

## Greening Your Home: Green Daylighting and Greening Roofs

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Presented by  
the **Nature Center**  
at **Shaker Lakes**  
and  
**Environmental Health**  
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## Greening Your Home: Rehab

Green or sustainable building means construction or rehab of our living spaces so there is little or no harm done to the natural environment or to the health of the residents.

## Buildings that Connect People to Nature

- Biophilia means “love for nature.”
- humans have an innate and evolutionarily based affinity for nature.
- It is the connections that human beings subconsciously seek with the rest of life.
- We connect to nature via our windows, our landscape, our gardens, our buildings.

## Life Cycle Analysis of Building Materials

- Following from the GreenSpec Directory of *Environmental Building News*  
[www.buildinggreen.com](http://www.buildinggreen.com)

## LCA Defined

- “If we are to understand the environmental impacts associated with any product,
- ...we must analyze the entire life of that product and consider the environmental burdens of each step along the way;
- ...from ‘cradle-to-cradle’”.

## What LCA Might Look Like in the Future

- “Food bought in a supermarket is labeled with a standard nutrition form that tells you amount of ...things in each serving.”
- Someday building materials ...may have a label listing how it may contribute or not to harm of the environment.”

### Summary of Product Standards for Green Spec

Products Made with Salvaged, Recycled or Agricultural Waste

- Salvaged products
- Products with post-consumer content
- Products with pre-consumer content
- Products made with agricultural waste material (straw, hay, etc)

### Products that Conserve Natural Resources

- Products that reduce material use
- Products with exceptional durability or low maintenance
- Certified wood products
- Rapidly renewable products

### Products that Avoid Toxic or Other Emissions

- Natural or minimally processed products
- Alternatives to wood treated with toxic preservatives
- Alternatives to products made from PVC

### Avoid Toxic Emissions (cont.)

- Alternatives to other components considered hazardous
- Products that reduce or eliminate pesticide treatments
- Products that reduce pollution or waste from operations

### Products that Reduce Environmental Impact of Construction

- Products that reduce the impacts of new construction
- Products that reduce the impacts of demolition
- Products that reduce the impacts of renovation

### Products that Conserve Energy or Water

- Building components that reduce heating/cooling loads
- Equipment that conserves energy
- Renewable energy and fuel cell equipment
- Fixtures and equipment that conserve water

### Products that Contribute to a Safe, Healthy Indoor Environment

- Products that don't release significant pollutants into building
- Products that block the introduction, development or spread of indoor contaminants
- Products that remove indoor pollutants

### Healthy House Products (cont.)

- Products that warn residents of health hazards in the building
- Products that improve light quality

What product standard is best represented (or not) by following materials/systems mentioned?

- Lawn chemicals
- Rain gardens
- Permeable surfaces
- Pesticides
- Foam insulation in basements
- Subslab ventilation

### More Products/systems that May Affirm or Violate LCA Standards

- Cellulose insulation
- Fiberglass insulation
- Foam insulation
- Windows: wood, vinyl, fiberglass
- Siding: wood clapboard, cedar shakes, asbestos, brick/stone, vinyl, aluminum, asphalt

### Green Daylighting

- Provide effective natural lighting (daylighting) to as much living space as possible
- ...using windows, doors, skylights, and light tubes as the project can afford
- ...while controlling as much as possible heat loss/gain, glare and deterioration/fading of materials.

### Taking Advantage of Natural Light

- The sun provides 7,000-10,000 foot-candles of light while most of our interior spaces need only about 50 foot-candles.
- Even cloudy days can provide sufficient natural light for most activities.

### Natural Light and Manmade Light

- Daylighting was always part of buildings until electric lights came along!
- Now we are trying to recover the baby we threw out with the bath.

### Positive Health Effects of Natural Lighting

- There are numerous studies demonstrating that natural lighting has a more positive influence on mood, function and health (e.g., Seasonal Affective Disorder-SAD).

### Natural Light and Heat Loss/Gain

- Creating superenergy efficient building envelope reduces overall heat loss to the point where some additional window exposure is less of an energy penalty.

### Increasing Natural Light Can Reduce Electrical Energy Consumption

- Lighting accounts for about 20-25% of electricity consumption.
- The use of natural light can reduce this consumption and cost.

### Some Light Can Be Damaging to Building Materials

- Ultraviolet light can damage building materials
- ...so methods of diffusing this damaging light are required (films, shading, etc).

### Other Benefits of Energy-efficient Natural Light Sources:

- Improved comfort (if there is southern exposure with appropriate shading for summer)
- Reduced condensation due to temperature rise of glass surfaces.
- Natural ventilation
- Sound control

## Create Natural Lighting Appropriate for Particular Spaces

- Whether a window faces north, east, south or west makes a big difference in the type of light it receives.
- Artists prefer northern exposures for their home studios because it has a more constant light.

## When are different windows appropriate?

- Skylights and light tubes are for lighting space on the interior when little natural light is available.
- Clerestory windows allow light entry at a high level which is then reflected down into the living space.

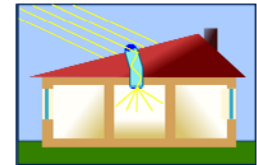
## Skylights



- Skylights are a great source of light,
- ...but can be a significant heat loss because of their location at top of stack effect.

## Light Tubes

- Light tubes can provide effective light with minimal heat loss.
- May require defuser due to brightness of light.



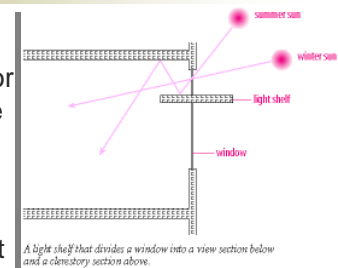
## Clerestory Windows



- When using clerestory windows it is best to have light color ceilings,
- ...so light that enters is reflected effectively.

## Controlling Natural Light Entry

- Shades/blinds
- Reflective films or low transmittance glass appropriate to the condition
- Bounce light off ceilings with "light shelves"



## Interior Windows Between Rooms



- The use of windows between rooms on the interior
- ...allows natural light from exterior to carry throughout the structure.

## Attics and Roofs

- Air sealing insulating attics/roof
- Ventilating an attic/roof
- Roof surfaces



## Air Sealing



- Air sealing the attic floor openings not only reduces heat loss,
- ...but keeps interior moisture out of attic.

## Attic Insulation

- Insulate the perimeter of the current or anticipated living space.



## Roof Surfaces

- Prepare and install the roof surface so it
  - blocks rain/snow entry,
  - reduces heat gain,
  - avoids ice backup,
  - and has best LCA you can afford.



## Roof Materials

- Underlayment: OSB, Plywood
- Rain screen: felt, ice guard
- Roof surface materials:
  - asphalt
  - slate
  - metal
  - wood shakes
  - clay tile

How do they measure up to LCA standards?

## Attic Ventilation

- Why do we ventilate?
- When don't we ventilate?
- How do we ventilate, if required?

## Avoiding Ice Backup on Roofs

- How we insulate, ventilate and air seal our attics
- ...and how we finish the roof surface
- can determine whether we have severe ice backup and water entry into the structure during our freeze/thaw cycles.