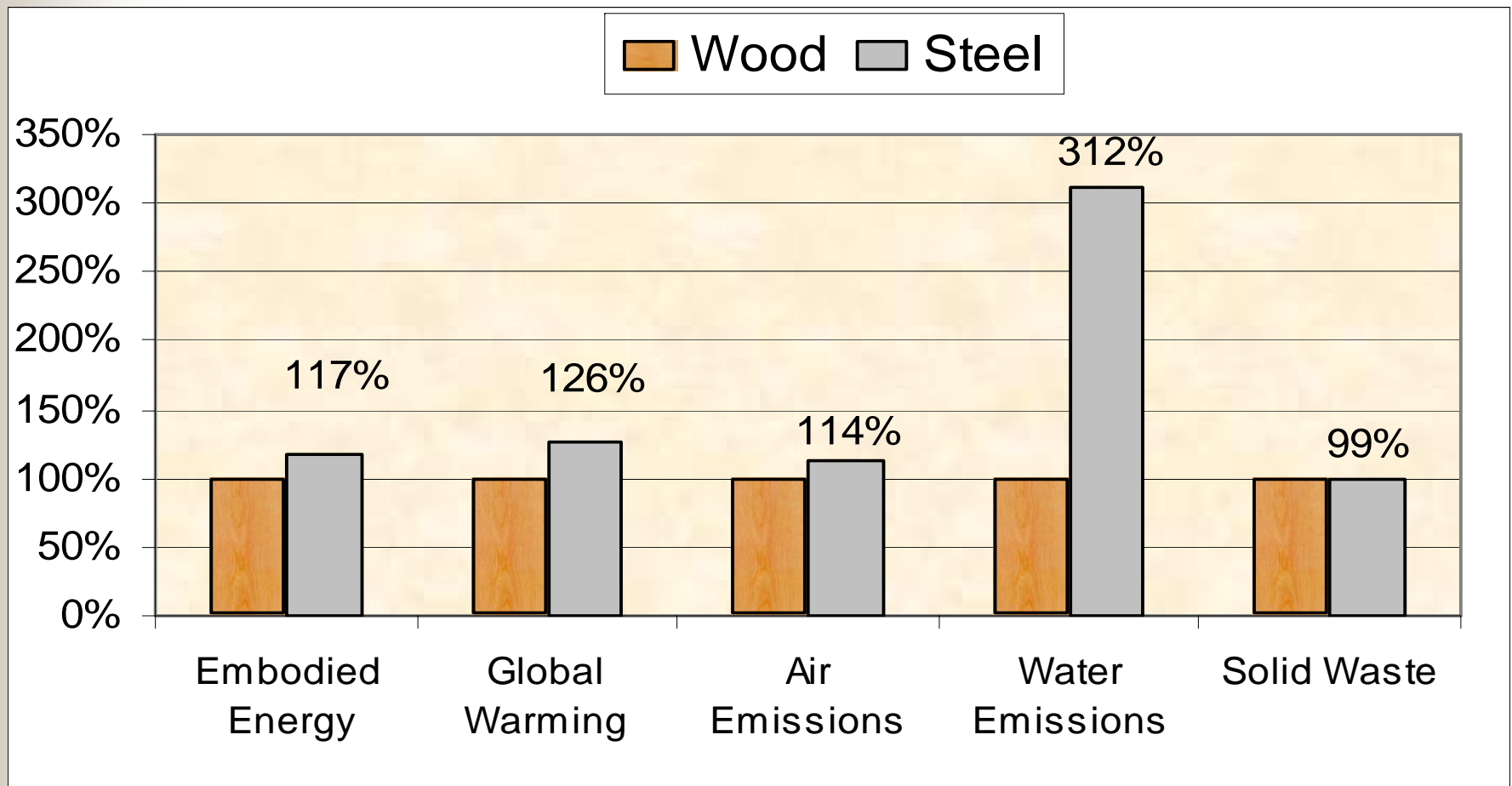
Example of Whole House LCA Analyses to Compare Building Materials

- Compared wood- to steel-framed home for Minneapolis
- Compared wood-framed to concrete block wall home for Atlanta



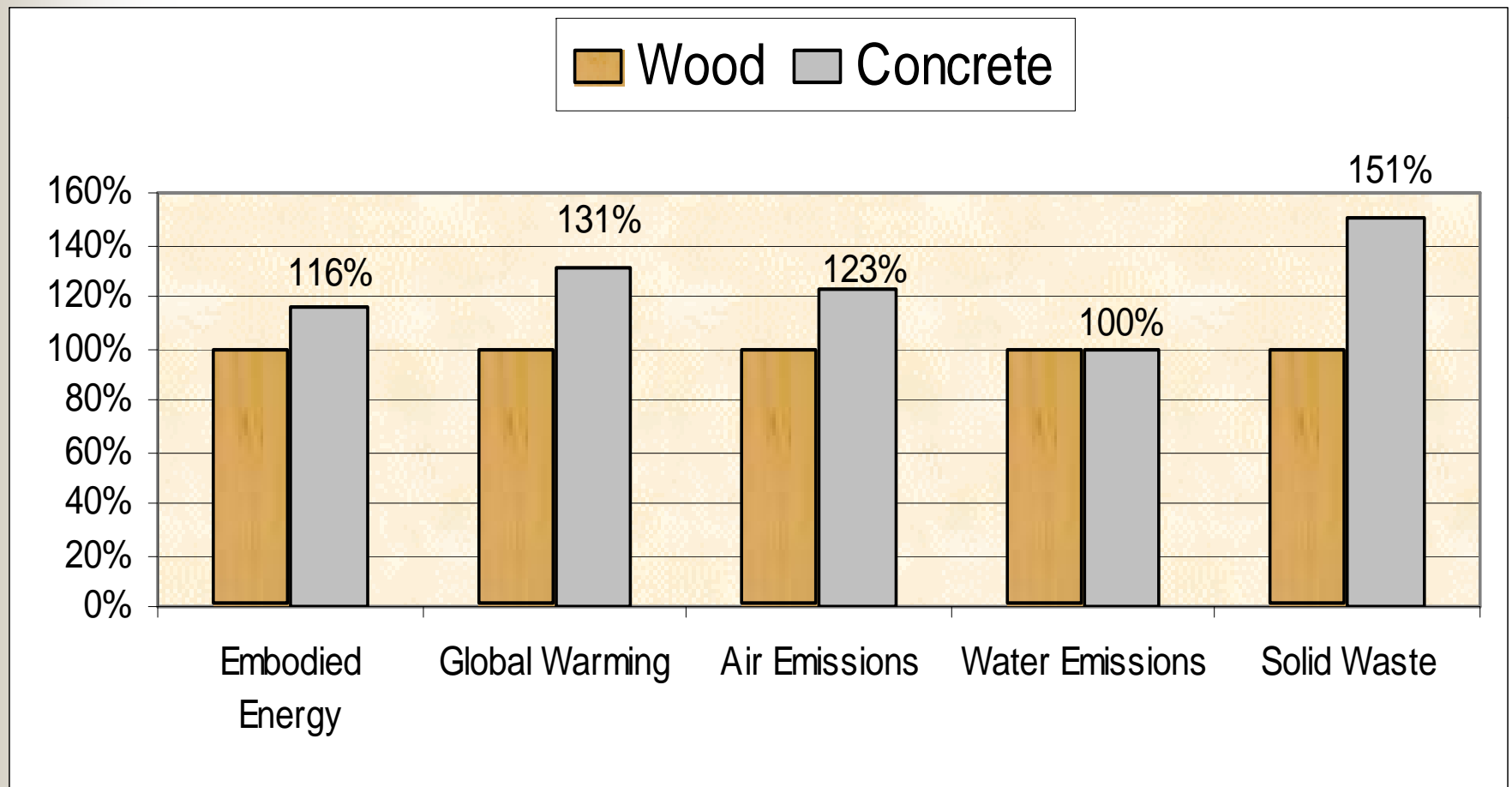


Comparison of Wood-Framed to Steel-Framed House





Comparison of Wood-Framed to Concrete Block House





Life Cycle Analysis



- Quantifiable
- Science-based
- “Cradle to Grave”
- Flexible
 - Environmental Impacts
 - Scientific advances



Rating Systems





Rating Systems



- **North America**
 - **Commercial – LEED/Green Globes**
 - **Residential - NAHB Guidelines/LEED Homes**
- **Global**
 - **Japan - CASBEE**
 - **UK - BREAM**
 - **HK - BEAM**





Components of Major Rating Systems

- Energy Use
- Water Use
- Pollution (emissions, solid waste, effluents)
- Material/Product Inputs
- Indoor Air Quality & Occupant Comfort
- Site Ecology
- Other Sustainable Systems & Processes

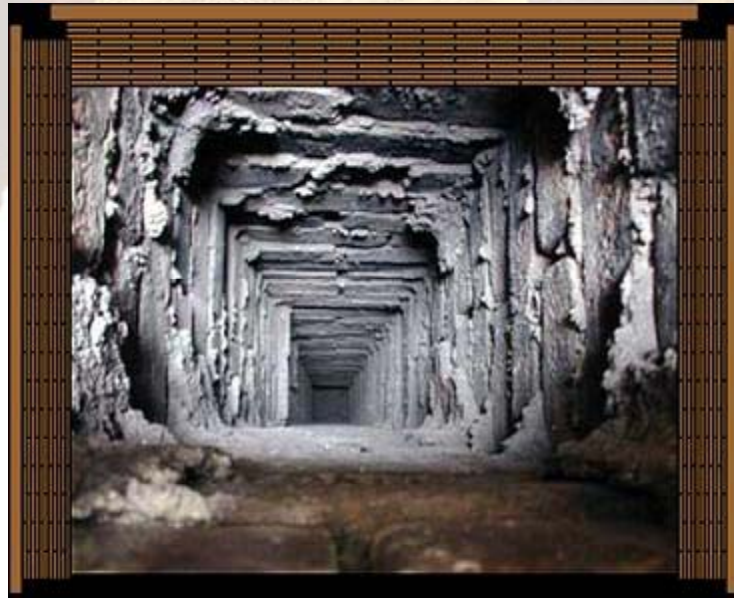




What a Rating System Should Do

- Recognize renewable as well as recycled materials
- Recognize wood from all recognized 3rd party sustainable forestry certification systems
- Recognize resource-efficient materials
- Use life cycle assessment (LCA) in evaluating materials:
 - Lowest life cycle environmental burden
 - Lowest embodied energy

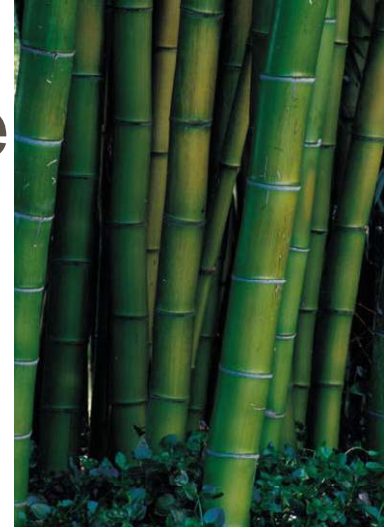






Where LEED Falls Short

- MR Credit 6 - Rapidly Renewable
 - Bamboo
 - Straw bale
 - Other agri-fiber
- Credit 7 - Certified Wood
 - Forest Stewardship Council only





USGBC

- What needs to change:
 - Certified wood credit (MR7)
 - Renewable credit (MR6)
 - Use life cycle analysis
 - Implement consensus-based process





USGBC

Change is underway – LEED v.3

- LEED 2009
- Revised Certified wood credit (MR7)?
- Life Cycle Credits
- ANSI PIN's submitted





Green Globes

- Recognized and Used by Government/Builders/Industry
- Third-Party Certification Available
- **Forest Certification Neutral**
- **Incorporates LCA**
- Easy to use
 - Quick
 - User-friendly questionnaire
- Calculates potential energy savings
- Updates as improvements are made to building
- Affordable

Green Globes Design Environmental Assessment For New Buildings
Concept Design Stage

Energy, Page One of Four
Updating information for Students dormitory (Hotel)

Modelling and simulation of building energy performance; establishing an energy target

Has a preliminary building energy simulation been carried out on each of the concept options? Yes No

Input the value of the projected annual energy use in GJ or kWh GJ kWh

Space optimization

Will space use be optimized to maximize energy efficiency? Yes No

Does the difference in space planning are achieved by identifying functions that can share the same space or by economizing space use?

Response to microclimate and topography

Will the occupied spaces and openings be configured to optimize passive solar gains? Yes No

Will the building be configured to minimize snow deposition and thermal loss due to wind? Yes No

Will the building form, occupied spaces and fenestration be coordinated to allow natural or hybrid ventilation? Yes No

Daylighting

Will the building be located and oriented to maximize opportunities for daylighting? Yes No

Will the window sizing and placement optimize energy savings and maximize daylighting? Yes No

What is the average window-to-wall area ratio?

Are design strategies being implemented to maximize daylight for upper floors? Yes No N/A

Are design strategies being implemented to bring light deeper into occupied spaces and provide uniform lighting? Yes No

Questionnaire Screen
Pop-ups provide guidance to each question.

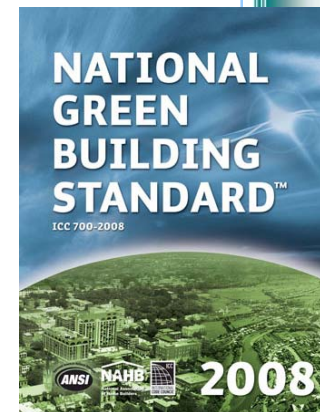
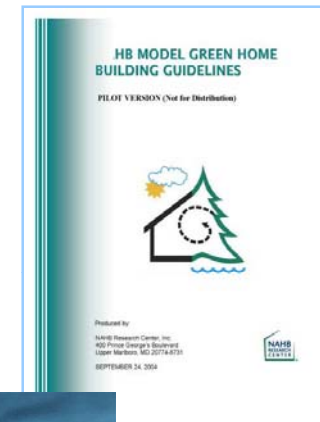
AF&PA





NAHBGreen

- Developed by NAHB Research Center
- Guidelines released January 2005
- ANSI Accreditation January 2009
- Treats wood very well
- Certification neutral



<http://www.nahbgreen.org/>





Summary

- Wood is an advanced, environmentally friendly material
- Wood plays a key role in building “Green”
- US has increasing inventories of desirable species with secure & predictable supplies and infrastructure
- Objective, science-based analysis shows that using more wood is good for the environment!



A Blueprint
for a
Sustainable
Future



USING WOOD IS BUILDING GREEN

Wood is:

- Strong
- Beautiful
- Renewable

Thank You