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http://www.icynene.com

www.weatherizationpartners.com

The Metal Roofing Alliance

www.metalroofing.com

www.Pentairpools.com

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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

Peter L Pfeiffer, FAIA
Barley | Pfeiffer Architecture Austin, Texas

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agave

LOST PINES ART CENTER – Bastrop, Texas

Estimated completion late 2016

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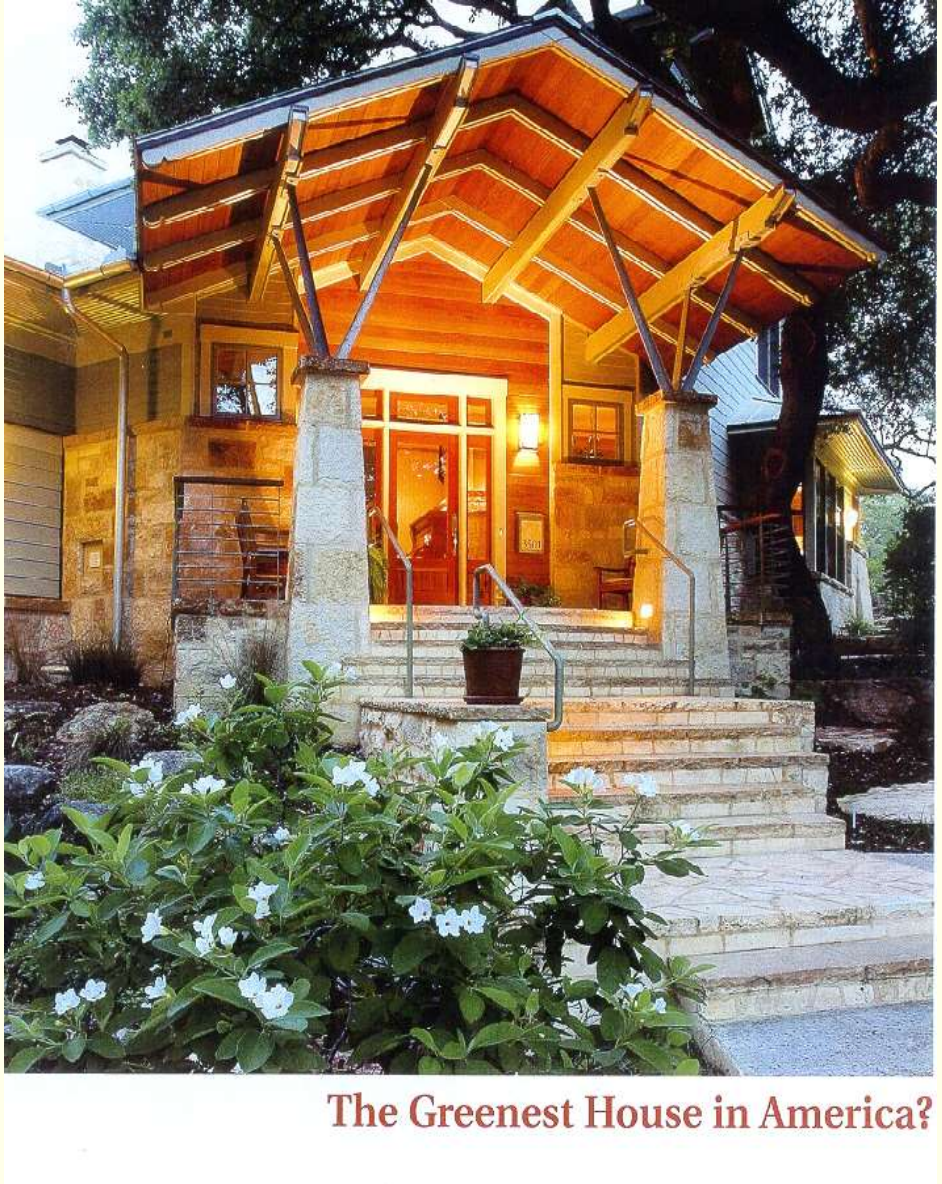
Approach & Background

- 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



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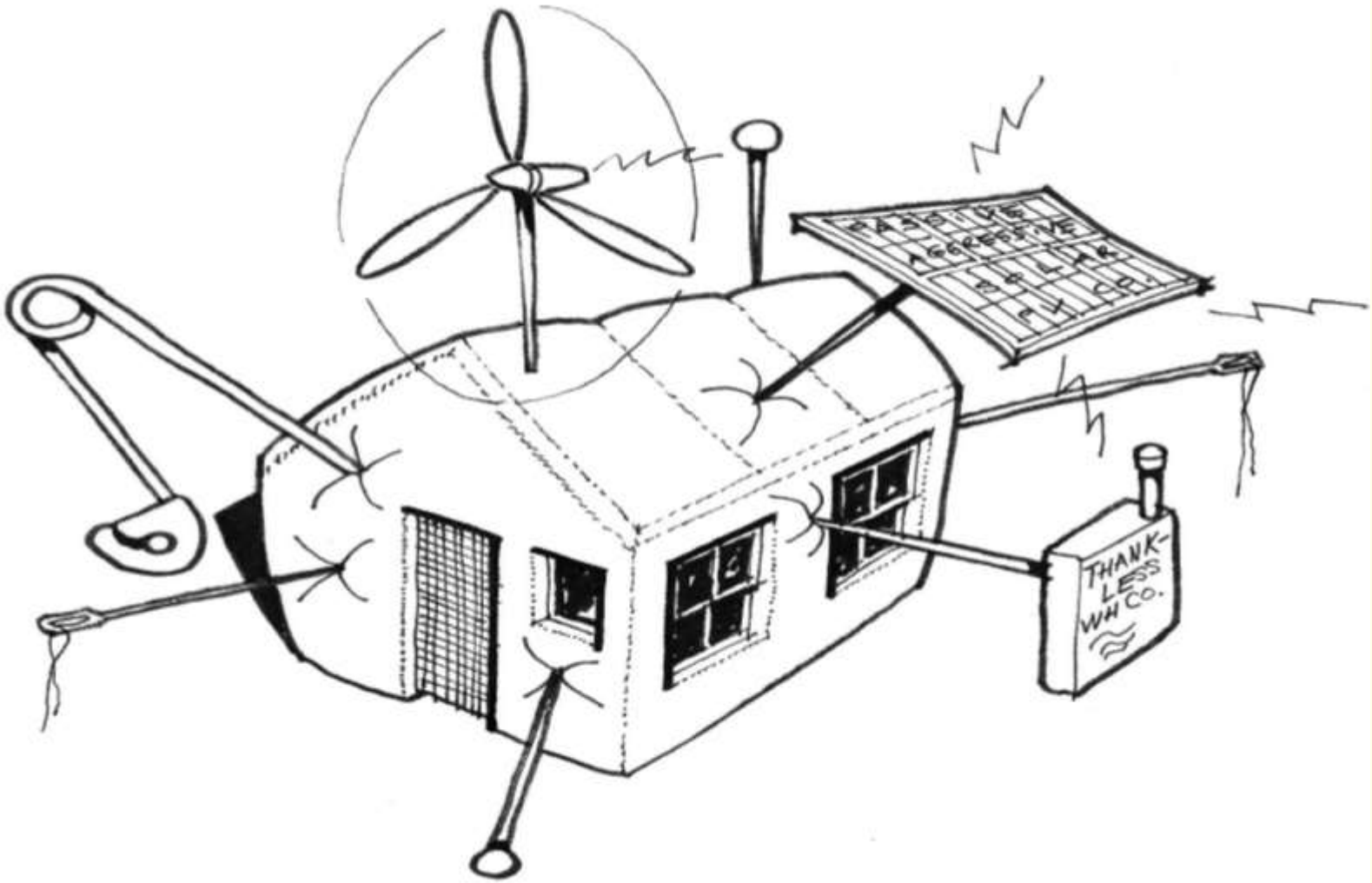
The PIN CUSHION house -

Tacked-on “green” eco-bling gizmos, gadgets and products.



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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?

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Then comes - LEED for Homes

The explosion that blew out the flames of the green building movement.

It's misleading to suggest you can "have it all" and still be Green...

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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…)

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VITAMIN ENRICHED CIGARETTE

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

- Its not about solar collectors being tacked on top of an energy inefficient design!

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Green Building boiled down to this:

- **Reduced Consumption –** energy, water, non-renewable materials.

- **Improved Health –** Indoor Air Quality, etc.

- **Reduced Environmental Impact**.

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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.

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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.

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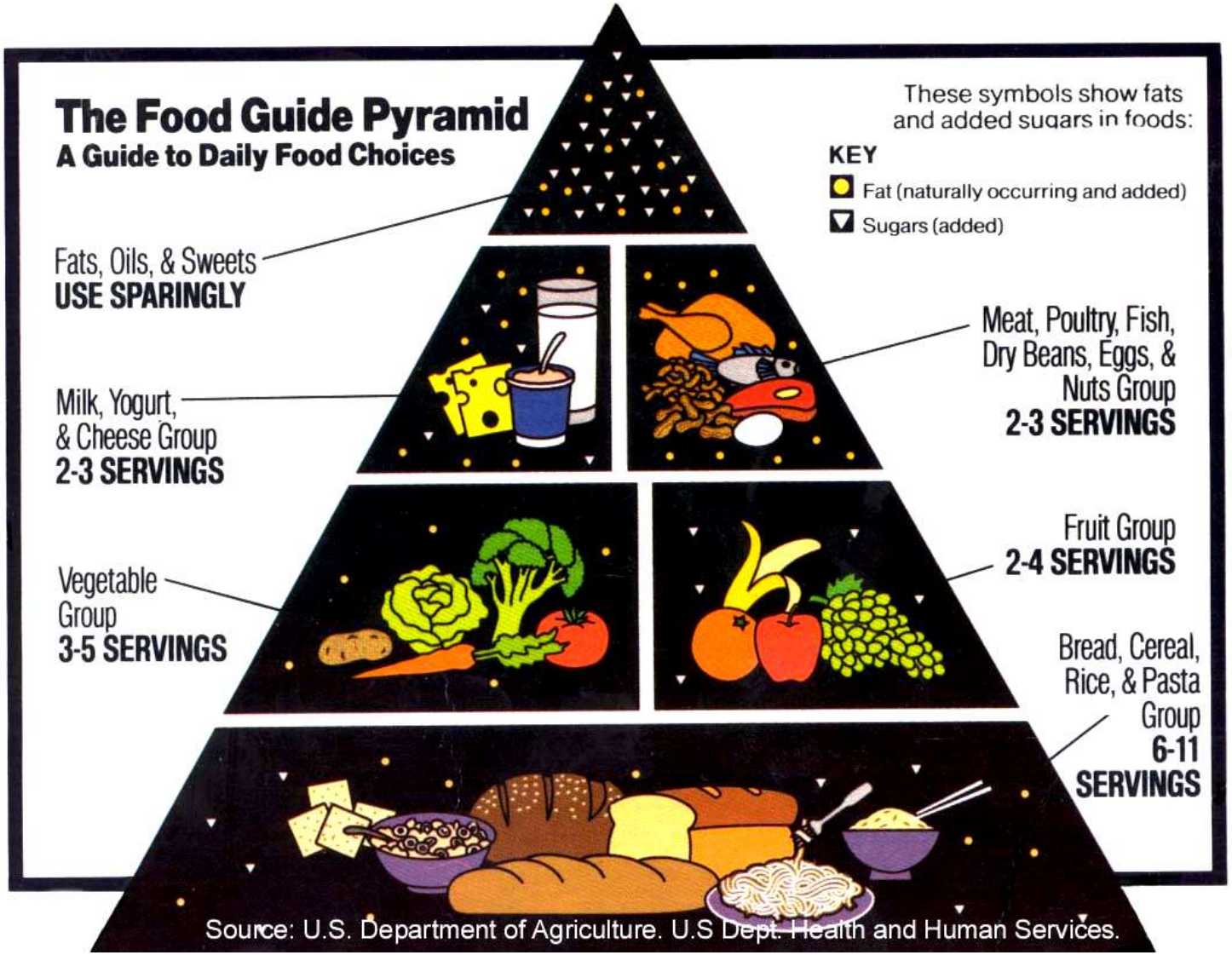


The Energy Use Pyramid A guide to energy saving choices

Produce your own power

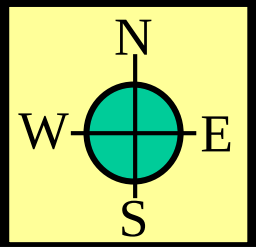
- Solar photo-voltaics
- Solar hot water
- Wind turbines

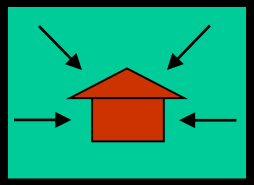
Don't use power

- Downsize building & systems
- Solar Orientation
- Tight Buildings
- Shade windows & walls:
  - roof overhangs
  - awnings
  - trees

Use power efficiently

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





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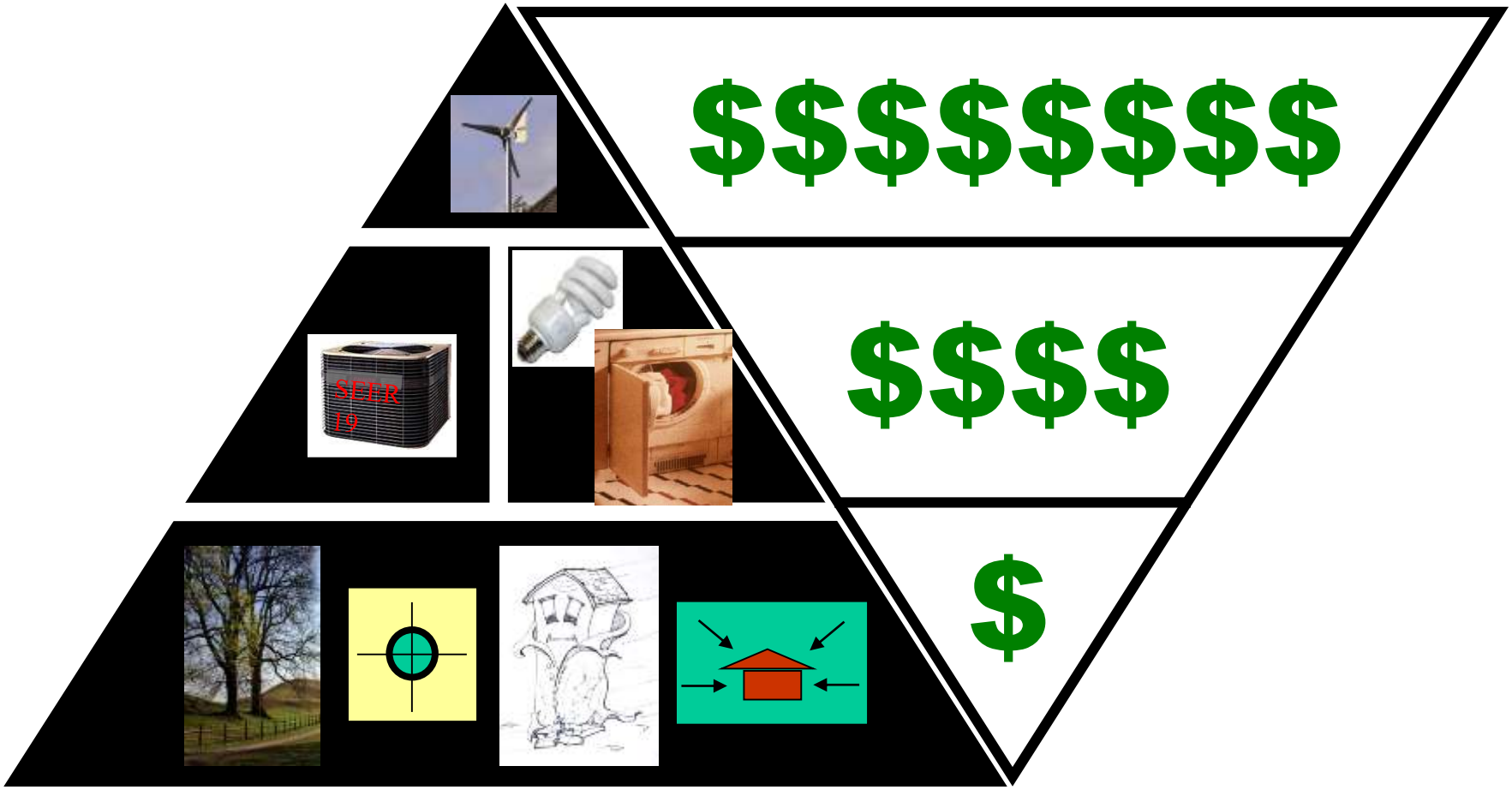
The Initial Cost versus Effectiveness Pyramid



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Retrofit Window Awnings

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

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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)

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Sol Austin "Near Zero Energy" neighborhood

Butterfly roofs:
Climatic responsive?
Rain protection?
or
just cool looking?

Usefulness of this PV?

DESIGN LEADERSHIP

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Window shading – the DESIGN of the roof overhangs with regard to the windows - saves more energy than $16,000 solar collectors.

Use “low flow-resistance” plumbing:

- “sweep 90’s (not hard 90’s)
- large diameter pool jets

70% reduction in electricity:

- 650 KWH/ month
- $65/month
- Potential for six fewer coal-fired power plants in Florida!

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

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- Layout
- # Stories
- Ceiling heights
- Roof pitch & color
- Exterior & interior colors

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?

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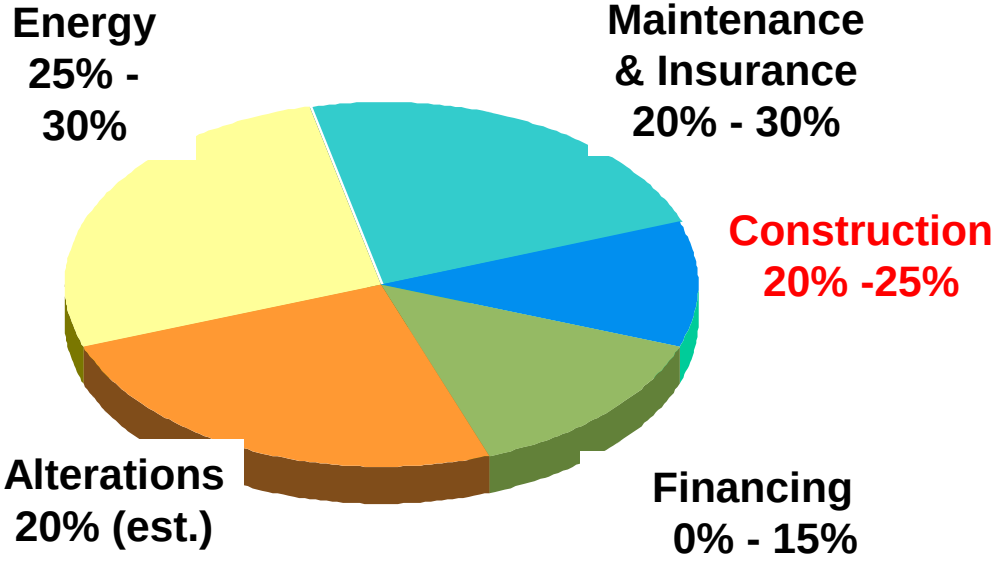

Life Cycle Costs

<u>Proper solar orientation is key!</u>
(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

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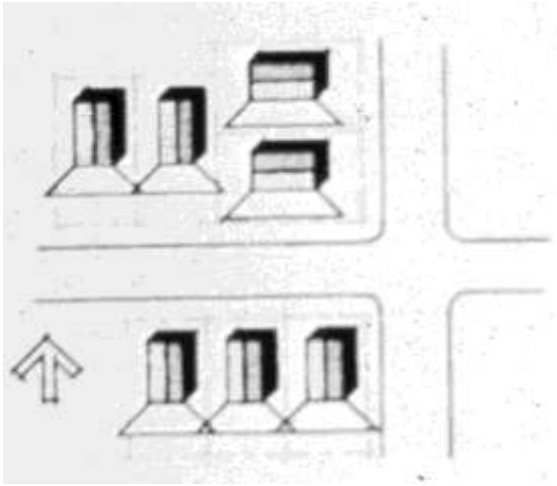
NEIGHBORHOOD LOCATIONS and **STREET LAYOUTS** that respond to **ENERGY CONSERVATION** and **SOLAR ORIENTATION**



US citizens: **25** Barrels Oil/ year
German citizens: **13** Barrels/ year

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Vertical-use living.
Thermal Siphoning stair windows on down-wind side.

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

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.

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Recycling the 70's "Ranch Burger"

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Raising the roof

Bringing in more daylight

No direct sunlight

Little glare

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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.

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INDOOR AIR QUALITY

Before the ERV…

Detached
or
Separated
garages.

Connecting
breezeway

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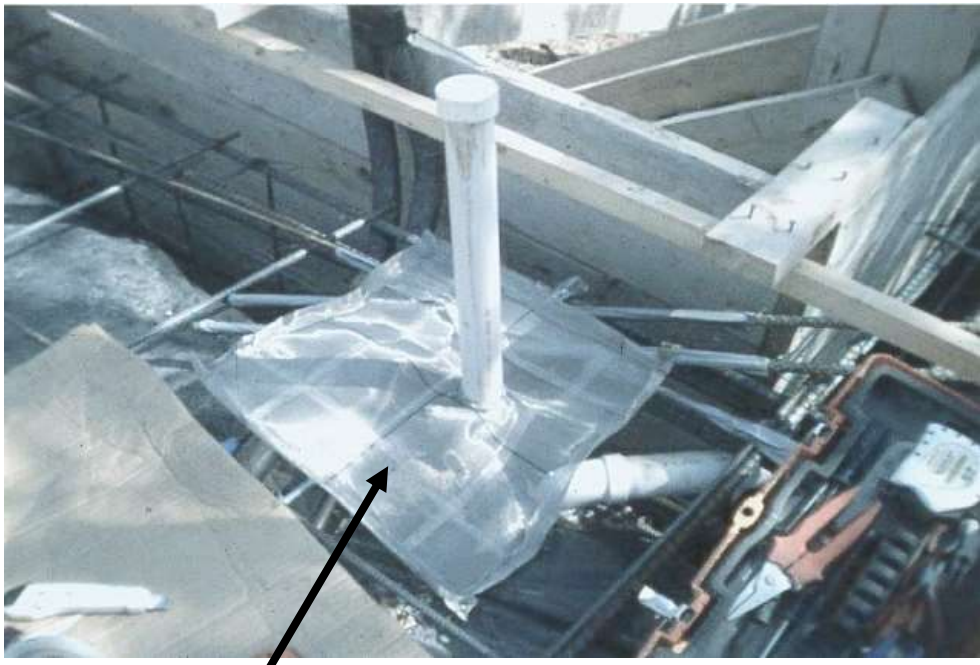
termimesh system

Non-toxic & permanent termite treatment



Stainless steel mesh
or
Sand barrier

(Chemical treatments pollute the water table, IAQ, and don't last.)

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Common sense Indoor Air Quality

when remodeling or building new

Air out carpeting and padding for two days before installation.

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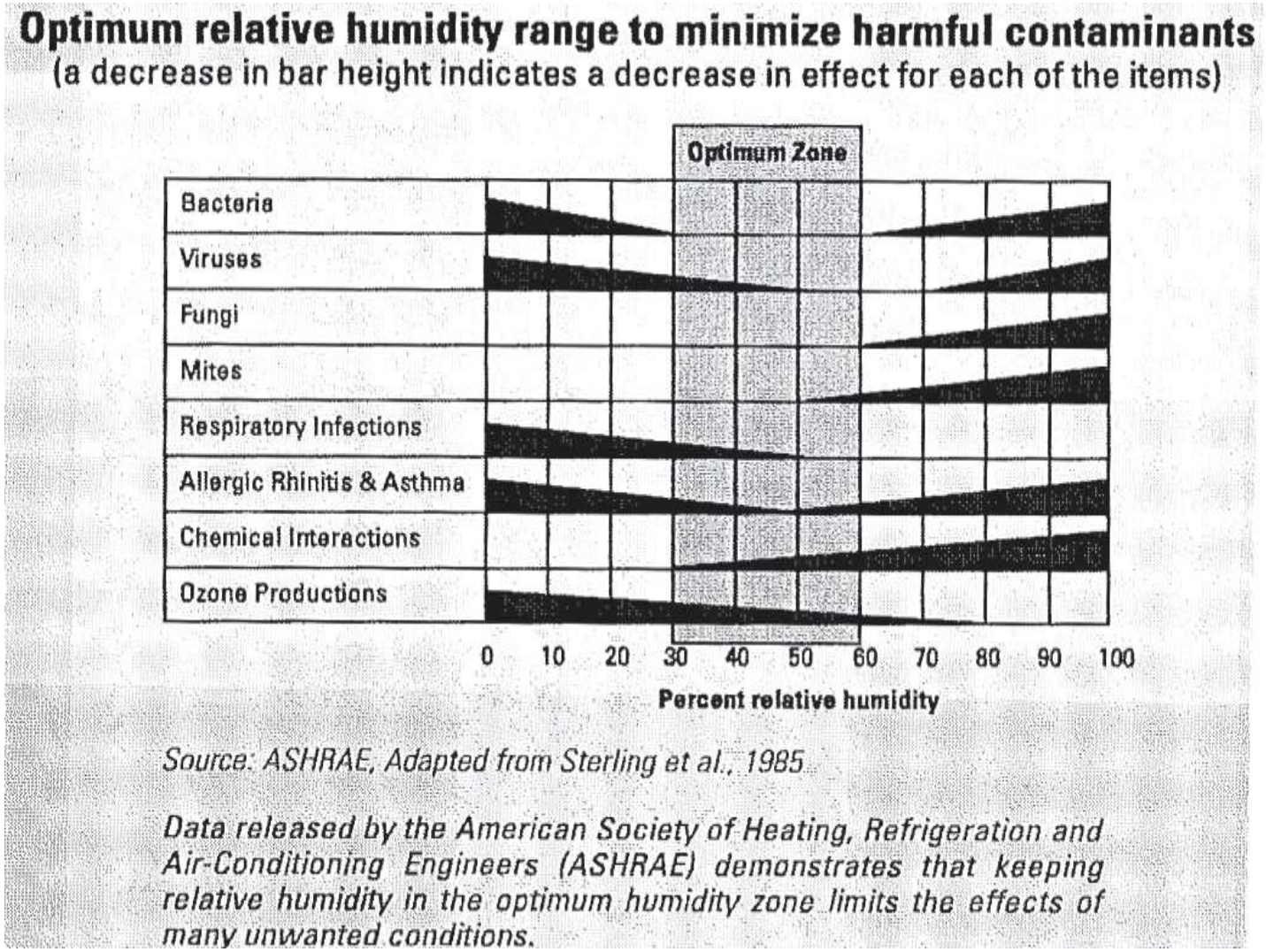


INDOOR AIR QUALITY & HUMIDITY CONTROL

As an example of connecting some dots…

INDOOR AIR QUALITY & HUMIDITY CONTROL

Front loading washers:

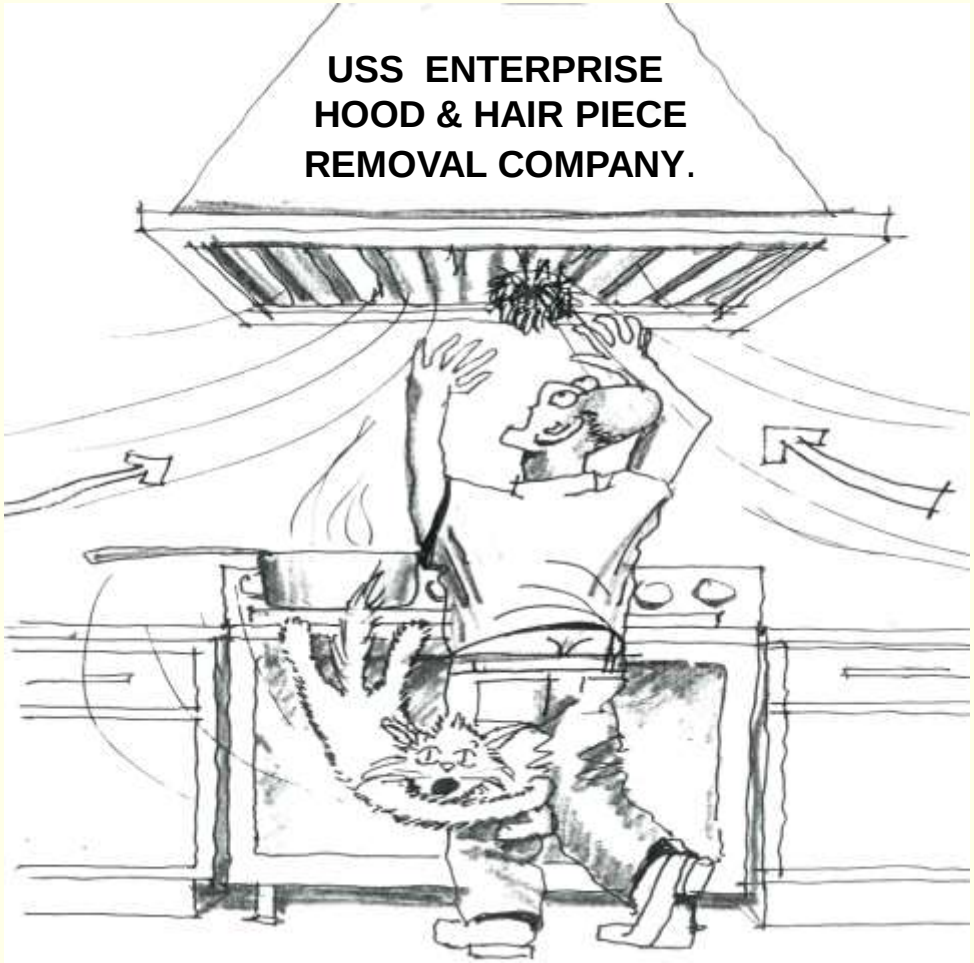
Because top loading washing machines are the single greatest source of indoor humidity in most homes.

Bathroom & Kitchen Exhaust fans:

High quality outside venting exhaust fans, with a timer switch for <u>every</u> 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!

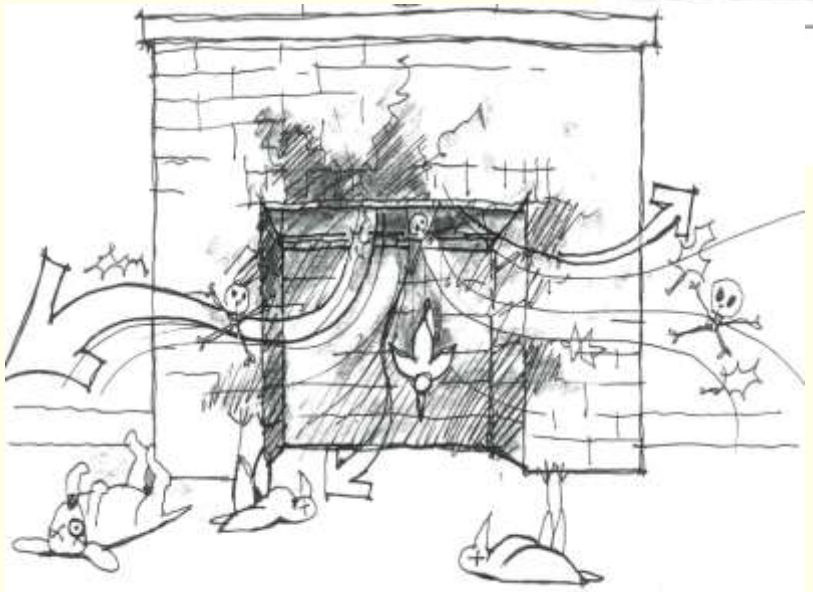
<u>REMOVAL</u> instead of **<u>DILUTION</u>** of pollution.



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.

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Duct Blaster test for HVAC system leakage.

(Target below 5% leakage.)

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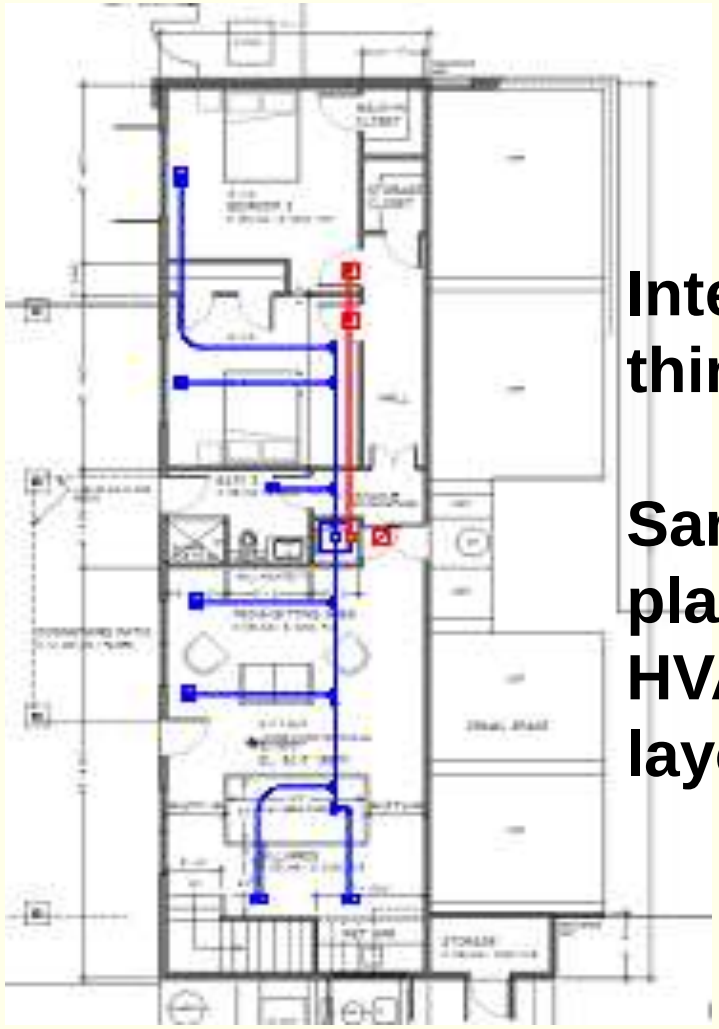
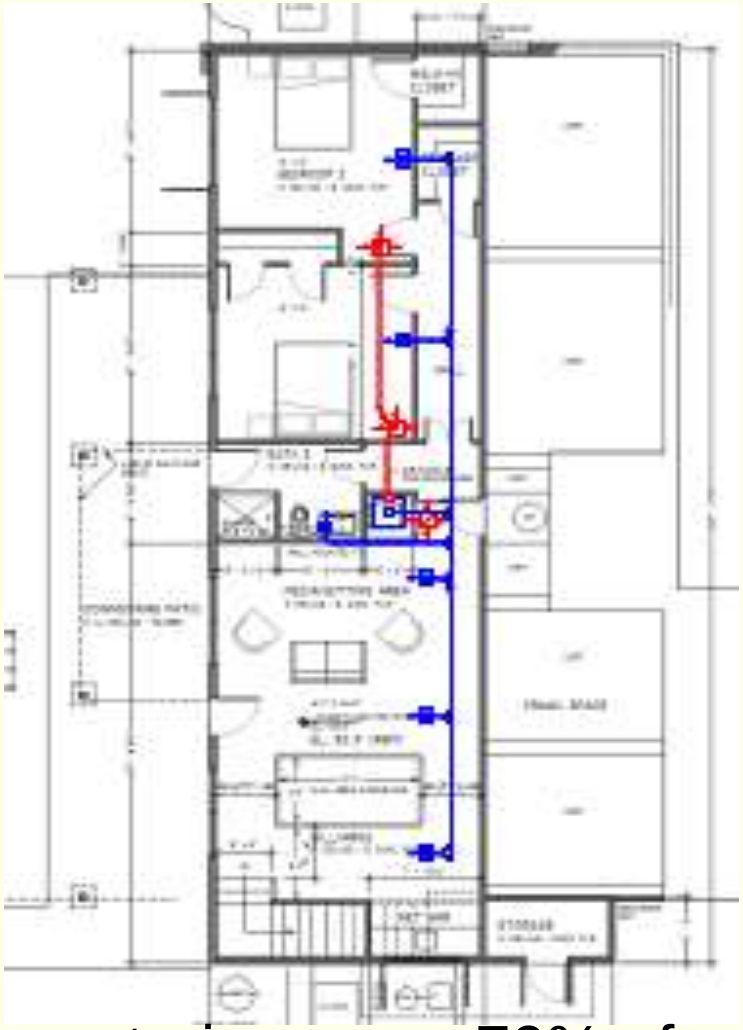


Integrative thinking:

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.

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Paco Arumi taught me metrics

University of TEXAS – 1980's

Applying the theoretical to the practical….

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

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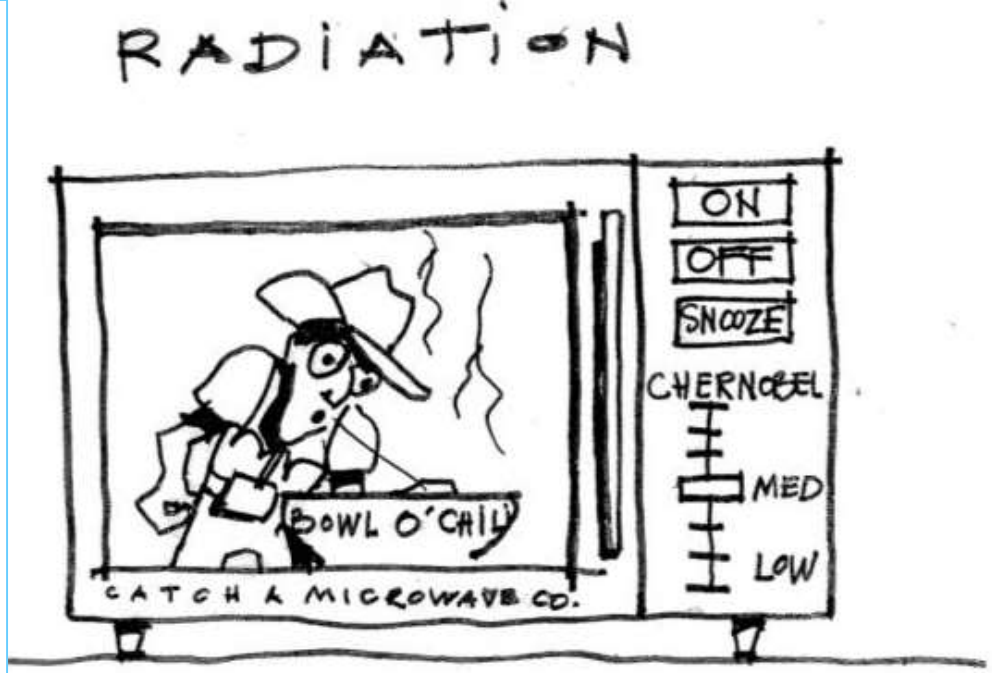
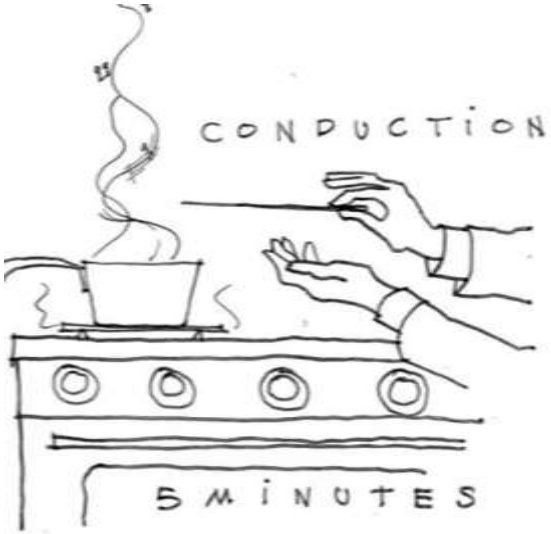
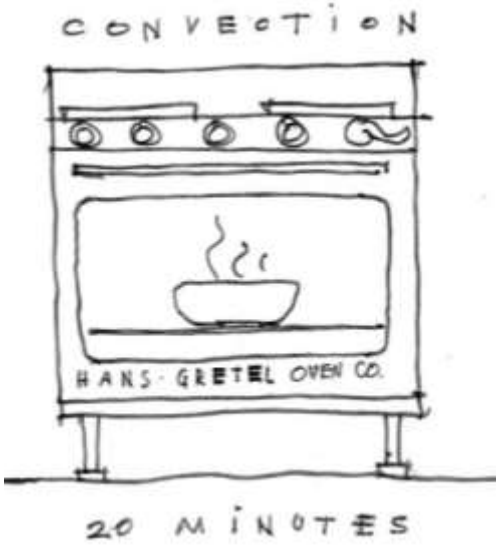






Heat transfers in 3 ways:

- **Radiation** (the biggie)
- **Conduction**
  (what "R" value is about)
- **Convection**

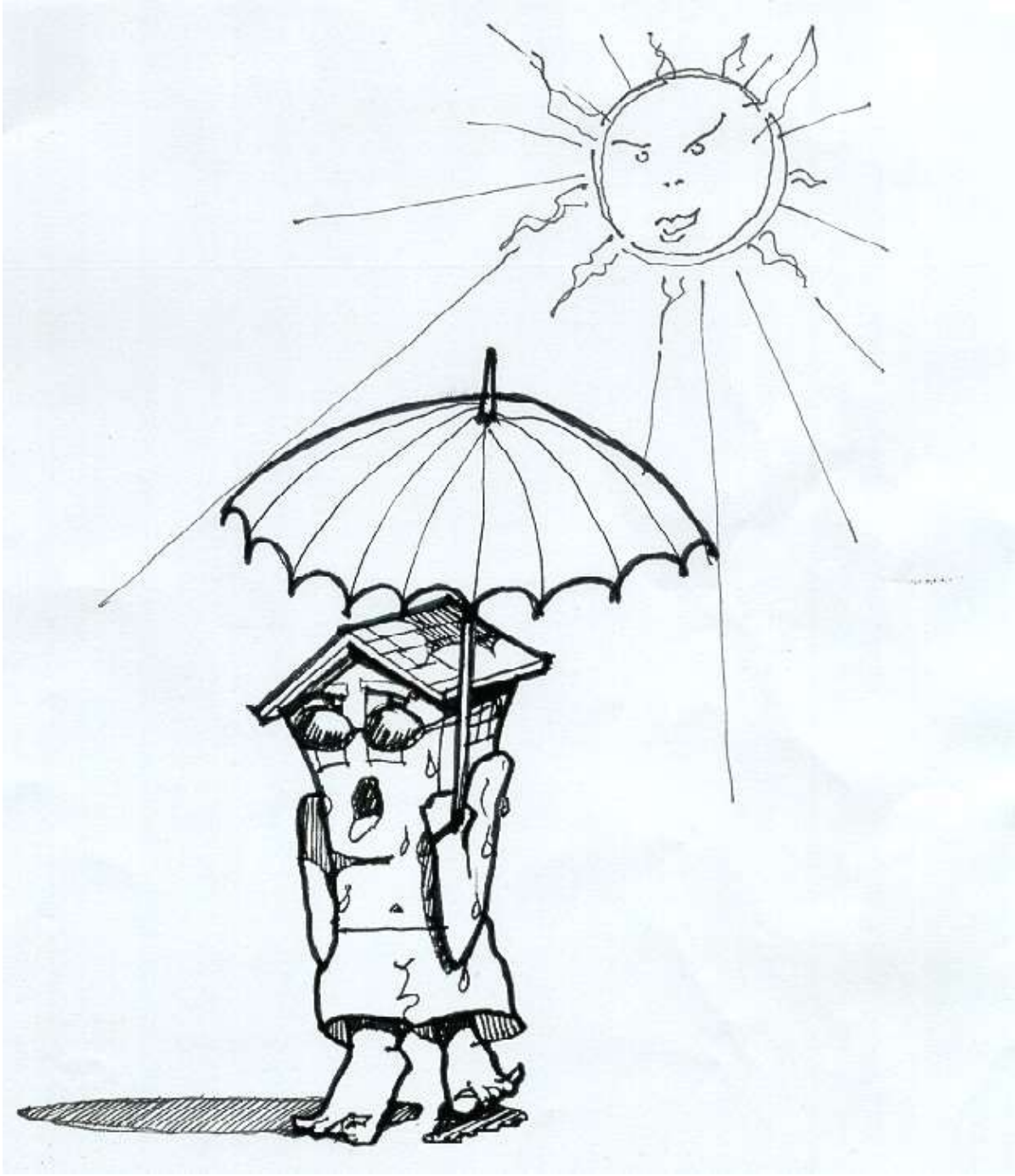
Light blue siding:
102 degrees F

Brown siding:
130 degrees F

The effect of radiant heat gain on conductive “R” value

The roof
as a

Shading Umbrella



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Green Roofs – New Orleans style

<u>1990's: Radiant barrier roof decking</u>.

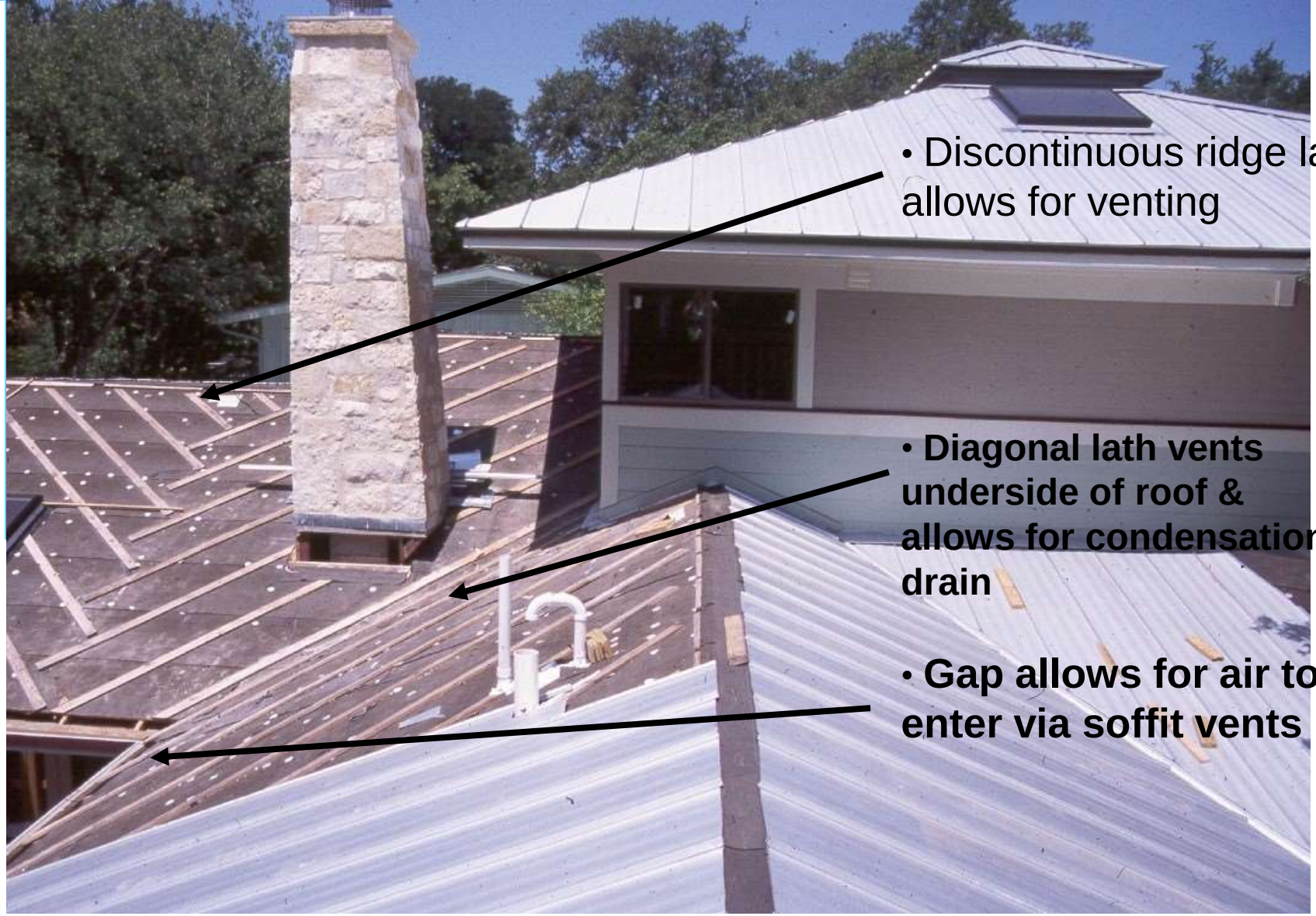
Like placing sod – builder has a 50% chance of correct installation.
(No longer called "Kool Ply".)

The durability of reflective roof coatings...

Eight year-old "Galvalume" roof in Austin, TX

Light colored roof – yes.
Does it remain reflective – ?????

(Note difficulty of "Power washing.)



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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.

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The Metal Roofing Alliance

www.metalroofing.com

OAK RIDGE NATIONAL LABORATORY — FACT SHEET

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Cool Roofs Will Revolutionize the Building Industry

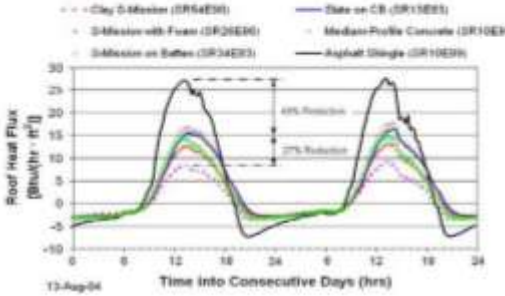
Adoption of infrared-reflective paints is one of the major advances in roofing in our century.

ORNL's Building Envelopes Program has conducted research for many roofing consortiums and their affiliates to help them develop cool roof products. Based on the knowledge gained through our studies and results of field tests, we concluded that cool roofs must not only be reflective and highly emissive — cool roofs must use all cost-effective strategies to minimize the energy use of buildings. Twenty percent of electrical energy use in houses is attributable to heat transfer through the roof. With the cool roofs now beginning to reach the market, we can significantly reduce residential energy consumption.

Cool Tile IR Coating™ applied to concrete tile (top row) boosts solar reflectance (SR) compared to standard coatings (bottom row) with the same appearance. Courtesy Joe Reilly, American Rooftile Coatings

The Department of Defense (DoD) developed novel cool color pigments to produce paints that are dark in color but highly reflective in the near-infrared portion of the solar spectrum. First used in paints for military camouflage to match the near-infrared reflectance of background foliage, these pigments were later applied by DOE to the manufacture roofing materials that reflect more sunlight than conventional roofing products, which lowers roof surface temperature and in turn reduces the building's cooling-energy requirement.

During our studies of the many prototype roofing materials produced by our industry partners, we serendipitously discovered the second major advance in roofs for our century: We found that elevating the roof cover from the roof deck to induce above-sheathing ventilation is as important as increasing solar reflectance and may be the stronger player in reducing heat gain into the attic. The two combined can reduce heat gain through the roof by 50% compared to nailed asphalt shingle roofs.



The effect of solar reflectance and above-sheathing ventilation for dark clay and concrete tile roofs as compared to a direct nailed shingle roof.

ORNL is collaborating with the U.S. Army and several industry partners to showcase cool roofs that mitigate heat gain by high reflectance and new ventilation schemes through a study at Fort Irwin in Southern California. All costs for actual roof construction are borne by roofing manufacturers and the base housing budgets.

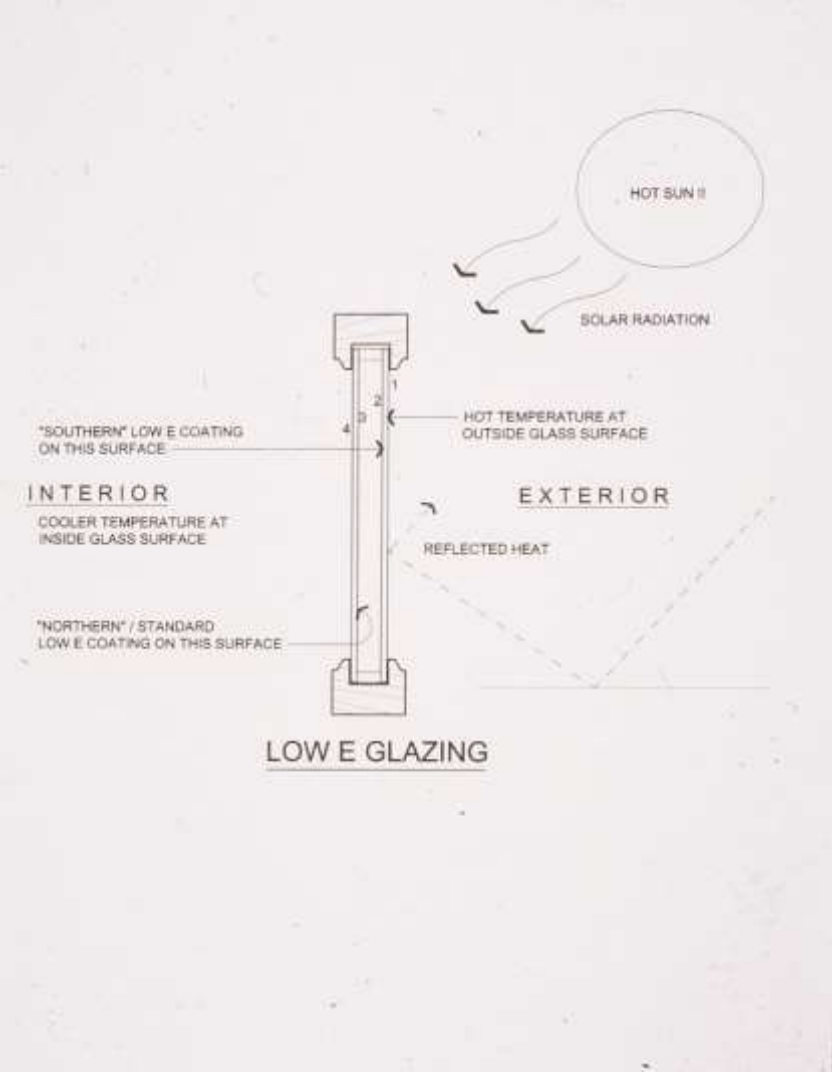
Privatized housing at Fort Irwin

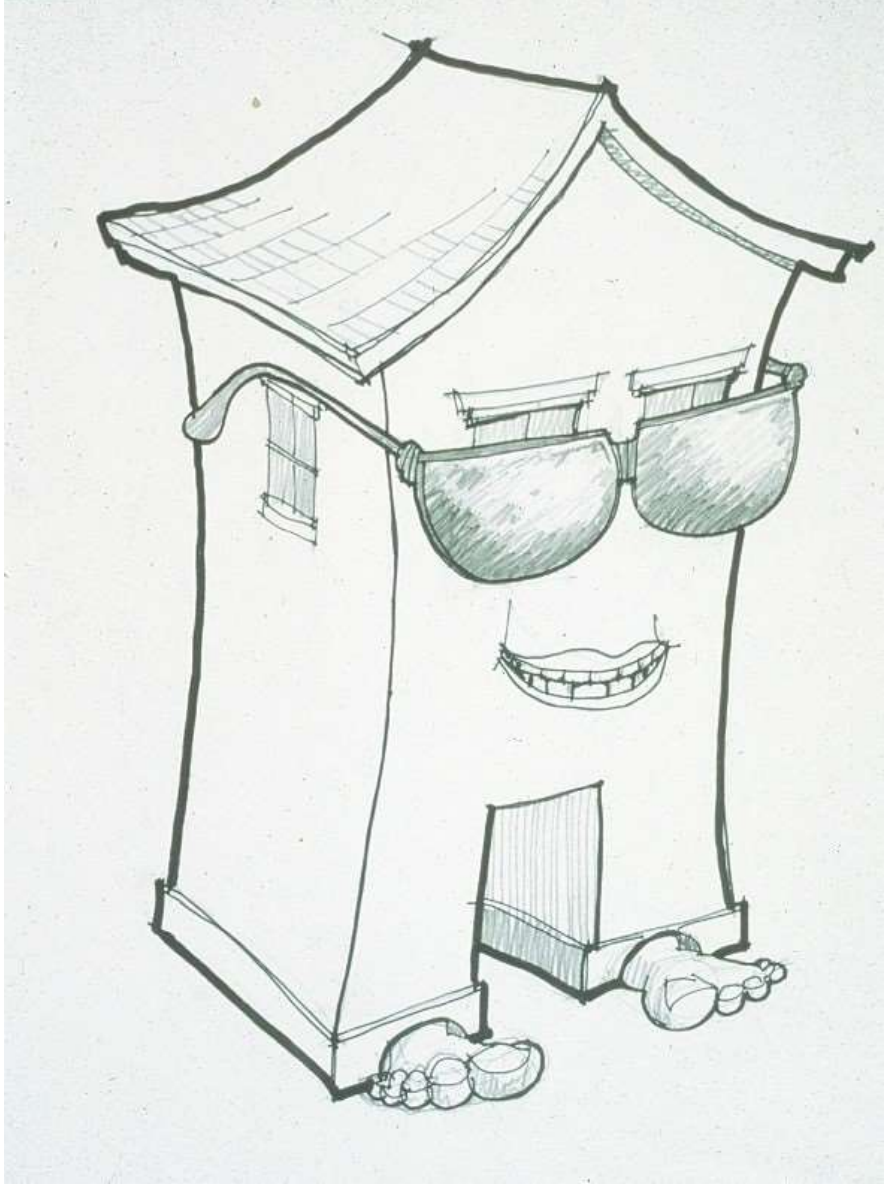
Deployment of cool, ventilated roofs could result in about a 10% reduction of building cooling-energy use with no heating season penalty. Through its Residential Community Initiatives Program (RCI), the Army is building 70,000 new privatized military family homes. This technology could be implemented in all of those homes and on shingled buildings when re-roofing is required. The payback period is expected to be less than five years.

Contact:
William Miller, Ph.D
ORNL
865-574-2013, millerwa@ornl.gov

UT-BATTELLE

SOLAR CONTROL
&
SUN SHADING





Shading is more effective than double pane “low E” glass.

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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

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Retrofit Window Awnings

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

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!

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Balanced day lighting & all fluorescent lamps.

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Open living & dining area with sloped ceiling to invite daylight from stair tower. Note light colored floors.

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Ample & BALANCED day lighting.

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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!

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Pre-finished wood on the exterior.

Brazilian hardwood (Ipe) decking.

Contact Information

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!

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