

*Down to Earth*

environmental consulting  
natural building design



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## **THE BIG PICTURE: STRAWBALE TRENDS AND DEFINING “ECO-SENSIBLE” DESIGN**

*by Sigi Koko*

### **INTRO: URBAN STRAWBALE AND OTHER TRENDS I’VE NOTICED...**

I frequently give presentations to educate homeowners, building officials, developers, and architects on how to see building design with green-colored glasses. In the past, I would briefly mention strawbale construction as what I call a “super green” example of how to create resource efficient, energy conserving, beautiful structures. In the past, I would get a lot of blank stares. But in the last couple years, and particularly in the past year, I’ve noticed a significant shift. Now those same audiences specifically request to hear about strawbale and other natural building techniques. Now I experience overt curiosity, thoughtful and informed questions that manage not to mention the big bad wolf, and a general attitude that natural building techniques are viable methods of construction. The obstacle I notice is uncertainty on how to build long-lasting structures in any climatic condition.

I’ve seen this same trend in getting building permits. Being on the East Coast and designing in a wet/humid climate poses challenges for strawbale construction. The notion is that “strawbale is great, but it will only work in the Southwest where it’s dry”. When I’m submitting for a building permit, I always schedule a “pre-submittal” meeting with the permitting office. In the past, these meetings were long and full of basic descriptions of what strawbale is and how I propose to build with it in our climate. Now the building officials have heard of strawbale and the questions focus on specific “how to” details. Generally there is a positive attitude toward strawbale. (I even had one building official call me monthly to check when construction was starting because he didn’t want to miss the bale raising.) What they want is reassurance that construction details will appropriately address the moisture issues we have in this climate.

The final trend is that strawbale is moving to urban areas and is no longer just considered viable for houses. Even in the Washington DC area (not known for it’s progressiveness...), upcoming strawbale projects include a school, a community-based healthcare facility, and several house additions.

Recently I gave a presentation at the Washington DC Green Festival. Following is a summary of what I covered, as well as some simple and inexpensive solutions to gain multiple benefits to health, ecological impact, quality of life, and resource use (including water and energy). I’ve also included some of my favorite resources on each topic.

*photo: [not shown] countertop is a salvaged bowling alley floor, cabinets were reused from the old kitchen, floor was refinished instead of replaced, interior walls were removed to create a brighter space with natural sunlight...*

## **OVERVIEW: WHAT DOES IT MEAN TO BUILD “GREEN”?**

There are five categories to consider in designing/creating a well-rounded “green” building:

- Site Development
- Water Conservation
- Energy Efficiency
- Health & Well-being
- Materials & Resources

It is the composite of all of these topics that makes a building “green”, not simply addressing a single issue. For example, if only energy efficiency is addressed, the result is an energy-efficient building, but not a “green building”. For each category, the general focus is to “reduce, reuse, recycle”, and I would add “renewable”. This means reducing resource use and using renewable resources, as well as reducing negative environmental impacts. It means reusing resources and allowing elements to perform double-duty. And it means recycling everything back to where it started, just like nature does. The beauty of many natural building techniques is being able to achieve multiple environmental benefits with a single effort. Strawbale is a great example, because it creates a super energy-efficient building envelope using a non-toxic, rapidly renewable farming waste product that is generally harvested locally.

## **1. SITE DEVELOPMENT**

*photo: [not shown] living roof with drought-resistant plants*

### **QUICK FACTS**

- Urban areas are an average of 6-8°F warmer than outlying areas
- Up to 80% of water that falls on a grass lawn ends up as runoff
- Stormwater runoff causes more water pollution than industrial sources

### **OVERVIEW**

Generally the emphasis on “green building” is on the structure itself, however, our landscapes also have enormous impact on local ecosystems. The largest impact is dealing with stormwater and water usage. Sustainable sites encourage natural water filtration and reduce overall use of potable water by mimicking natural systems. The shift is thinking about stormwater as a resource instead of as a burden. This means allowing water to stay on the site where it is filtered and recharges groundwater tables. This is accomplished by:

1. reducing impervious surfaces
2. slowing down water flows so they have longer to “soak in”
3. collecting rainwater
4. eliminating potential pollutants (including litter, pesticides, and fertilizers)

Eliminating potable water use for landscaping should then be easy, since the rainwater will do this job for you. This means, of course, using native and climate-adapted plants in the landscaping.

## **NATURAL BUILDING EXAMPLE: LIVING ROOF**

Reduces stormwater runoff; protects waterproofing membrane; reduces heat gain to roof

#### **WHAT CAN YOU DO?**

- Eliminate irrigation (except collected rainwater or graywater discharge)
- Use only native, non-invasive, drought-resistant plant species for landscaping
- Reduce impervious surfaces (including roofs) – goal is to keep all rainwater on-site and to mimic natural water flows
- Collect rainwater
- Do not use pesticides or fertilizers
- Create rain gardens or swales to collect and slow down rainwater

#### **ADDITIONAL RESOURCES**

[www.epa.gov/water/](http://www.epa.gov/water/)

[www.ces.ncsu.edu/depts/hort/consumer/hortinternet/water\\_quality.html](http://www.ces.ncsu.edu/depts/hort/consumer/hortinternet/water_quality.html)

[www.greenroofs.com](http://www.greenroofs.com)

[www.greenroofplants.com](http://www.greenroofplants.com)

[Introduction to Permaculture](#) by Bill Mollison ISBN 0-908228-08-2

## **2. WATER CONSERVATION**

*photo: [not shown] composting toilet in Maryland home*

#### **QUICK FACTS**

- Less than 1% of water on the planet is fresh water
- The U.S. uses 17% of all available freshwater worldwide
- 35% of all potable water use in the U.S. is for flushing toilets

#### **OVERVIEW**

Water is one of our most squandered resources and is often referred to as “the oil of the future”. The reason water is wasted when we look at how it is commonly used. Drinking quality water is generally used to flush toilets and water lawns, and all wastewater is treated alike, regardless if it is lightly soiled soapy water from a sink or if it is flush water from a toilet. This means all water gets processed with maximum intensity. Again we can look to natural systems for the ideal model. Potable water resources are best used where it is reasonable that a person may ingest water, such as drinking fountains, sink faucets, and showers. Non-potable uses of water, such as irrigation and toilet flushing, can use filtered graywater or collected rainwater.

#### **NATURAL BUILDING EXAMPLE: COMPOSTING TOILETS**

Eliminates water use for toilet flushing; creates nutrient-rich compost

#### **WHAT CAN YOU DO?**

- Eliminate use of potable water for irrigation and toilet flushing
- Install water-efficient appliances (Energy Star)
- Select ultra low-flow fixtures (showerheads, faucets) and non-water using toilets
- Install aerators on faucets
- Use captured rainwater or filtered graywater for toilet flushing

#### **ADDITIONAL RESOURCES**

[www.energystar.gov](http://www.energystar.gov)

Texas Guide to Rainwater

Harvesting

<http://www.twddb.state.tx.us/publications/reports/RainHarv.pdf>

[www.oasisdesign.net](http://www.oasisdesign.net)

### 3. ENERGY

*photo: [not shown] ample natural daylight means reduced energy use and healthier light quality; indoor windows allow light to be "borrowed" from one room to another*

#### QUICK FACTS

- 40% of all energy use is in buildings
- 6.6 tons of greenhouse gases are emitted per person each year in the U.S.
- If every house in the U.S. replaced 1 light bulb with a compact fluorescent, it would be the equivalent of taking 1 million cars off the road

#### OVERVIEW

There is no doubt that energy conservation receives the lion's share of attention relating to creating "ecologically sensitive" buildings, and for good reason. If there's any single initiative with multiple benefits, it's reducing energy consumption and focusing on renewable energy sources of power. Power plants commonly use non-renewable resources, contribute to air pollution, ozone depletion, and "greenhouse effect", and they use and pollute significant amounts of fresh water. There are 3 areas to focus on when reducing energy use. First is to focus on energy conservation, by using passive heating and cooling, maximum insulation in walls and roof, using sunlight instead of electrical lighting, and installing energy efficient appliances and equipment. The second strategy is to produce any energy you use with renewable energy systems. And finally is to reduce the reliance on energy-intensive forms of transportation.

#### NATURAL BUILDING EXAMPLE: PASSIVE SOLAR DESIGN

Reduces or eliminates energy use for heating and cooling

#### WHAT CAN YOU DO?

- Minimize need for car use
- Design for solar orientation
- Create an efficient building envelope for your climate
- Make use of daylight and natural ventilation – windows on 2 sides of every room
- Generate your own energy & use net-metering where possible to eliminate batteries
- Install efficient appliances & HVAC systems (Energy Star)

#### ADDITIONAL RESOURCES

[www.energystar.gov](http://www.energystar.gov)

[www.eere.energy.gov/solar/](http://www.eere.energy.gov/solar/)

[www.nrel.gov/clean\\_energy/passivesolar.html](http://www.nrel.gov/clean_energy/passivesolar.html)

[The Solar House](#) by Dan Chiras ISBN 193149812-1

[www.efficientwindows.org](http://www.efficientwindows.org)

### 4. MATERIALS & RESOURCES

*photo:[not shown] recycled glass & salvage tile scraps on a cob wall*

#### QUICK FACTS

- Buildings account for 40% of all extracted raw materials from the earth

- Demolition and construction of buildings accounts for 50% of all landfill waste
- The U.S. generates 4.4 pound of trash per person per day (1.5 to 2x as much as any other First World country)

## OVERVIEW

Choices of building materials have great potential to effect both health and resources use. *Healthy materials* are those that do not threaten human health AND do not negatively impact natural ecosystems. *Sustainable materials* can be defined as renewable or regenerative AND acquisitioned without ecological damage AND used at a rate that does not exceed the natural rate of replenishment. The overall impact of any given materials can be determined through “life cycle analysis”, which reviews the entire life of a material, from getting the raw materials, through manufacturing and shipping, and through it’s normal lifespan of being used. The ideal is to create a “closed-loop” model where any material that is removed can be reuse, remanufactured, or recycled back into a useful new product. If you question the healthfulness of a particular product, you can get an MSDS (Material Safety Data Sheet) from the manufacturer (often available online).

## NATURAL BUILDING EXAMPLE: STRAWBALE

Creates a super energy-efficient building envelope; uses local, non-toxic, biodegradable, rapidly renewable waste material

## WHAT CAN YOU DO?

### 1. **reduced: lower total burden**

- create smaller compact plans
- use structural elements as finishes
- optimize material use

### 2. **reused: longer lifespan**

- incorporate salvaged materials
- design for dismantle and reuse
- create flexible spaces

### 3. **renewable: replenished by natural systems**

- use agriculture-based products
- use certified sustainably harvested wood

### 4. **recycled: waste becomes a resource**

- use products with high post-consumer recycled content

### 5. **healthy: non-toxic**

- avoid products with ozone depleting potential or global warming potential
- use non-toxic building & cleaning products
- avoid products that support pathogens or bio-contaminants (such as mold/mildew, fungus, bacteria)
- create details that protect materials from water damage

### 6. **local: less transportation energy**

- give preference to locally manufactured materials

### 7. **durable: longer lifespan**

- use high quality, durable products
- use materials that can be partially replaced or easily repaired
- protect materials from premature damage

### 8. **post-use: avoid disposal**

- select materials that can be salvaged, reused, recycled (with no down-cycling)

- select materials that are biodegradable

#### **ADDITIONAL RESOURCES**

[www.buildingforhealth.com](http://www.buildingforhealth.com)

[www.realgoods.com](http://www.realgoods.com) (especially their [Solar Living Sourcebook](#))

check locally for salvage resource options

## **5. HEALTH & WELLBEING**

*photo: [not shown] earthen niche in a masonry heater*

#### **QUICK FACTS**

- The average American spends between 80 and 90% of their time indoors
- Air inside a home can be more polluted than outside air, even in cities
- Indoor air pollution is the primary cause of chronic respiratory disease

#### **OVERVIEW**

The trend toward energy-efficient buildings with tighter (less leaky) building envelopes has had one challenging outcome: potentially trapping harmful contaminants inside. Indoor pollutants include combustion gases, airborne chemicals, particulates, and microbes (such as mold or dust mites). Indoor air pollution has been linked to asthma, chronic fatigue, burning eyes, dry coughs, headaches, dizziness, rashes, and temporary loss of memory. Pollutants can come from carpeting, cabinets, vinyl products, cleaning products, candles, and air-fresheners. Many of the persistent pollutants come from daily activities, so I recommend starting with items you use regularly (soaps & cleaners, fragrances, etc.) and making sure these are non-toxic and biodegradable.

#### **NATURAL BUILDING EXAMPLE: NATURAL PLASTERS & PAINTS**

Uses local, non-toxic readily-available materials

#### **WHAT CAN YOU DO?**

- Use maintenance products that are non-toxic, biodegradable, and zero-VOC
- Control moisture to prevent mold and mildew growth
- Use interior plants that filter pollutants from air
- Use outside air for any combustion and vent directly outdoors

#### **ADDITIONAL RESOURCES**

<http://www.epa.gov/iaq/pubs/>

[Prescriptions for a Healthy House](#) by Paula Baker, Erica Elliott, and John Banta ISBN 1-56690-355-6

[Clean & Green](#) by Annie Berthold-Bond ISBN 1-886101-01-9

[Clean House, Clean Planet](#) by Karen Logan ISBN 0-671-53595-1

#### **CONCLUSION...**

My favorite comment during a presentation is “This all sounds like common sense.” That’s my goal, actually. That people walk away thinking that “going green” just makes sense. I strongly believe that the single obstacle is education. (That’s my goal in giving presentations.) I believe that informed consumers will demand healthful and “eco-sensible” options, and that demand will bring natural building more and more into the mainstream.

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