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High Performance Strategies for Homes & Buildings
Seeing Beyond LEED and the Glare of “Eco-Bling”

2016 EEBA Keynote

Sept 27, 2016
Frisco, Texas

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Barley | Pfeiffer Architecture
Austin, Texas

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LOST PINES ART CENTER – Bastrop, Texas
Estimated completion late 2016
Approach & Background

• New Construction

• Remodeling

• Interior Designers

• Building Science Consultants

• Practicing Architects who grew up in construction

• UT Masters in Architecture and Energy Studies

• Real Estate Development & Property Management
The PIN CUSHION house -
Tacked-on “green” eco-bling gizmos, gadgets and products.
Where did the term “Green Building” come from?

Forces behind the start of the Austin Energy Star program in 1984, then its Green Building program in 1991.

One big result: Offsetting the need for a 730 MW power plant – and a national movement!

Altruism or just facing Reality?
Then comes - LEED for Homes
The explosion that blew out the flames of the green building movement.

Unsustainable LEED-Platinum Home in Texas

It’s misleading to suggest you can “have it all” and still be Green...
The checklist approach:
- developed by a consensus of whom?
- what about the architect’s professional judgement?

Is the strategy right for your climate?
- for the region?
- for the way the house will be used?
- for the budget?

Is it a home being designed to be sold?
- or to be lived in? (Big difference…)
VITAMIN ENRICHED CIGARETTE

Without integrated planning the best grade you will ever get on your High Performance Building efforts is a “C”.

It's not about solar collectors being tacked on top of an energy inefficient design!
Green Building boiled down to this:

- **Reduced Consumption** – energy, water, non-renewable materials.
- **Improved Health** – Indoor Air Quality, etc.
- **Reduced Environmental Impact**.
High-Performance adds this:

• **Lower cost of ownership** – energy bills, water bills, durability, maintenance cost, etc.

• **Improved Health** – cleaner indoor air, better humidity control, getting sick less often, etc.

• **More comfort** – better use of natural lighting, less glare, more even temperatures from one room to the next.
My view on how to accomplish it:
(It’s not that hard....)

• Keep in simple.

• Rely on smart thoughtful climate sensitive DESIGN.

• Gizmos & complex things break. Cost money & time to fix.
The Food Guide Pyramid
A Guide to Daily Food Choices

Fats, Oils, & Sweets
USE SPARINGLY

Milk, Yogurt, & Cheese Group
2-3 SERVINGS

Vegetable Group
3-5 SERVINGS

Meat, Poultry, Fish, Dry Beans, Eggs, & Nuts Group
2-3 SERVINGS

Fruit Group
2-4 SERVINGS

Bread, Cereal, Rice, & Pasta Group
6-11 SERVINGS

These symbols show fats and added sugars in foods:

- Fat (naturally occurring and added)
- Sugars (added)

The Energy Use Pyramid  A guide to energy saving choices

Don’t use power
- Downsize building & systems
- Solar Orientation
- Tight Buildings
- Shade windows & walls:
  - roof overhangs
  - awnings
  - trees

Produce your own power
- Solar photo-voltaics
- Solar hot water
- Wind turbines

Use power efficiently
- Efficient appliances
- High SEER air-conditioners & heat
- Fluorescent & LED light bulbs

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The Initial Cost versus Effectiveness Pyramid
Retrofit Window Awnings

- Reduces radiation (the biggie)
- Cut A/C system sizing by 1/3
2.55 KW solar array installed in 2004 on my house.
“ACTIVE” SOLAR

Atmospheric dirt build-up makes for “active” annual maintenance.

2.55 KW solar array costs $16,000 to install.

Saves $25 - $35/ month (at 10 cents/ KWH electricity cost)
Butterfly roofs:
Climatic responsive?
Rain protection?
or
just cool looking?

Usefulness of this PV?

Sol Austin “Near Zero Energy” neighborhood
DESIGN LEADERSHIP

Window shading – the DESIGN of the roof overhangs with regard to the windows - saves more energy than $16,000 solar collectors.
For an extra investment of $800 this pump saved more electricity than a $16,000 solar PV system.

70% reduction in electricity:
- 650 KWH/ month
- $65/month
- Potential for six fewer coal-fired power plants in Florida!

Use “low flow-resistance” plumbing:
- “sweep 90’s (not hard 90’s)
- large diameter pool jets

For an extra investment of $800 this pump saved more electricity than a $16,000 solar PV system.

www.Pentairpools.com
PROGRAMMING:
The often overlooked but necessary first step in the design process. Problem seeking, before problem solving. How to accommodate needs with less energy use?
Life Cycle Costs

Energy: 25% - 30%

Maintenance & Insurance: 20% - 30%

Construction: 20% - 25%

Alterations: 20% (est.)

Financing: 0% - 15%
Proper solar orientation is key!
(Also known as Passive Solar Design)

- The long axis of the house runs east to west.
- Most windows face north or south
- Minimize windows facing into the afternoon sun
NEIGHBORHOOD LOCATIONS and STREET LAYOUTS that respond to ENERGY CONSERVATION and SOLAR ORIENTATION

US citizens: 25 Barrels Oil/ year
German citizens: 13 Barrels/ year
Vertical-use living.
Thermal Siphoning stair windows on down-wind side.
Placing all the family bedrooms on the same floor reduced heating and cooling costs in this remodeled home by 30%. That’s more savings than gained by replacing the old windows.

GREEN REMODELLING

¾ of all the homes in the US have been built since 1980.

80% of the energy consumed by the residential sector in the US are used by those homes...

2004 Texas Star Builder award
Recycling the 70’s “Ranch Burger”
Raising the roof

Bringing in more daylight

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No direct sunlight

Little glare
Taking down walls to open things up. New flooring for “give” and warmth.
Examples of specific strategies:

- Planning for health and better indoor air-quality
- What you bring into your home effects things
- How you operate the home does too.
Detached or Separated garages.

Connecting breezeway

INDOOR AIR QUALITY

Before the ERV...
Non-toxic & permanent termite treatment

Stainless steel mesh or Sand barrier

(Chemical treatments pollute the water table, IAQ, and don’t last.)
Common sense Indoor Air Quality when remodeling or building new

Air out carpeting and padding for two days before installation.
Optimum relative humidity range to minimize harmful contaminants
(a decrease in bar height indicates a decrease in effect for each of the items)

Source: ASHRAE, Adapted from Sterling et al., 1985

Data released by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) demonstrates that keeping relative humidity in the optimum humidity zone limits the effects of many unwanted conditions.
Front loading washers:
Because top loading washing machines are the single greatest source of indoor humidity in most homes.

Bathroom & Kitchen Exhaust fans:
High quality outside venting exhaust fans, with a timer switch for every time you bath or cook – even if it’s just boiling water for noodles.

But be careful with the industrial-sized aircraft carrier type kitchen exhaust hoods!

REMOVAL instead of DILUTION of pollution.
Over-Powering Kitchen Exhaust fans can depressurize a house...
The make-up-air can come in from places you don’t want it to…

Automobile fumes and VOC’s from the attached Garage.

Soot, ash & gasses down-drafting From the fireplace or other flues.
Duct Blaster test for HVAC system leakage.

(Target below 5% leakage.)
Integrative thinking:

Same floor plan – two HVAC duct layouts

Blowing air from the inside towards the exterior saves 70% of the ducting – requiring significantly less energy to deliver the same volume of air.
Examples of specific strategies:

- Climate-specific planning for comfort and energy efficiency – solar radiation & sun shading.
Applying the theoretical to the practical….

Think about what Enhances YOUR comfort – then design the Building with that in mind.

**Paco Arumi** taught me metrics

University of TEXAS – 1980’s
Heat transfers in 3 ways:

- **Radiation** (the biggie)
- **Conduction** (what “R” value is about)
- **Convection**
Light blue siding: 102 degrees F

Brown siding: 130 degrees F

The effect of radiant heat gain on conductive “R” value
The roof as a Shading Umbrella
Green Roofs – New Orleans style
1990’s: Radiant barrier roof decking.

Like placing sod – builder has a 50% chance of correct installation. (No longer called “Kool Ply”.)
The durability of reflective roof coatings...

Eight year-old “Galvalume” roof in Austin, TX

Light colored roof – yes. Does it remain reflective – ?????
Discontinuous ridge lath allows for venting

Diagonal lath vents underside of roof & allows for condensation drain

Gap allows for air to enter via soffit vents

The Barley|Pfeiffer Floating Radiant Barrier Roof System
Galvalume roofing installed with a vented airspace beneath.
Elevating the roof off the decking may be the stronger player than solar reflectance in terms of reducing unwanted heat gain.

The Metal Roofing Alliance

www.metalroofing.com
SOLAR CONTROL & SUN SHADING

Shading is more effective than double pane “low E” glass.
Careful attention to solar shading.
Pilkington **SUN ANGLE CALCULATOR**
(formerly by LOF Glass Company)
now available through Ball State University  (765) 285-1135
www.sbse.org/resources
Retrofit Window Awnings

- Reduces radiation (the biggie)
- Cut A/C system sizing by 1/3

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Examples of specific strategies:

• Passive solar design

• Designing for comfortable use of natural “day-lighting”

• Interior color and finish selections effect comfort, eye-strain – even air-conditioning!
Balanced day lighting & all fluorescent lamps.
Open living & dining area with sloped ceiling to invite daylight from stair tower. Note light colored floors.
Ample & BALANCED day lighting.
Flooring enhances day lighting – white-washed finished engineered Oak flooring.
Examples of specific strategies:

Comfortable indoor – outdoor spaces

• Screened-in porches are being appreciated again!
Pre-finished wood on the exterior.
Brazilian hardwood (Ipe) decking.
I recognize the right and duty of this generation to develop and use our natural resources, but I do not recognize the right to waste them, or to rob by wasteful use, the generations that come after us.
- Teddy Roosevelt

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Westgate Shopping Center, Austin & soon Dallas, Tx!