

Selecting Green Building Materials

Professional Methods and Sources to Identify, Evaluate, and Compare

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Presentation Outline:

- Introduction
Sustainable approaches focus on two questions:
 1. *What are we using?*
 2. *How well are we using it?* (1)
- What are characteristics of green building materials? (2)

1. Products made with Salvaged, Recycled, or Agricultural Waste Content

- a. Salvaged Products-
Re-used instead of re-manufacturing new from raw materials.
Example: Salvage yard building materials (bricks, millwork, period hardware)
- b. Post-Consumer Recycled Content-
Diverted material destined for landfill or disposal
Example: Rubber flooring
Closed-loop recycling vs. downcycling (lower grade produced)
- c. Pre-Consumer Recycled Content-
Post-Industrial (industrial by-products for creation of materials not within the same manufacturing process)
Example: Fly ash (by product of burning coal) in concrete
- d. Agricultural Waste Material-
Made from raw material left over after harvest.
Example: Kirei Board made from sorghum stalks

2. Products that Conserve Natural Resources

- a. Reduce Material Use-
Resource Efficiency- allows other materials to be used more efficiently or less.
Example: Concrete pigments added to slabs instead of conventional finished flooring.
- b. Exceptional durability or low maintenance requirements-
Less replacement or low impact maintenance.
Example: slate shingles
- c. Certified Wood Products-
Third-party forest certification based on Forest Stewardship Council standards
Example: Raw and engineered wood products with chain of custody certification
- d. Rapidly Renewable Products-
Shorter harvest rotation than wood (10 years or less), biodegradable, low in VOC emissions, produced from agricultural crops. Less energy intensive to produce, transportation and processing energy inputs must be considered.

3. Products that Avoid Toxic or Other Emissions

- a. Naturally or Minimally Processed Products
Low energy use and low risk of chemical release. Wood products, natural stone.
- b. Alternatives to Hazardous Products-
Better alternative than majority of products used for specific application.
Example: Low Mercury fluorescent lamps, alternatives to PVC

4. Products that Save Energy or Water

- a. Fixtures and Equipment that Conserve Water
Exceeds federal water efficiency standards and meet Maximum Performance standard.

5. Products that Contribute to a Safe, Healthy Built Environment

- a. No Release of Significant Pollutants into the Building
Zero and Low VOC paints, caulks, adhesives or low emitters.
- b. Block the Introduction, Development, or Spread of Indoor Contaminants
Prevention of generation or introduction of pollutants:
Example: Track-off systems at entryways
- c. Improves Light Quality
Solar tubes, reflective ceiling panels
- d. Noise Reduction
Absorb, masking and sound-cancellation technologies.
- e. Enhance Community Well-Being
Contribute to safer neighborhoods, increase walkability to make high-density neighborhoods more appealing.

- Interior Design Programming: - Inquiry - Research – Synthesis
- Material Selection: 1. Research 2. Evaluation 3. Selection
- Sources of Information for Research phase:
 - Manufacturer supplied information: MSDS sheets
 - Direct inquiry of Manufacturer using questionnaires
ASTM 2129 Data Collection for Sustainability Assessment of Building Products
Environmental Impact Questionnaire (Green Building Materials, Dru Meadows and Ross Spiegel)
 - Third Party Certifications:
 - 1. GreenGuard
 - 2. Cradle to Cradle
 - 3. Scientific Certification Systems
 - LifeCycle Software Tools:
 - 1. Athena Institute
 - 2. Pharos Project
 - 3. BEES 4.0
 - Online: Websites (see Sources)
 - Print Materials: Local Libraries for Books and Periodicals (see Sources)
- **ASID/ USGBC ReGreen Checklist**
http://www.regreenprogram.org/docs/product_checklist.pdf
- **Life Cycle Assessment:** the formal methodology that investigates the impact of a product at every stage in its life from preliminary development through obsolescence. (Cradle to grave). At each stage, the materials and energy consumed and the pollution and waste produced are considered.
Typical Life Stages:
 - 1. Extraction of Raw Materials
 - 2. Processing and Fabrication
 - 3. Transportation
 - 4. Installation
 - 5. Use and Maintenance
 - 6. Reuse/ Recycling/ Disposal

Selection of materials is only one part of making a high performance building.
LCA methodology helps us understand the link between the big picture and the details.

- **Pharos Project:** <http://www.pharosproject.net/>
<http://www.pharosproject.net/demo/index/>
“The Pharos Framework provides a set of general criteria, i.e. impact categories, against which we can and should evaluate all of our products. There are currently four active categories:
 1. *IAQ & other Toxic User Exposure* identifying indoor air quality and user exposure issues;
 2. *Manufacturing and Community Toxics* identifying manufacturing chemical hazards for workers and surrounding communities
 3. *Renewable Materials* assessing recycled and bio-based content used in the product
 4. *Renewable Energy* reflecting the amount of renewable energy used in the manufacturing facility/ies where the product is made and in the supply chain.Pharos scores products on a ten-point achievement scale within each impact category. Level ten represents the ideal product and level one the worst (there is no zero scoring). Levels in between represent benchmarks of achievement on the path to the ideal.” (3)
- **Athena Institute:** <http://www.athenasmi.org/>
EcoCalculator for Assemblies:
<http://www.athenasmi.org/tools/ecoCalculator/index.html>
LCA Model: <http://www.athenasmi.org/about/lcaModel.html>
- **BEES 4.0:** <http://www.bfrl.nist.gov/oae/software/bees/>
Building for Environmental and Economic Stability model:
<http://www.bfrl.nist.gov/oae/software/bees/model.html>

▪ **Alison’s Sustainability Index**

Research the following for Comparison and Analysis of Material:

1. Consideration of aesthetics and potential end use in design.
2. Environmental Policy of Material Manufacturers
3. Material Attributes:
 - a. Raw Materials- Identification and Source
 - b. Manufacturing Process
 - c. Proximity of Manufacture to Project site, Transportation
 - d. Health and Well-being benefits of Material
 - e. Impacts of Material on Indoor Air Quality
 - f. Anticipated Life of Product: Durability
 - g. Maintenance Requirements of Material
 - h. Recyclability of Product, end of life considerations
 - i. Affordability of Product (initial costs, maintenance costs over duration of installation).

Sustainability Ranking System for Comparison of Materials

1. Does the manufacturer have an Environmental Policy or Sustainability goals? **0-5 points**
2. Do their sustainability goals take into account social justice and/or impacts to the environment at all stages of the material's life cycle? **0-5 points**
3. Comparison of Material Attributes:
 - a. Raw Materials- Identification and Source. **0-10 points**
 - b. Manufacturing Process **0-10 points**
 - c. Proximity of Manufacture to Project site, transportation **0-10 points**
 - d. Health and Well-being benefits of Material **0-10 points**
 - e. Impacts of Material on Indoor Air Quality **0-10 points**
 - f. Anticipated Life of Product: Durability **0-10 points**
 - g. Maintenance Requirements of Material **0-10 points**
 - h. Recyclability of Product, end of life considerations **0-10 points**
 - i. Affordability of Product (initial costs, maintenance costs over duration of installation). **0-10 points**

HIGH SCORE: 100 points

- Third-Party Certifications vs. Manufacturer supplied product information
 - **Greenguard**
<http://www.greenguard.org/quickSearch.aspx>
 - **Scientific Certification Systems**
Environmentally Preferable Products:
http://www.scscertified.com/lcs/epp_products.php
 - **Cradle to Cradle**
Criteria Matrix: http://www.mbdc.com/docs/V2_criteria_matrix.pdf
Detailed Certification Criteria: http://www.mbdc.com/docs/Outline_CertificationV2_1_1.pdf
- **Decision Matrix Worksheet**
 - Example: see next page(s)
 - Worksheet follows resource list.

References:

- (1) Spiegel, Ross and Meadows, Dru. Green Building Materials, Second Edition. Hoboken, NJ: Wiley & Sons, 2006.
- (2) Excerpted and condensed from Wilson, Alex. Environmental Building News Building Materials: What Makes a Product Green? Brattleboro, VT: BuildingGreen, Inc. Vol. 9, No. 1 Jan 2000, Revised Jan. 2006.
- (3) <http://www.pharosproject.net/framework/index/>

DECISION MATRIX EXAMPLE

Product Type: Countertop	Weighted Value	Product One: Icestone	Score	Pro/Con
Description		Concrete with recycled glass aggregate		
1. Warranty/ Durability	5	13,000 psi compressive strength	3	pro
2. Design Aesthetics	17	29 colors available, glass catches light, depth of surface	13	pro
3. First Cost	15	\$100- \$120 sq. ft. installed	7	con
4. Recycled Content	10	70-75% recycled content by weight. 80-100% of this content is pre-consumer	10	pro
5. Recyclability	12	Exis. Slabs can be cut into new pieces. Can be ground and reformed into new slabs. Can be down-cycled into tiles, landscaping, road bed aggregate.	12	pro
6. Maintenance	8	Must be sealed. Commercial use: reseal annually. Some foods if left on surface can stain.	6	pro
7. Local Content/ Origin	18	Fabricated in Brooklyn, NY	18	pro
8. VOCs IAQ impacts	10	Chemically benign. 99.5% inorganic. Specify low/no VOC sealants.	10	pro
9. Certifications/ Rating	5	Cradle to Cradle- Gold. NSF certified for use in food service areas.	5	pro
TOTAL:	100	Product One: Icestone	84	

Product Type: Countertop	Weighted Value	Product Two: Natural Granite	Score:	Pro/Con
Description		Natural granite slab		
1. Warranty/ Durability	5	19,000 psi compressive strength	5	pro
2. Design Aesthetics	17	Limitless colors and veining patterns available, natural variation.	17	pro
3. First Cost	15	\$75-\$95 sq. ft. installed	15	pro
4. Recycled Content	10	Naturally occurring non-renewable resource	5	con
5. Recyclability	12	Exis. Slabs can be cut down into new pieces. Can be down-cycled into tiles, landscaping, thresholds or other building uses.	11	pro
6. Maintenance	8	Must be sealed. Can scratch depending on mineral content. Acidic foods can damage surface.	7	pro
7. Local Content/ Origin	18	Quarries located worldwide. Color choice may be limited if proximity to building site most important.	16	pro
8. VOCs IAQ impacts	10	Naturally emits radiation. May be a [insignificant] source of radon gas (amount emitted may vary by type)	5	con
9. Certifications/ Rating	5	Some granite tile is GreenGuard Children & School certified, slabs usually are not.	3	con
TOTAL:	100	Product Two: Natural Granite	84	

Additional Resources:

Collaboration for High Performance Schools

High Performance Products Database: <http://www.chps.net/dev/Drupal/node/445>

Low Emitting Materials Table: <http://www.chps.net/dev/Drupal/node/381>

Green Building Rating Systems/ Design guides:

<http://www.greenglobes.com/default.asp>

<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>

Life Cycle Assessment Tools:

<http://www.pharosproject.net/about/faq/>

<http://www.bfrl.nist.gov/oa/software/bees/>

<http://www.athenasmi.org/about/lcaModel.html>

<http://www.athenasmi.org/tools/ecoCalculator/index.html>

<http://www.sustainableindustries.com/greenmarketing/66147977.html>

Material Guides:

<http://www.chps.net/dev/Drupal/node/381>

<http://www.chps.net/dev/Drupal/node/445>

<http://www.c2ccertified.com/>

<http://www.greenguard.org/quickSearch.aspx>

http://www.scscertified.com/lcs/epp_products.php

<http://www.scscertified.com/gbc/index.php>

Websites:

Repeat No Repeat Blog: <http://repeatnorepeat.com/>

Greenkonnnect.com <http://greenkonnnect.com/>

Environmental Building News www.buildinggreen.com

USGBC sponsored website/ forum <http://greenhomeguide.com/>

www.greenbuildingadvisor.com/green-product-guide

<http://www.greenbuildingadvisor.com/content/16-how-do-i-know-when-building-product-really-green>

Green Building Materials Print Resources:

Associates III and Foster, Kari. Sustainable Residential Interiors, 2006.

Bonda, Penny and Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley, 2006.

Botti-Salitsky, Rose Mary. Programming & Research: Skills and Techniques for Interior Designers. New York: Fairchild Books, 2009.

Crave, Jackie. The Healthy Home: Beautiful Interiors that Enhance the Environment and Your Well-Being. Gloucester, MA: Rockport Publishers, Inc., 2003.

Greenspec Directory, Seventh Edition. Brattleboro, VT: BuildingGreen, LLC.

Jones, Louise. Environmentally Responsible Design: Green and Sustainable Design for Interior Designers. Wiley, 2008.

Maczulak, Anne. Green Technology Sustainability: Building Eco-Friendly Communities. New York: Facts on File, Inc., 2010.

Nussbaumer, Linda L. Evidence Based Design for Interior Designers. New York: Fairchild Books, 2009.

Rosseau, David, Wasley, James. Healthy by Design: Building and Remodeling Solutions for Creating Healthy Homes. Point Roberts, WA: Hartley & Marks Publishers, Inc., 1997.

Spiegel, Ross and Meadows, Dru. Green Building Materials: A Guide to Product Selection and Specification. Second Edition. Hoboken, New Jersey: John Wiley & Sons, 2006.

Wilson, Alex, Your Green Home, Gabriola Island, BC Canada: New Society Publishers, 2006

Wilson, Alex, Piepkorn, Mark. Green Building Products. Gabriola Island, BC Canada, Brattleboro, VT: BuildingGreen, LLC and New Society Publishers

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DECISION MATRIX WORKSHEET

**Item No. 10 is self-selected criteria

Product Type: _____

Product One:	Weighted Value	Comments:	Score:	Pro or Con?
1. Warranty/ Durability				
2. Design Aesthetics				
3. First Cost				
4. Recycled Content				
5. Recyclability				
6. Maintenance				
7. Local Content/ Origin				
8. VOCs IAQ Impacts				
9. Certifications/ Rating				
10.				

100

DECISION MATRIX WORKSHEET

**Item No. 10 is self-selected criteria

Product Two:	Weighted Value	Comments:	Score:	Pro or Con?
1. Warranty/ Durability				
2. Design Aesthetics				
3. First Cost				
4. Recycled Content				
5. Recyclability				
6. Maintenance				
7. Local Content/ Origin				
8. VOCs IAQ Impacts				
9. Certifications/ Rating				
10.				

100