

Green Building Materials

Autumn Salamack ESM 595 F November 9, 2000



Outline

- Overview of green buildings
- Principles of green building materials
- Examples: roofing and floor coverings
- Conclusion



Green Buildings

- Holistic approach
- Sources and impacts of materials
- Mechanical system efficiency
- Site / building relationship
- Innovation



Principles of Green Building

- Save energy
 - Recycle buildings
 Save water
 - Create community
 Make the building
 - Reduce material use
 - Protect and enhance the site
 - Select low-impact materials

- Maximize longevity
 - - healthy
 - Minimize C&D waste
 - Green up your business



Building Materials

- Materials form a large part of the overall environmental burden of buildings
 - Raw material extraction
 - Waste and pollution associated with manufacturing
 - Material installation
 - Public health risks
 - Disposal



Material Life Cycle Assessment

- Resource extraction
- Manufacturing and transportation
- Installation
- Operation and maintenance
- Salvage, recycling and disposal

Principles of Green Materials

- Choose products:
 - made from environmentally attractive materials
 - that are green because of what isn't there
 - that reduce environmental impacts during construction, renovation or demolition
 - that reduce environmental impacts of building operation
 - that contribute to a safe, healthy indoor environment

environmentally attractive materials



- salvaged products
- products with post-consumer/industrial recycled content
- certified wood products
- rapidly renewable products
- products made from agricultural waste material

Products that are green because of what isn't there

- products that reduce material use
- alternatives to ozone-depleting substances,
 PVC and polycarbonate
- alternatives to conventional preservative-treated wood
- alternatives to other components considered hazardous

Products that reduce environmental impacts associated with construction

- products that reduce the impacts of new construction
- products that reduce the impacts of renovation
- products that reduce the impact of demolition









- building components that reduce heating and cooling loads
- energy & water conserving components
- renewable energy and fuel cell equipment
- products that prevent pollution or reduce waste



- products that don't release significant pollutants into the building
- products that block the introduction, development or spread of indoor contaminants
- products that remove indoor pollutants
- products that warn occupants of health hazards in the building



Focus Building Materials

- Roofing
 - Asphalt / fiberglass composition



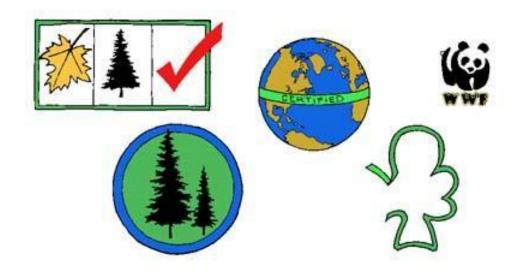
- Aluminum / steel
- Metal
- Floor Coverings
 - Wood
 - Natural linoleum
 - Carpeting / carpet pads





Principles Discussed

- Durability
- Recycled-content
- Recyclability
- Pollution (embodied energy)





Roofing Criteria

- Durability
 - 25-year minimum warranty
- Color
 - Use light colored roofs
 - Increases durability
 - Decreases reliance upon mechanical cooling

Roofing: Options for Shingles

- Asphalt / FiberglassComposition
 - Very durable
 - 40-year warranty
 - Some recycled content

- Aluminum / Steel
 - Durable
 - 90% recycled content
 - Recyclable at end of life



Roofing: Options for Shingles

- Metal
 - Durable
 - 100% recycled content
 - Recyclable





Comparison of Materials

 $\sqrt{\frac{1}{2}}$ Low $\sqrt{\frac{1}{2}}$ Moderate $\sqrt{\frac{1}{2}}$ High -

Material	Durability	Emb. Energy	Cost	Env. Impact	Recycled Content	Recyclability
Cedar	√		V V V	√√√		
Tile/ Slate	√√√	√ √	√ √	√ √ - √ √ √		
Asphal t/ Fibergs	√ √ √		√		√- √ √	
Alum. / Steel	√√√	√√√		√	√ √	√√-√√
Metal	$\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{$	√√-		$\sqrt{}$	$\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{$	√√-√√√



Floor Coverings Criteria

- Durability
- Resource efficiency



- Indoor air quality
 - Offgassing concerns





Floor Coverings

- Wood
 - Reclaimed wood flooring
 - Sustainably harvested wood flooring
 - Bamboo flooring
- Natural Linoleum
 - Durable
 - Abrasion resistant







- Carpeting
 - Must be replaced frequently
 - Large contributor to landfill waste
 - Traps dust, mold, bacteria
- Carpet pads
 - Durable with recycled content
 - Use of recycled materials
 - Offgassing concerns



Floor Coverings

- Options
 - Recycled-content carpeting
 - Carpet tiles
 - Carpet leasing
 - Rapidly renewable fibers
 - Use mats or small carpets





Comparison of Materials

 $\sqrt{\text{Low}}$ $\sqrt{\sqrt{\text{Moderate}}}$ $\sqrt{\sqrt{\sqrt{\text{High}}}}$ --

Material Durability Emb. Cost Recycled Recyclability Env. Impact Content Energy $\sqrt{\ \sqrt{-}}$ $\sqrt{\sqrt{}}$ Renew. Fibers $\sqrt{\sqrt{}}$ Nat. Linol. √√-**√** √ -Vinyl / Rubber $\sqrt{-\sqrt{\sqrt{-1}}}$ Carpet $\sqrt{\sqrt{\sqrt{|\nabla x|^2}}}$



General Recommendations

- Specify at least four major construction materials with post-consumer recycled content
 - Less energy expenditure and pollution
- Use natural materials to the extent possible as they have low levels of toxicity compared to synthetic materials



- Santa Monica Green Building Guidelines
 - http://greenbuildings.santa-monica.org
- Environmental Building News
- GreenSpec Binder
- Santa Barbara County Green Building Guidelines (To be published)