

CWHIP Green Building Workshop

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FLORIDA SOLAR
ENERGY CENTER®

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Energy Efficient Buildings

Photovoltaics & Distributed Generation

Solar Thermal Systems

Hydrogen and Alternative Fuels

Education and Training



**FLORIDA SOLAR
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Green CWHIP Program Elements

- ❖ US EPA Energy Star
 - ❖ Threshold unless >3 stories then required prescriptive elements
- ❖ FGBC Florida Green Home Designation
 - ❖ Forgivable supplemental loan of \$5000 per new unit / \$7000 per rehab unit max 100 units
- ❖ USGBC LEED for Homes
 - ❖ Forgivable supplemental loan of \$5000 per new unit / \$7000 per rehab unit max 100 units



Learning Objectives

- ❖ Understand concept and benefits of “Green Building.”
- ❖ Learn about how green building is specified.
- ❖ Learn about green building programs:
 - ❖ Introduction to organizations.
 - ❖ Basics of technical strategies.
 - ❖ Basics of qualification / certification requirements.
 - ❖ Overview of certification costs.
- ❖ Understand concept and benefits of “Integrated Design.”
- ❖ Find resources to learn more and/or get started.



Why is CWHIP Program going Green?

- ❖ Green housing makes practical sense for affordable housing.
- ❖ To aid in the reduction of utility costs for low income families.
- ❖ To make housing more affordable, healthier, and environmentally friendly.
- ❖ To increase the number of green features incorporated into units funded by the program.
- ❖ To follow Governor Crist's lead set at the Climate Change Summit.

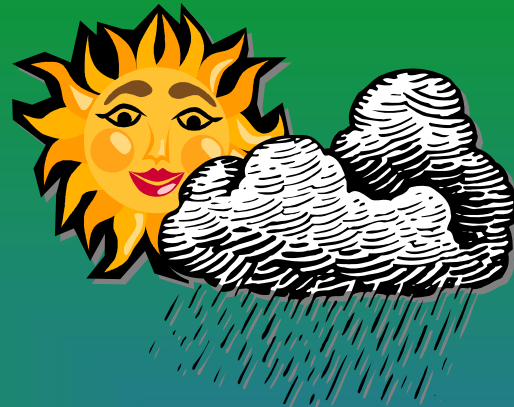
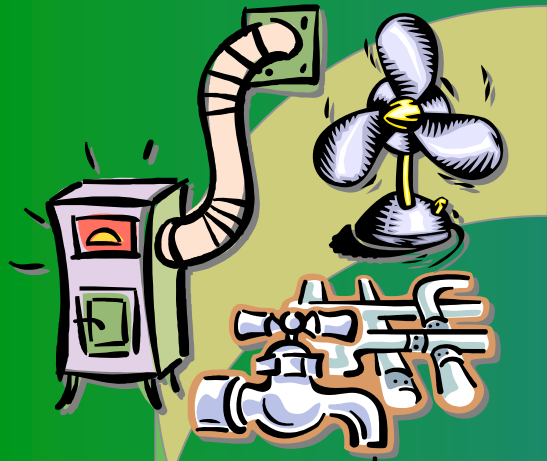


Green Building?

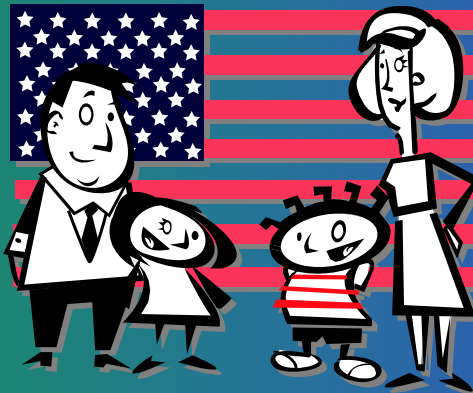
Green Building?



What is a green building?



Health & Safety
Building Durability
Comfort
Energy efficiency
Resource efficiency



What does a green building do?

❖ Manage the Water

- Keep liquid water out of building
- Control water vapor
- Conserve water during operation



❖ Manage the Air

- Produce dry air inside the building
- Direction of air flow (positive pressure)
- Control contaminants



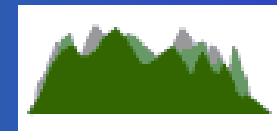
❖ Manage the Heat (Energy)

- Building envelope
- Windows & lighting
- Heating, Cooling & Ventilation systems
- Parasitic loads
- Alternate energy sources



❖ Manage the Earth

- Erosion control
- Landscape / site selection
- Habitat preservation
- Resource Efficiency



The Mix

Construction

- ❖ Site
 - Sand & sun
- ❖ Structure
 - Sticks & bricks
- ❖ Equipment
 - Fans & furnaces
- ❖ Finishes
 - Carpets & cabinets
 - Pastes & paints



Occupancy

- ❖ People
 - Off gassers
- ❖ Furnishings
 - Sponges & off gassers
- ❖ Plants
- ❖ Pets



What environmental benefits does a green building achieve?

- ❖ Energy Conservation / Renewable Energy
- ❖ Water Conservation / Alternative Sources
- ❖ Preservation of wildlife habitat / Green Space
- ❖ Healthy atmospheric and aquatic environments
- ❖ Materials conservation / recycling and waste management
- ❖ Durability: general longevity and surviving disasters
- ❖ Access & Transportation
- ❖ Environmental Education

PERCEPTION



REALITY





REALITY

REALITY





REALITY

SV 06 The Wilmington
 Built by Palm Harbor Homes

VILAGE ■ ■ ■ ■ ■
 Basic Installation, Back Power Tools & Accessories, Deck Building & Construction, Home Fit Sprinkle System, (3) 16oz. 2.5 Gallon
 House Molds, Safety Fence and Automation, Workshop Construction

HOME ■ ■ ■ ■ ■
 GE Sealants & Adhesives, Glass Construction Products, Sprinkler Installation

ROOM ■ ■ ■ ■ ■
 Brick of America, Fertile Building System Group, Sump Removal

Palm Harbor Homes



PSG
CONSTRUCTION, INC.
ESTABLISHED 1978

THE RENEWED AMERICAN HOME 2007
An Official Show Home
of the
2007 International Builders Show
Orlando, Florida



An association with
Builder PSG Construction, Inc.
Residential Designer Lutz, Kozak & Morley, Inc.
Interior Design and Manufacturing
Floor & Ceiling Hardware and Design Studio
Window Designer G. T. T. Home

The National Association of Home Builders
The National Council of the Housing Industry
Housing Market 2007 - 10/18/07-10/20/07

Make Your Home Renovation a Success
Hire a Professional Remodeler
Hire a Professional Remodeler
Hire a Professional Remodeler



www.PSGconstruction.com

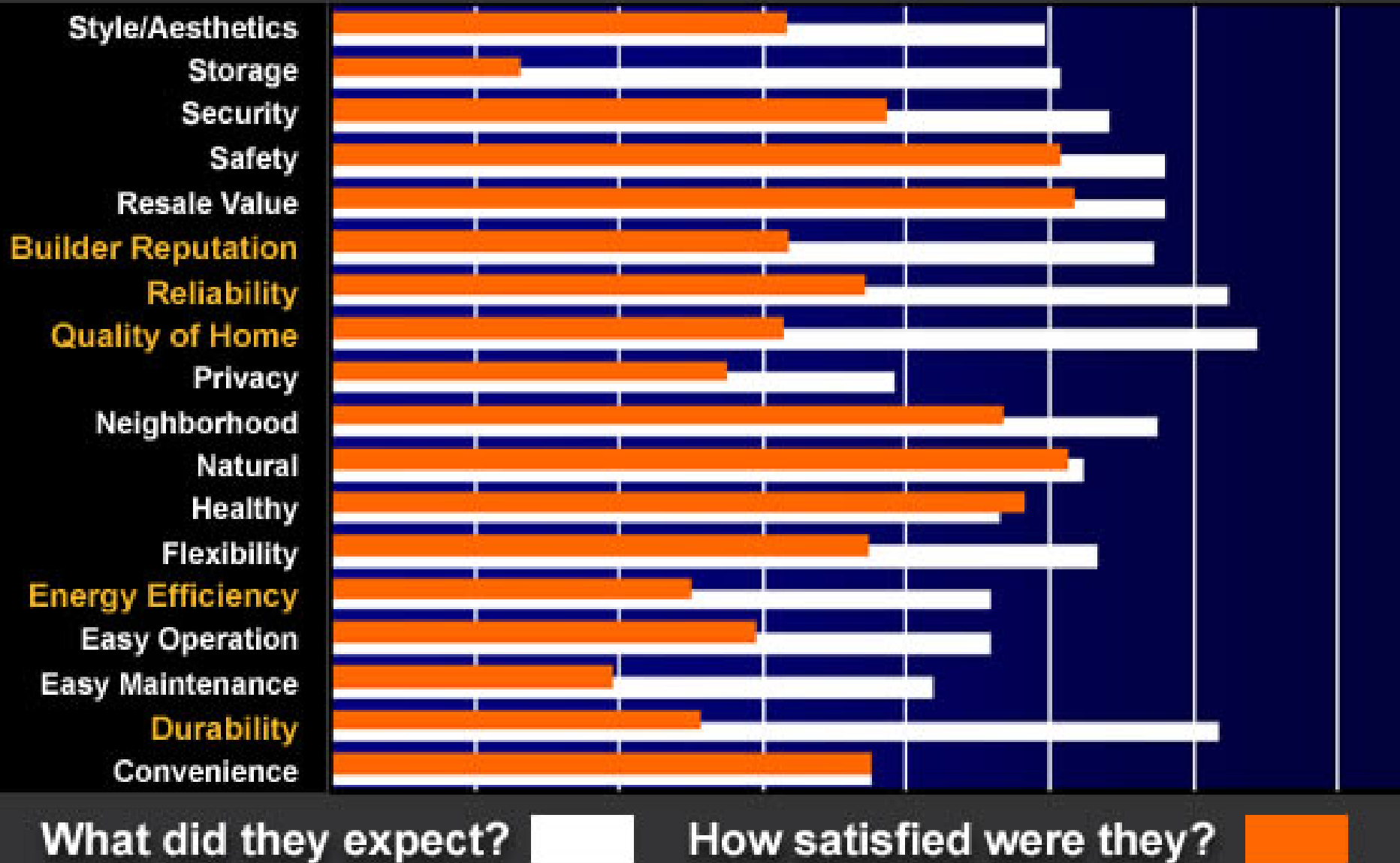
REALITY

What is the reality?

Attractive, affordable homes that benefit property owners / occupants:

- Enhancing affordability of operation.
- Enhancing indoor air quality and comfort.
- Increasing durability.
- Providing greater access to mortgage money.
- Enhancing the profitability of resale.

Homeowner's Priorities Living in the Home



Green Building is News

Sports
HeraldTribune.com
Home Sarasota Venice Manatee E. M.
Tuesday, December 30

- Jobs
- Cars
- Classifieds
- Real Estate
- Subscribe

NEWS

- Florida
- Nation
- World
- Sports
 - Golf
 - Pro baseball
 - Pro football
 - Prep football
 - High school

Venetian wins 'green' certification

STAFF REPORT

Four models at WCI Communities' Venetian Golf and River Club in Venice have won "green" certification. All four earned high marks for design, energy and water savings, health, materials, disaster mitigation and site.

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MEET FLORIDA'S "GREENEST" HOME

10/14/2003

PALM BEACH GARDENS, FL -- The Florida Green Building Coalition (FGBC) has named a production home built by WCI Communities, Inc., as the state's greenest home.

VTS THE BUILDERS' VIRTUAL TRADE SHOW

BuilderBooks.com
Books that build your business

Real Estate | Naples Daily News

✉ 📄 🔍 [Real Estate front](#) | [Real Estate archive](#) | [help](#)

Centerpiece: Going green

Naples builder leads the way in constructing environmentally-friendly homes

Sunday, October 12, 2003

By LAURA LAYDEN, llayden@naplesnews.com

The tag line for their business is "A Better Way to Build."

Benefits of Green Building

Builders / Developers

- Adding marketing value to property.
- Increase profits.
- Differentiation from competition.
- Reduced callbacks.
- Gain valuable promotion and advertising.
- Qualify for various incentives.

Local and State Government

- Management of solid waste.
- Management of air and water resources – pollution prevention.
- Providing and maintaining affordable housing.
- Energy security.
- Managing growth.

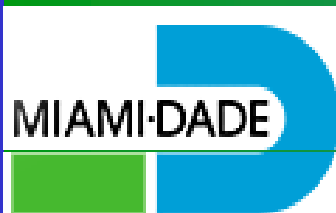
Incentives for Green Buildings



- ❖ Gainesville Green Building Program
 - 1/2 off building permit fee
 - Free fast track permitting
 - Marketing for builders



- ❖ Sarasota Green Building Program
 - Same as Gainesville
 - Plus incentives for building dept staff



- ❖ Miami-Dade County
 - Expedited permitting

Requirements for Green Building



❖ University of Florida



❖ Sarasota County



❖ Orange County



❖ State of California



❖ Lakewood Ranch

Requirements for Green Building



State of Florida Office of the Governor Executive Order 07-126

Section 3. (2) – The DMS shall adopt the USGBC LEED NC for all new buildings and is directed to strive for Platinum Certification.

Section 3. (3) – The DMS shall immediately implement USGBC LEED EB for all buildings owned and operated by the department.



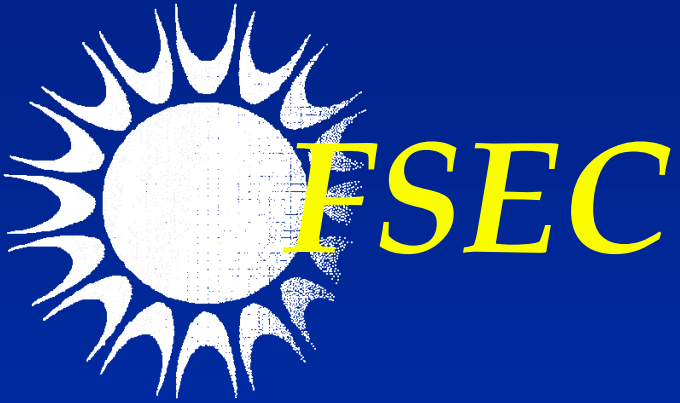
Specifying Green Building through Standards

- ❖ Certification programs
- ❖ Help “define” green in the Marketplace
- ❖ Create mechanisms for technical assistance
- ❖ Help provide market differentiation
- ❖ Help ensure benefits are realized
 - Quality and efficiency through 3rd party inspections
 - Mechanism to keep project on track



Elements of Green Standards

- ❖ Performance based, not prescriptive.
- ❖ Generally a long list of categorized “options” that lead an applicant down a path to achieve a goal.
- ❖ A point system is generally employed to gauge achievement of the goal.
- ❖ Typically involve inspections / documentation.
- ❖ Are designed to apply to particular geographic areas.
- ❖ Option list includes leveraging of other established national and state programs rather than “reinventing the wheel”.



Green Begins with Energy Star Blue

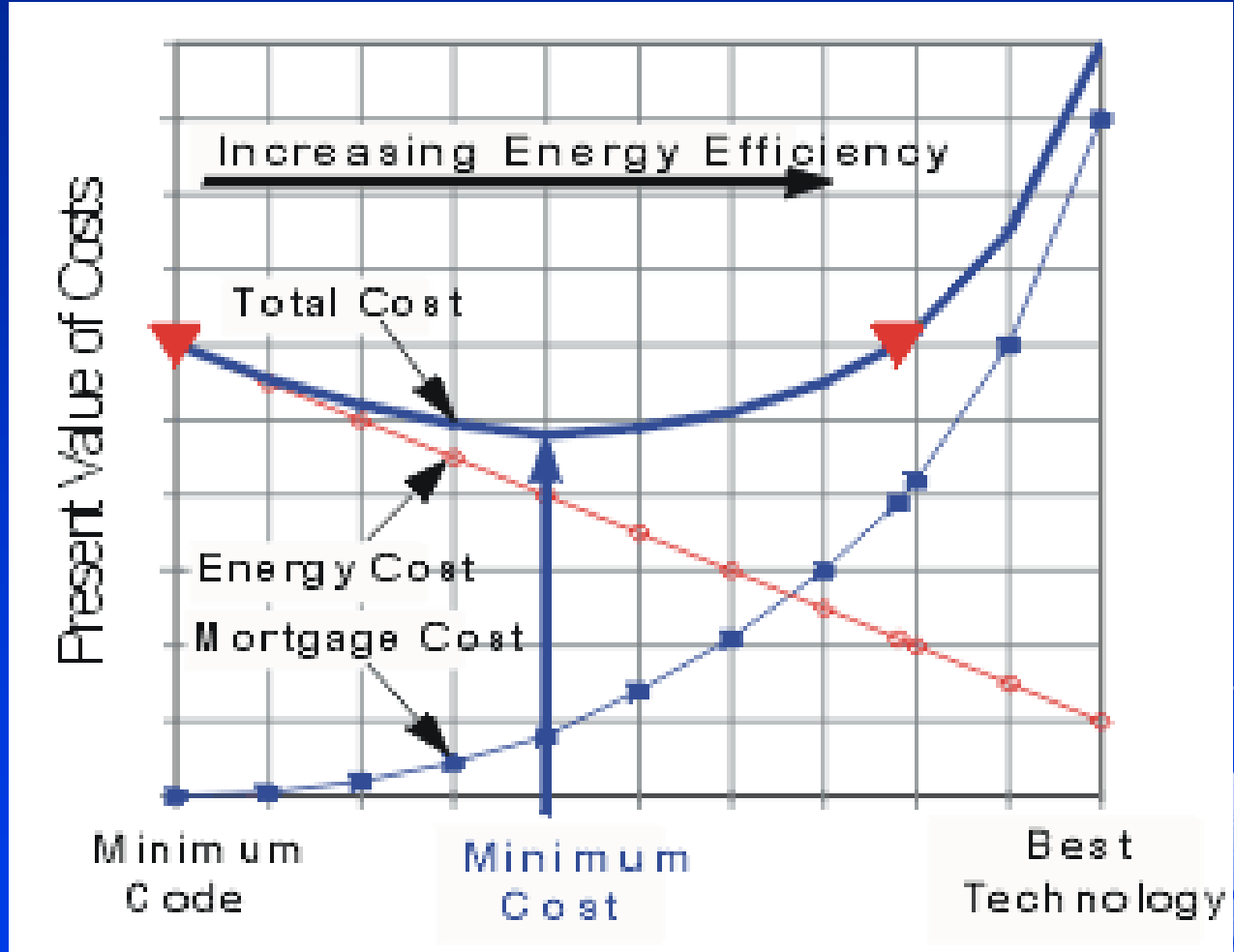


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It's The Economics ...

Minimum Code is not Minimum Cost!

The *Total Cost* of owning a home includes both the *Cost of Capital* and the *Cost of Operating* the home.





Which Costs More?



- ❑ Sticker Price
\$140,000
- ❑ Payment at closing
\$14,000 + closing
- ❑ Monthly P&I&T&I
&Energy = \$1200

- ❑ Sticker price
\$143,000
- ❑ Payment at closing
\$14,300 + closing - \$500
= \$13,800
- ❑ Monthly P&I&T&I
&Energy = \$1185





Which Has More Value?



- Typical of Competition



- More efficient HVAC equipment
- Tested ductwork
- Increased insulation
- Rated and certified by third party
- Higher resale value





Which Is Easier to Sell?

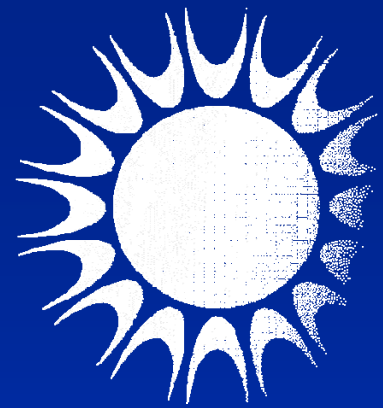


- Typical of Competition



- 15% reduction in energy bills
- Receive independent rating and Energy Star[®] certificate
- Pay less at closing, pay less each month

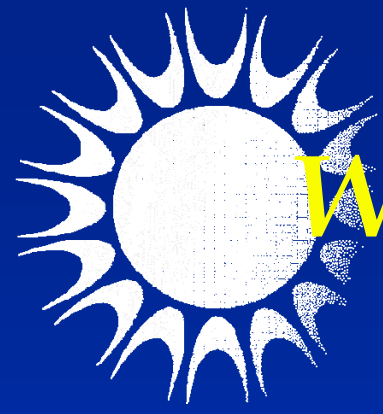




What is an ENERGY STAR Home?

- ❑ 15% More Efficient Than 2004 IECC
HERS Index \leq 85 (South)
- ❑ Indoor Air Quality as per ASHRAE
Guidelines
- ❑ Inclusion of High-Efficiency Lighting
and Appliances



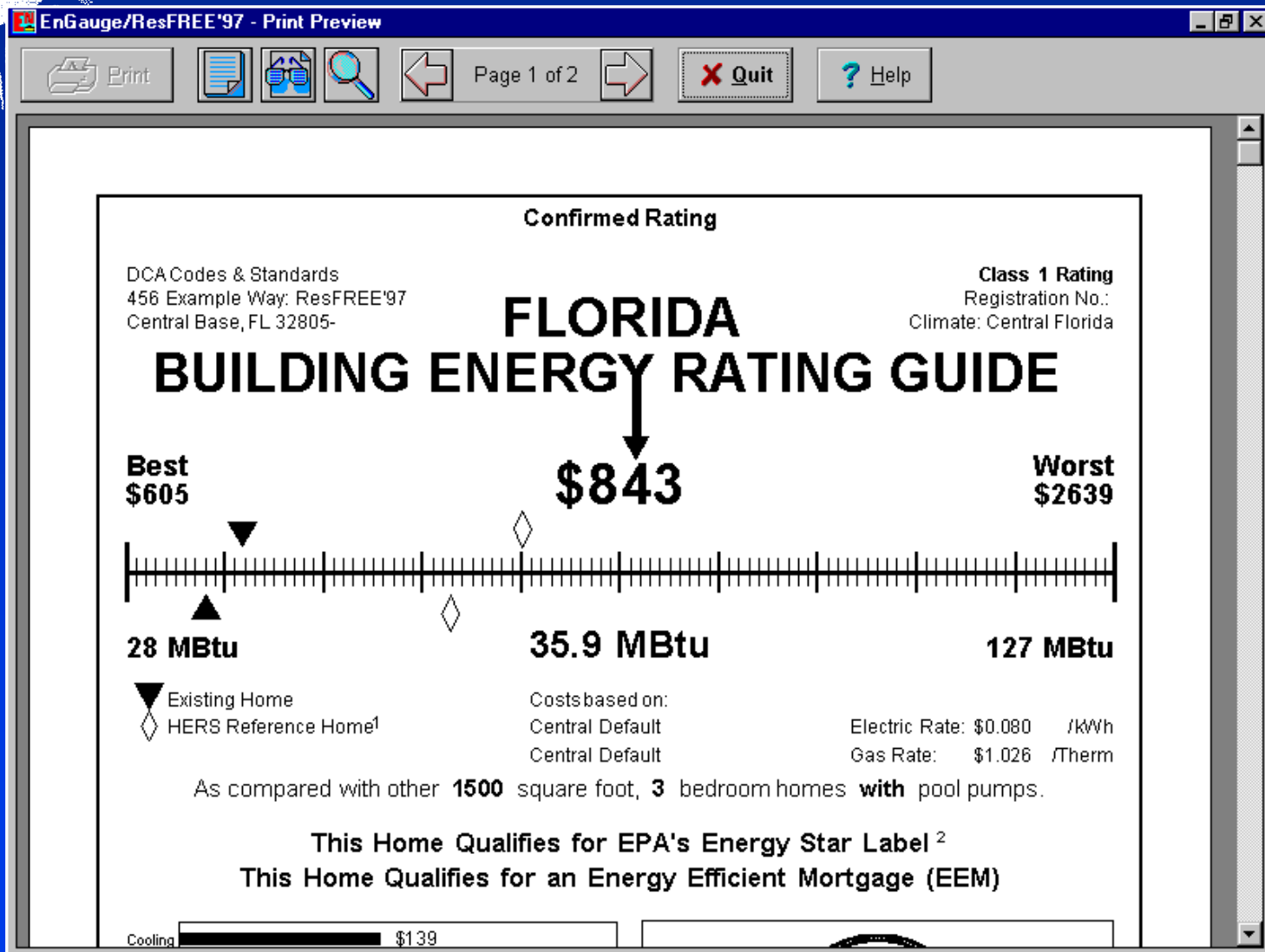


What is an Energy Rating?

- A method to evaluate the energy use of a home with respect to a “reference” home.



Florida's Rating Scale



The National HERS Index

RESNET

Residential Energy Services Network

HERS

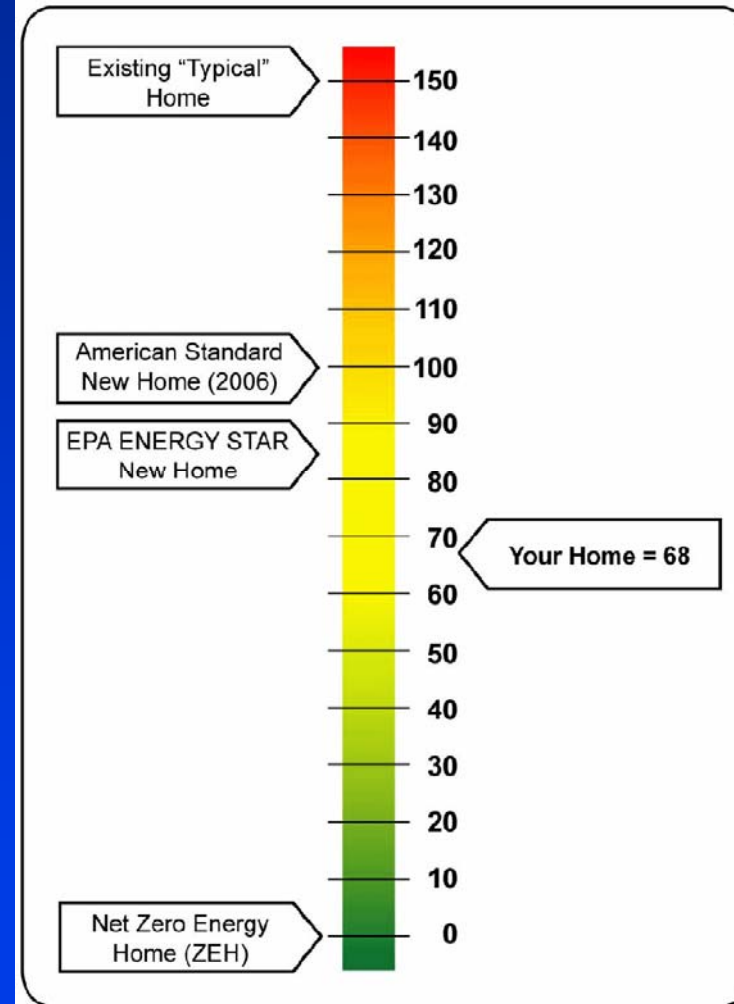
Home Energy Rating System

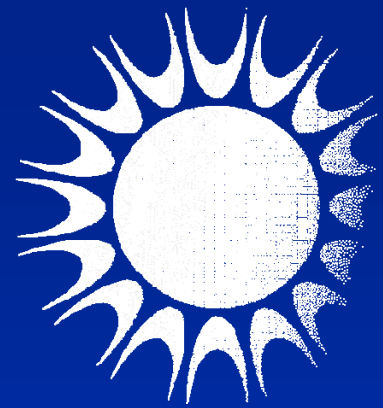
- ❑ Energy Star Ref. home = 100
- ❑ Florida Code Home ~ 100
- ❑ Energy Star Home = 85 or below

Each HERS point translates to 1% savings in whole house energy use.

No one to one match between code and ratings

HERS Index

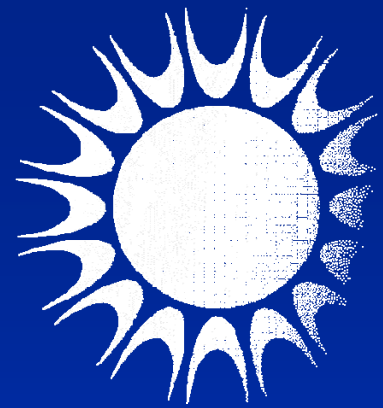




Who are the raters?

- Housing or Energy Background
 - Home inspectors
 - Energy auditors
 - Utility Company
- Trained By FSEC
- Certified by State of Florida





What do Raters Do?

- Create a working energy model
 - Input envelope and equipment details
 - Estimate envelope and duct leakage
 - Report status and can perform analysis
- Visit site to confirm dimensions, equipment specs, air and thermal barriers
- Characterize leakage of envelope and duct system

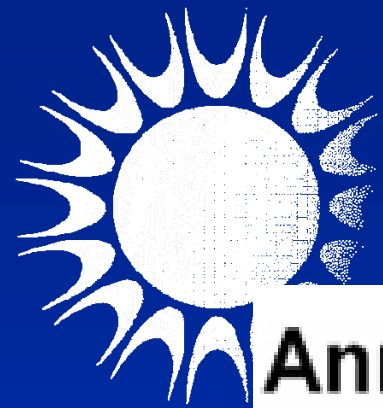




Energy Savings Suggestions from kids

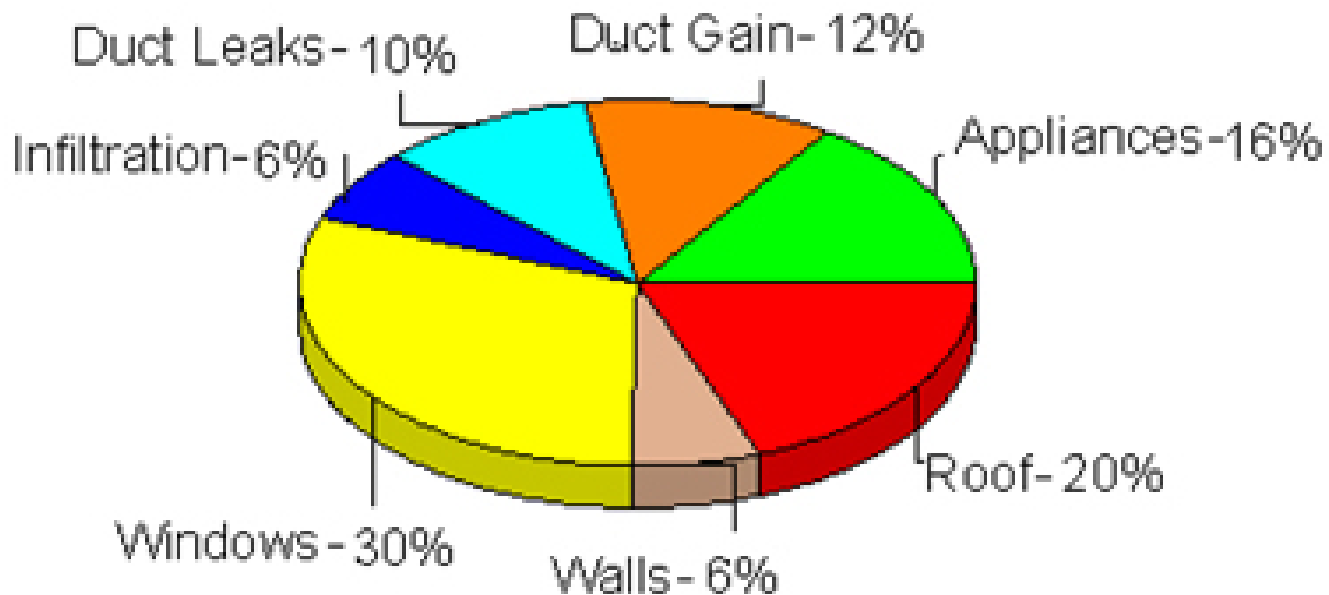
- Lower peoples' body temperature to 68 F.
- Dip everything that's made in stuff that glows in the dark.
- Make it a rule that there has to be at least two people in every big bed that uses an electric blanket.
- Put more hot sauce in the food.
- Don't stay in more than one room at a time.
- Don't have so many days of school.



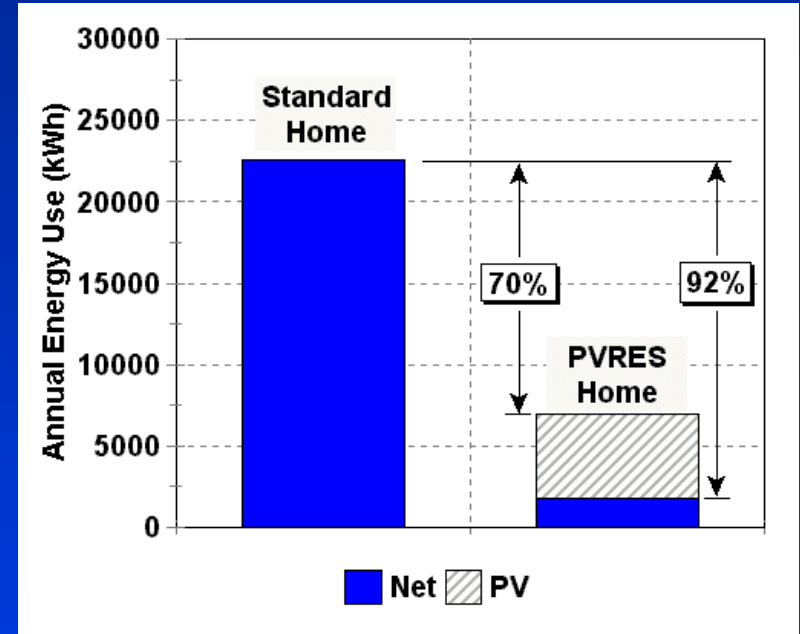
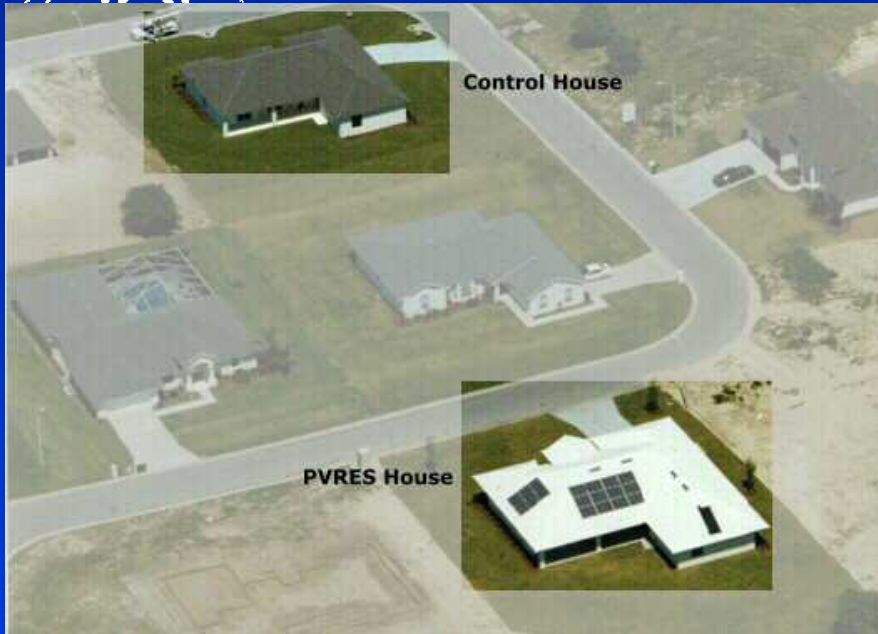


Annual Cooling Load Components

Tampa FL, 2000 sqft Residence

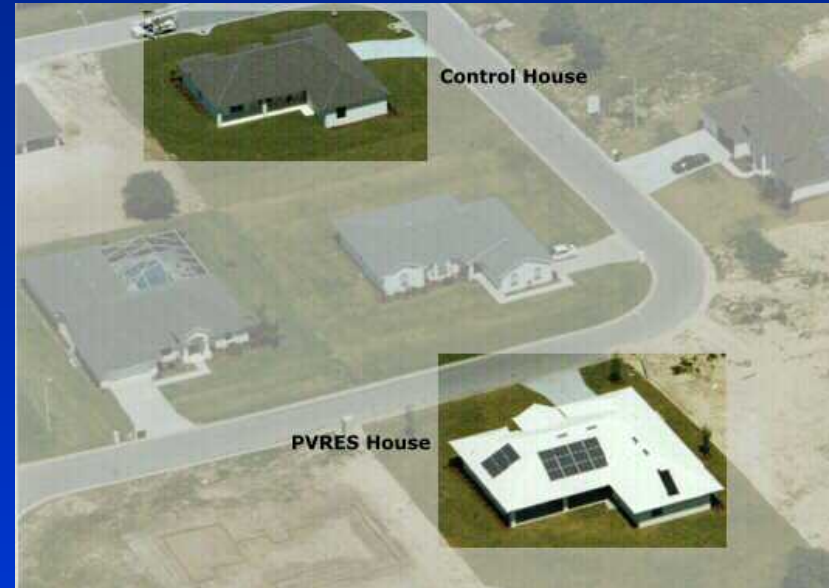


Pushing the limit - Lakeland PVRes



Pushing the limit - Lakeland PVRes

PVRes home incorporated cool roof, interior sealed ducts, high efficiency lighting and AC, advanced windows and overhangs, and saved 78% of cooling energy use. Energy use was monitored from 1998-2002.



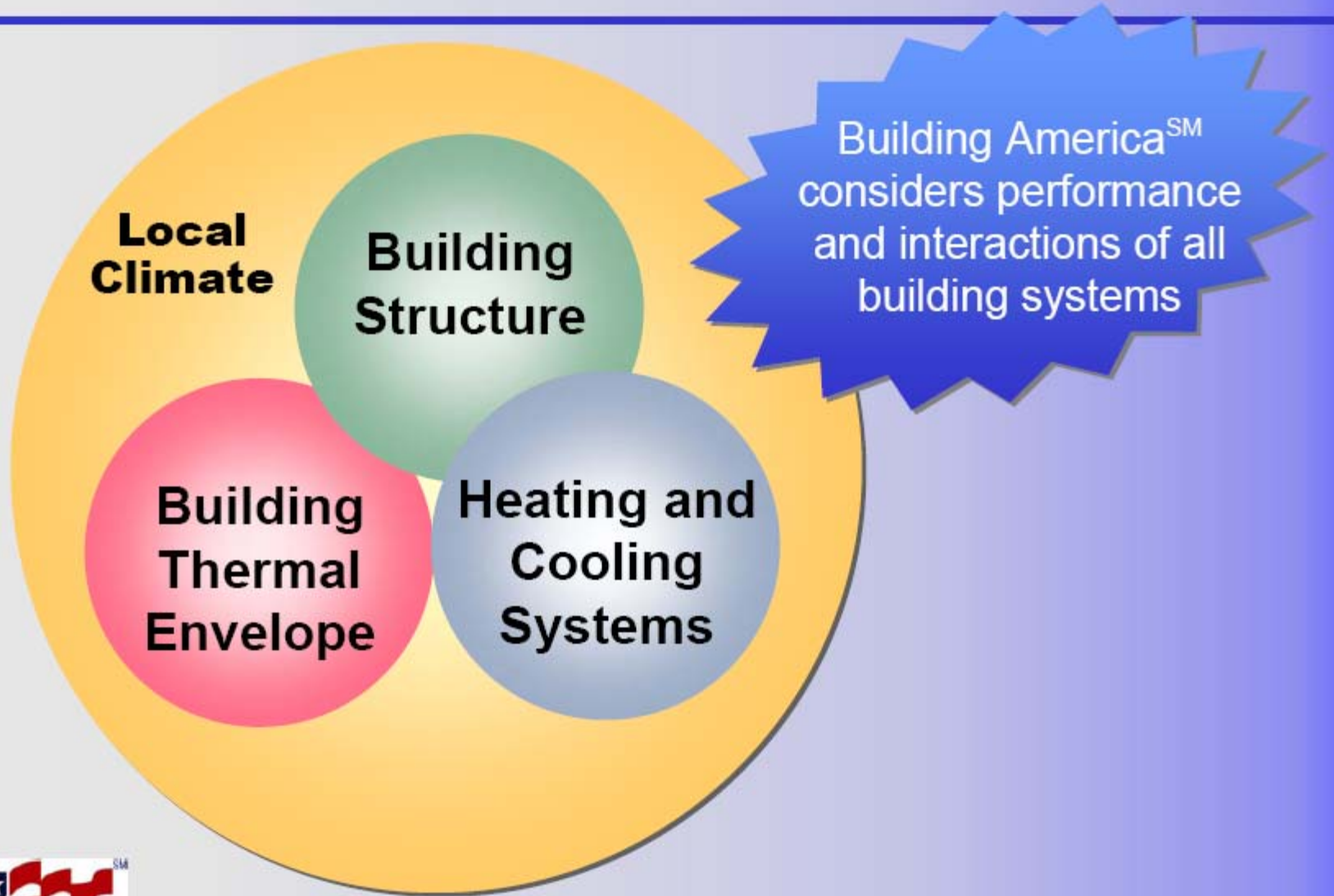
PVRes maintained 75°F and provided better comfort than the control home that has a 4 ton AC ...

...using a 2 ton system (1200 sq. ft. / ton)...

... during the summer of '98!

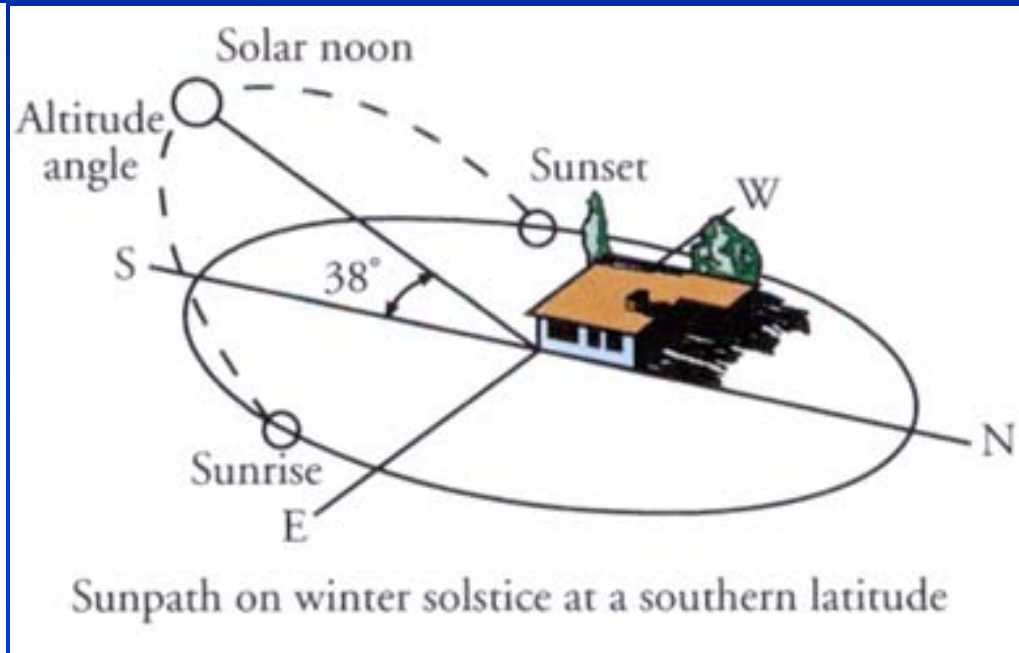
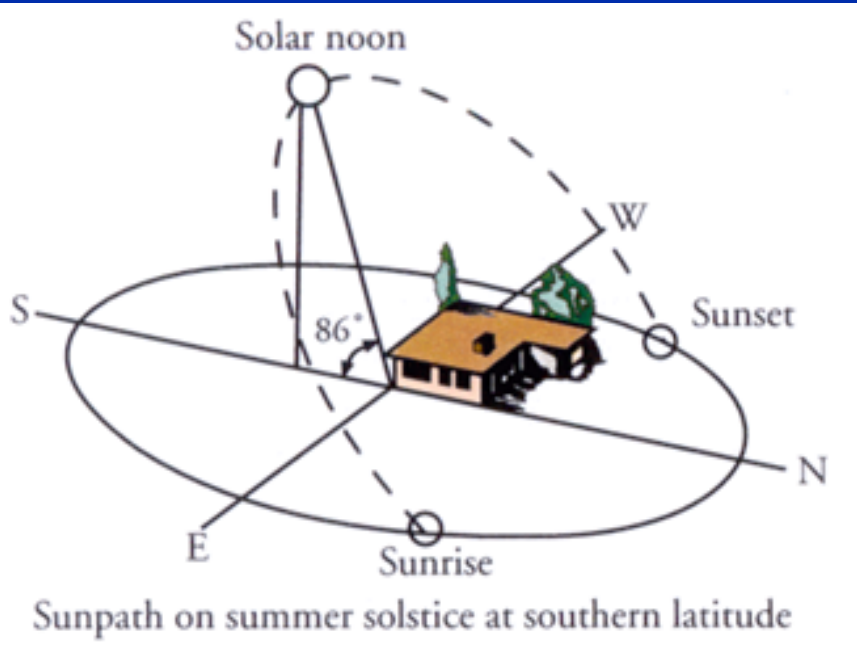


Whole-house Approach





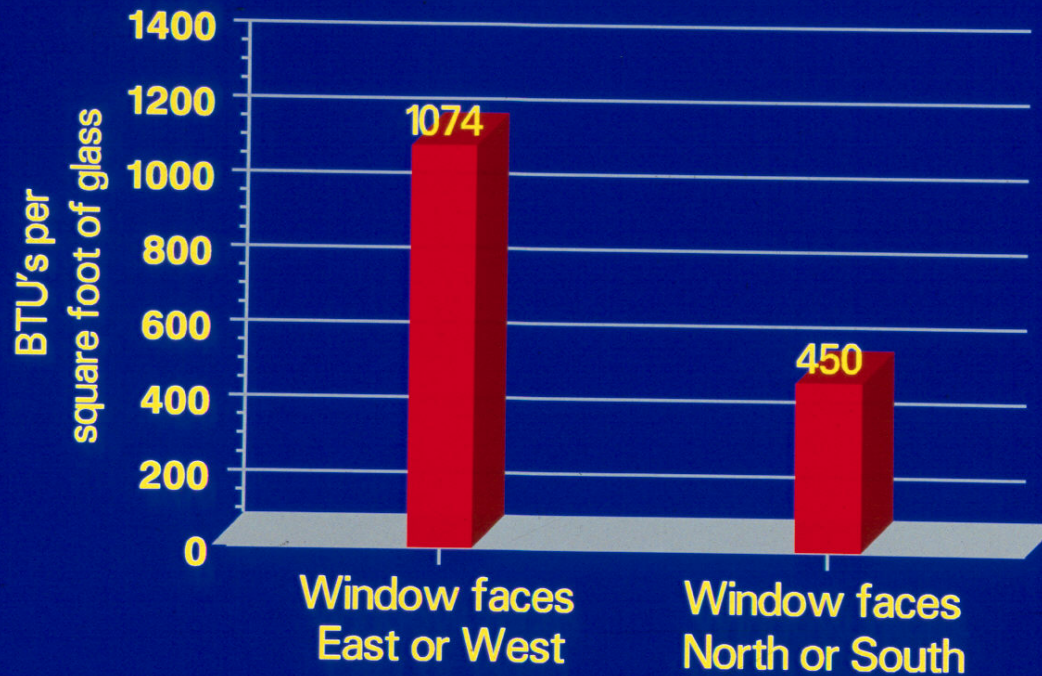
Orientation

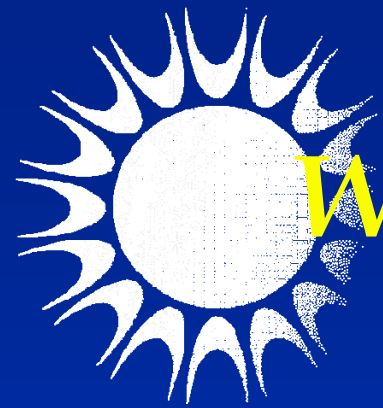


Window Strategies

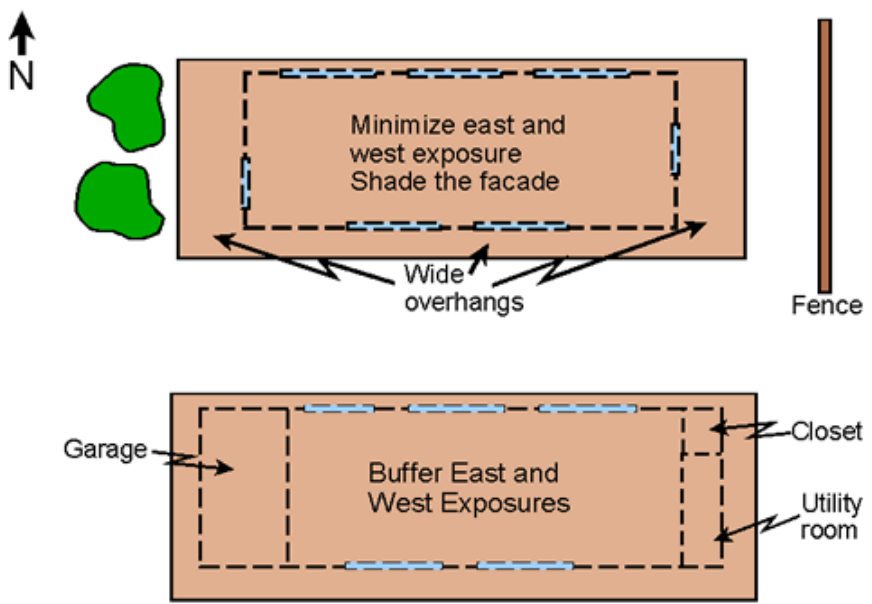


Solar Heat Gain through Windows Orlando - July



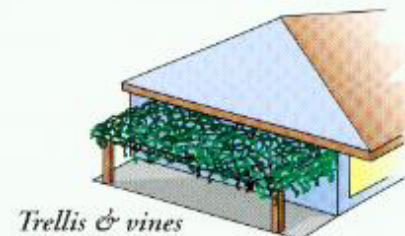
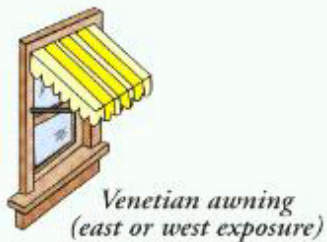
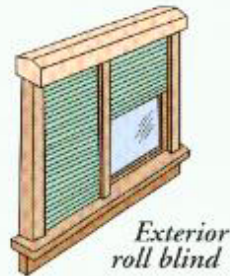


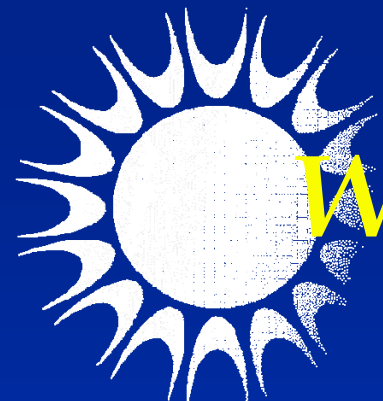
Window Shading Strategies



Window Shading Strategies

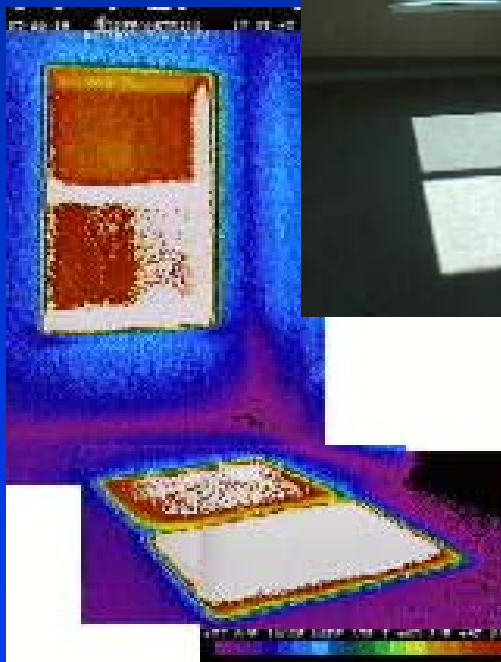
Exterior window shading strategies



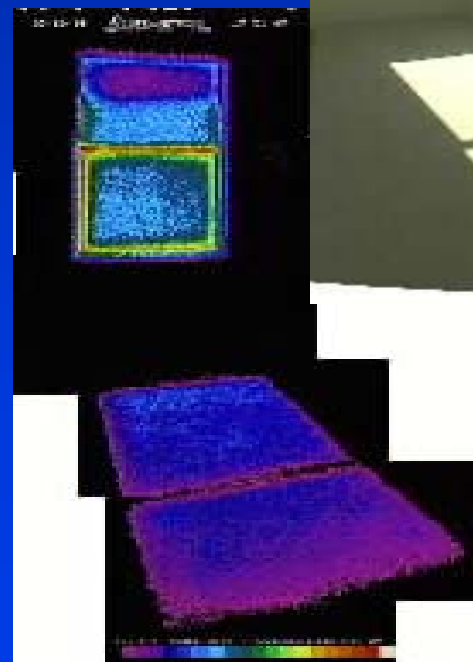


Window Strategies

Control
Home



PVRES

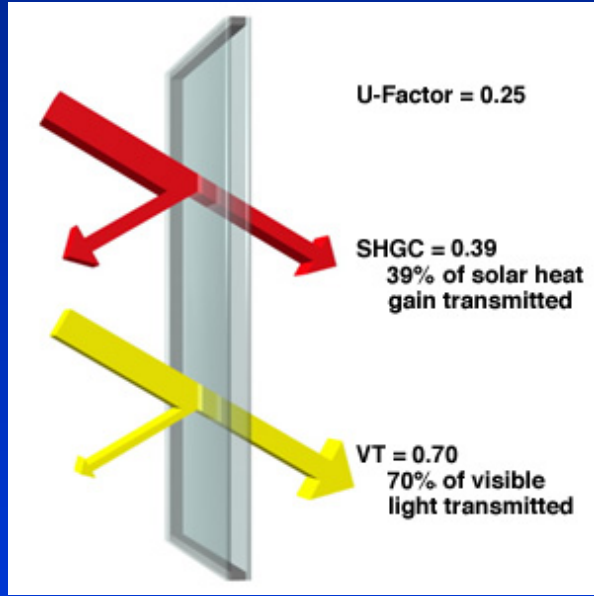
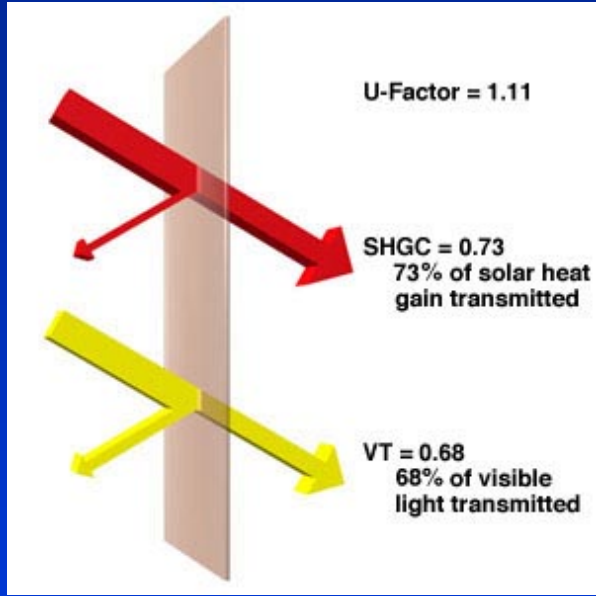
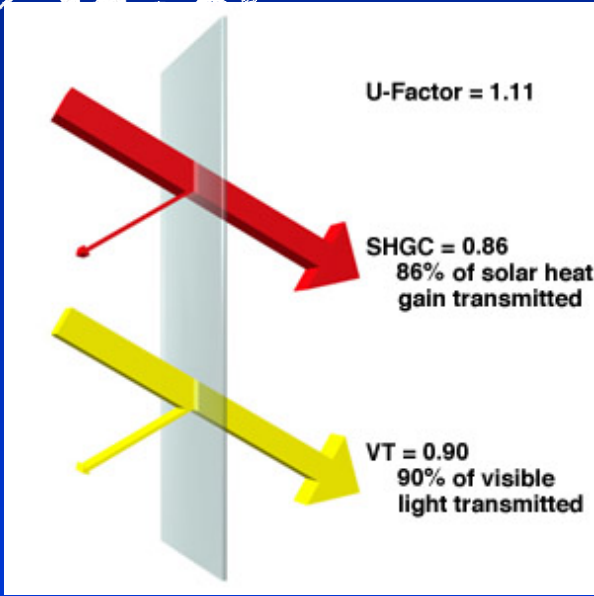


Window Strategies

Single-glazed clear

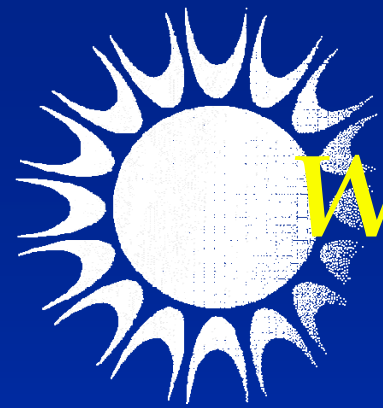
Single-glazed tint

Double-glazed low-e

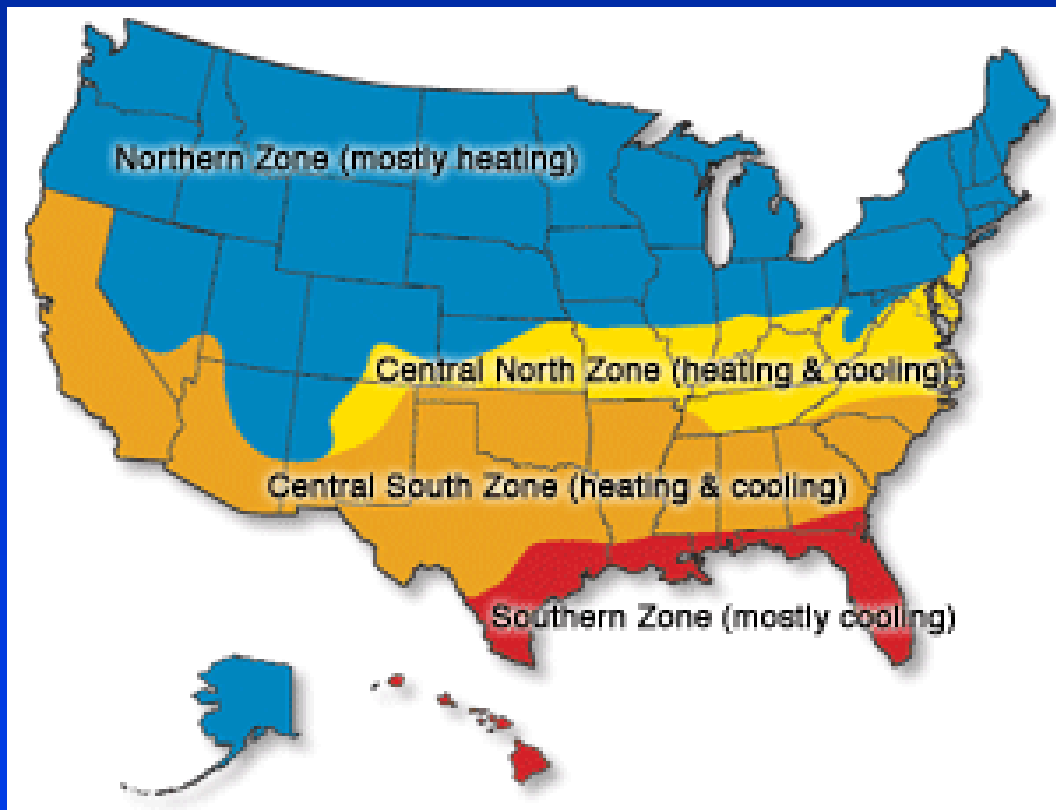


 National Fenestration Rating Council CERTIFIED	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider (per NFRC 100-97)	
	ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.35	0.32	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S./I-P)	
0.51	0.2	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>		





Window Strategies



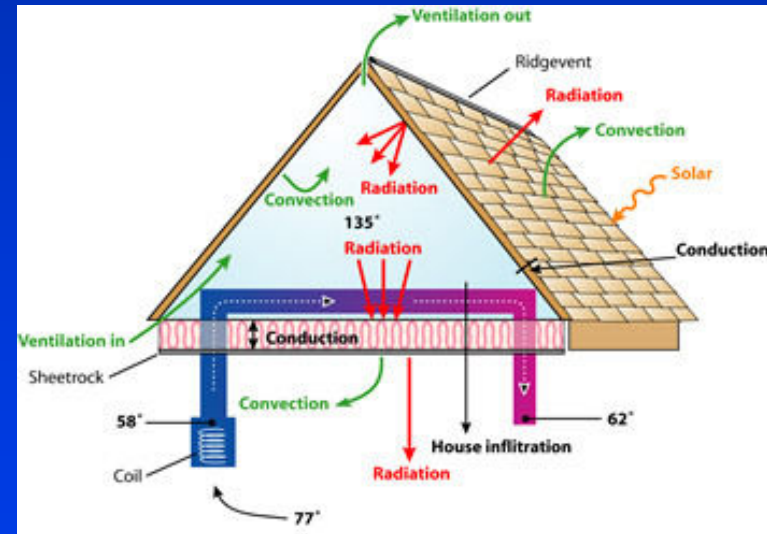
U-factor < 0.65

SHGC < 0.4



Cool Roofs

- ❑ White metal or tile reflective roofs
- ❑ Radiant barrier with other roof materials
- ❑ Solar heat gain through the insulated ceiling and to the duct system can be responsible for 20 - 30% of the AC use. Choice of a white roof color can reduce the overall cooling load by 20% or more in new homes.





Roof Materials - Cool Roof Study

Ft. Myers Habitat for Humanity





Roof Materials - Cool Roof Study

✓ Seven homes with same floorplan, orientation, equipment and insulation

✓ Seven different roofing systems:

Control gray shingle

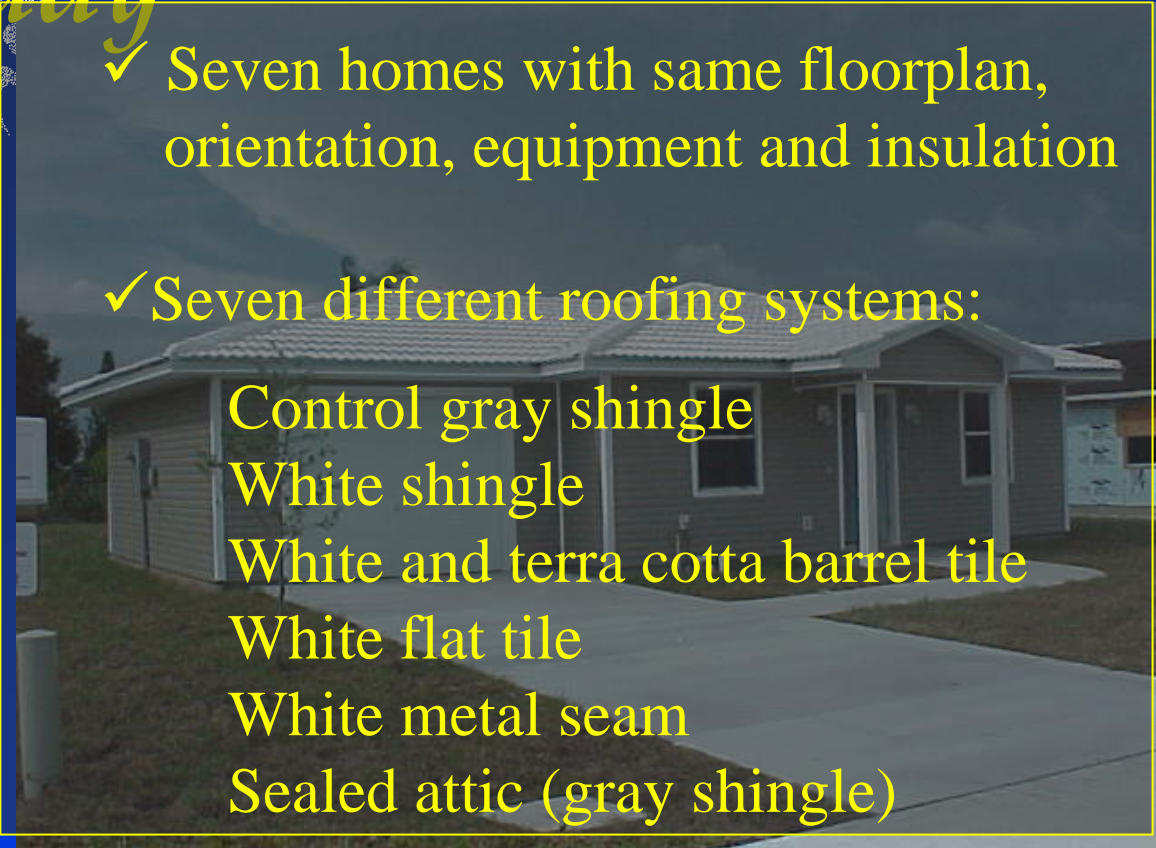
White shingle

White and terra cotta barrel tile

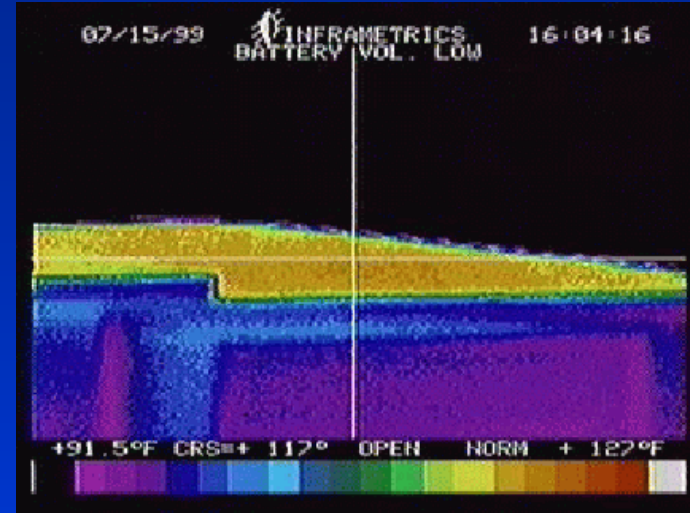
White flat tile

White metal seam

Sealed attic (gray shingle)



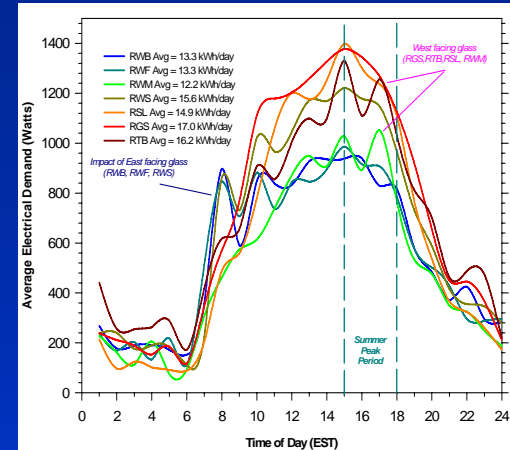
Roof Materials - Cool Roof Study

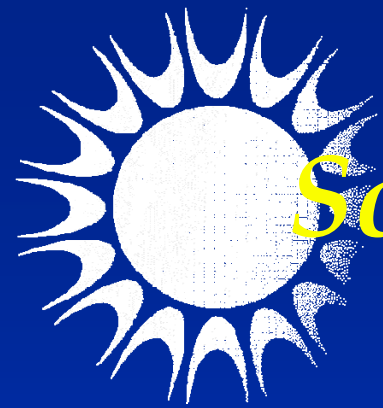


Roof Materials - Cool Roof Study

Estimated Normalized Average Savings for 1770 Square Foot Home

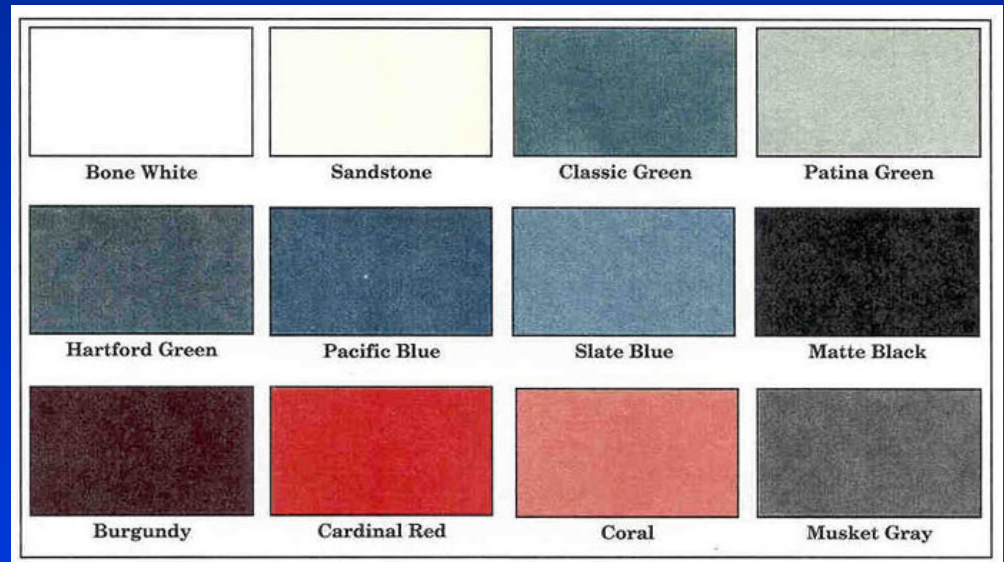
	<u>Cooling Savings</u>	<u>Peak Demand Reduction</u>
RGS (Control):	--	--
RWS (White Shingle):	4%	17%
RSL (Sealed Attic):	9%	5%
RTB (Terra Cotta Barrel):	3%	13%
RWB (White Barrel Tile)	20%	32%
RWF (White Flat Tile)	17%	34%
RWM (White Metal)	23%	28%

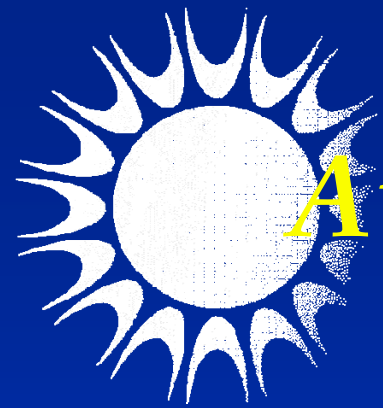




Solar Reflectances (%)

- White 66
- Sandstone 50
- Classic Green 11
- Patina Green 24
- Hartford Green 9
- Pacific Blue 18
- Slate Blue 20
- Matte Black 6
- Burgundy 12
- Cardinal Red 37
- Coral 34
- Musket Gray 13



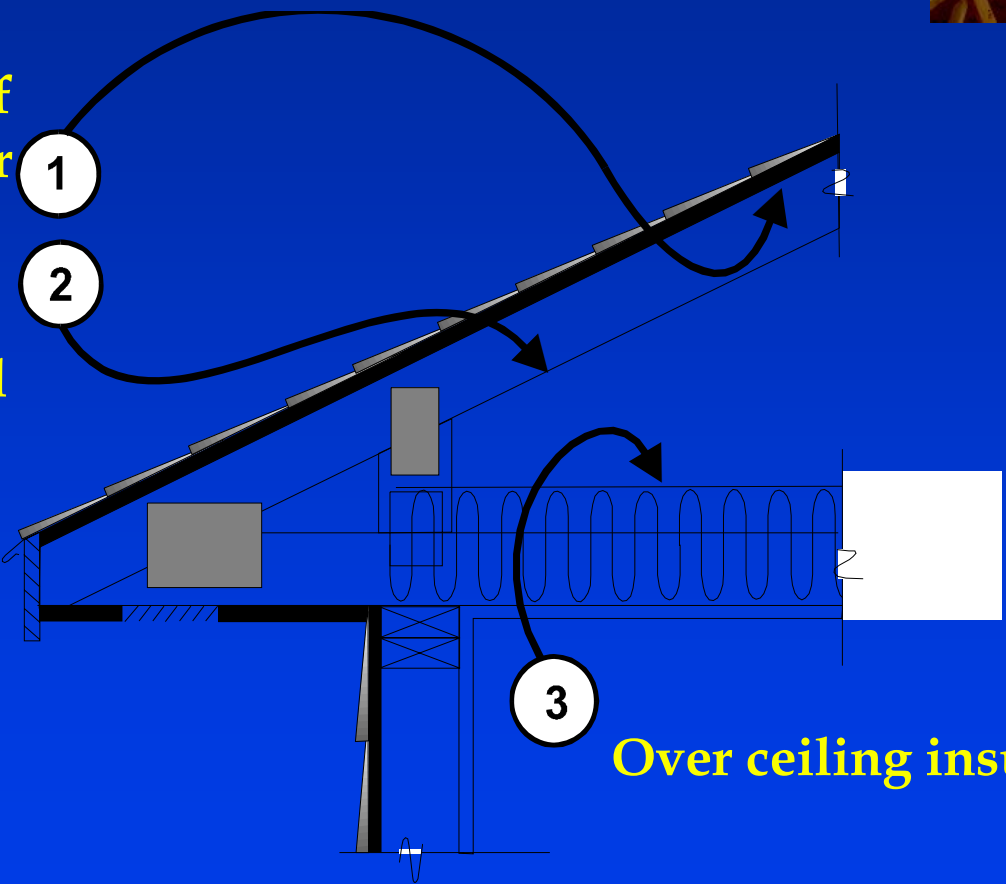


Attic Radiant Barrier



Top side of
truss under
sheathing

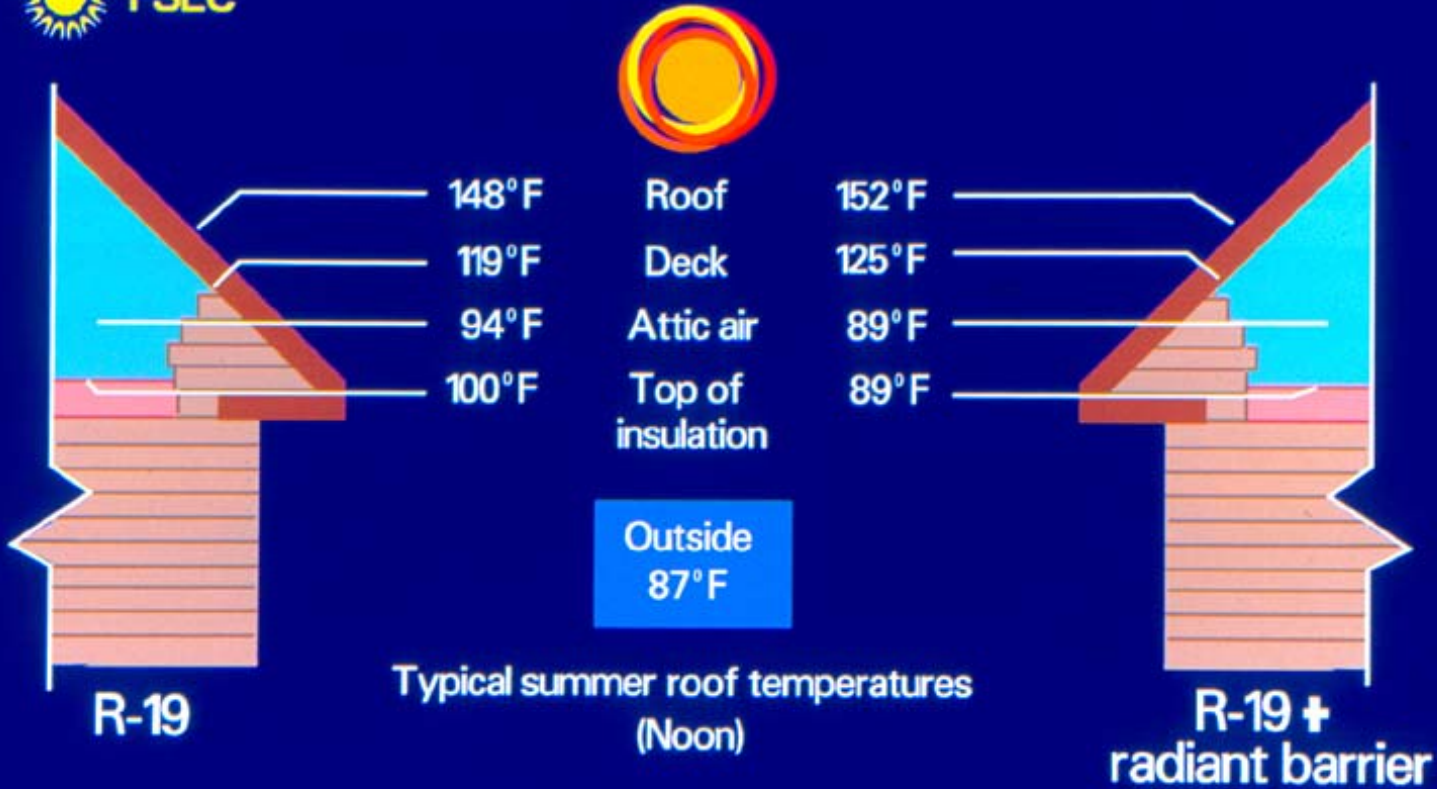
Below
bottom cord



Over ceiling insulation



Attic Radiant Barriers





Sealed and Tested Ductwork

- ❑ Duct leakage can account for 10% - 20% of heating and cooling bills.

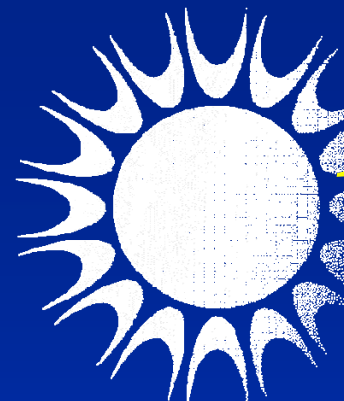




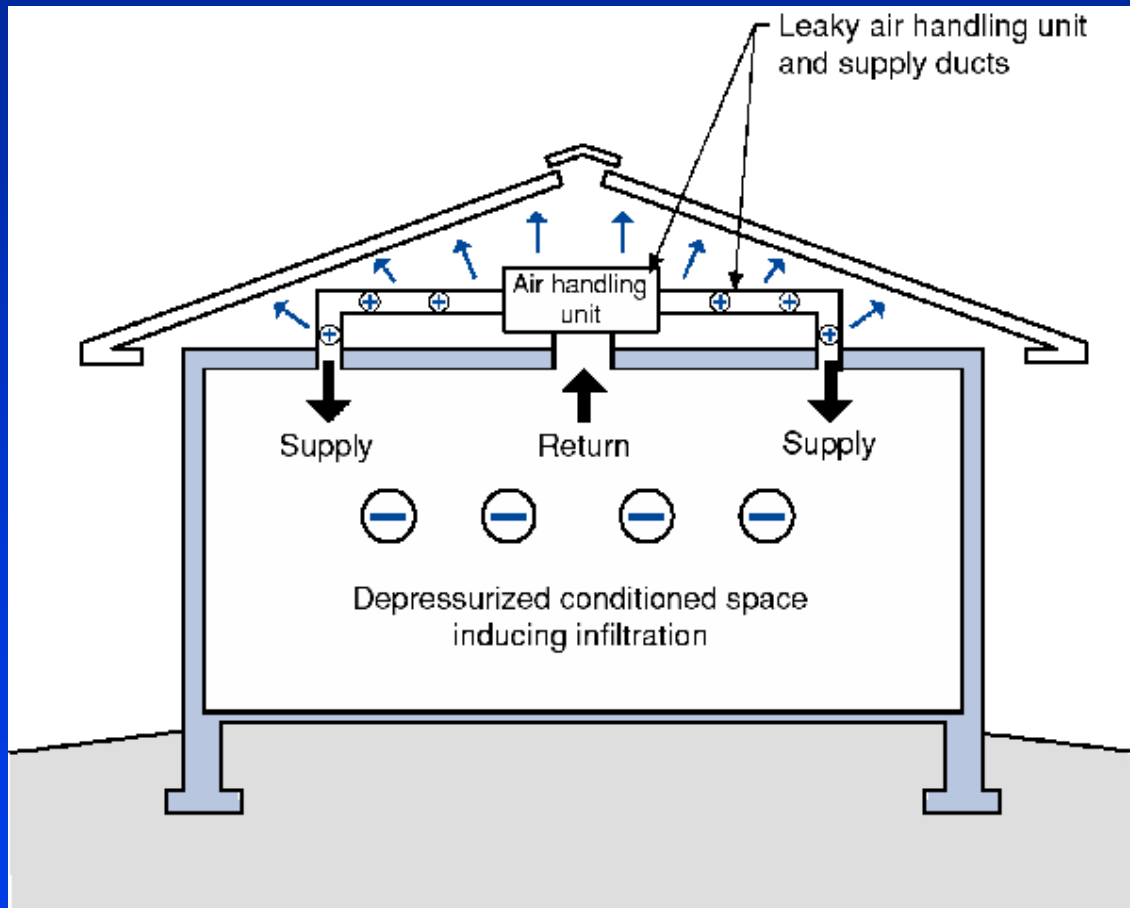
Sealed and Tested Ductwork

❑ Air handler leakage often around 5%.



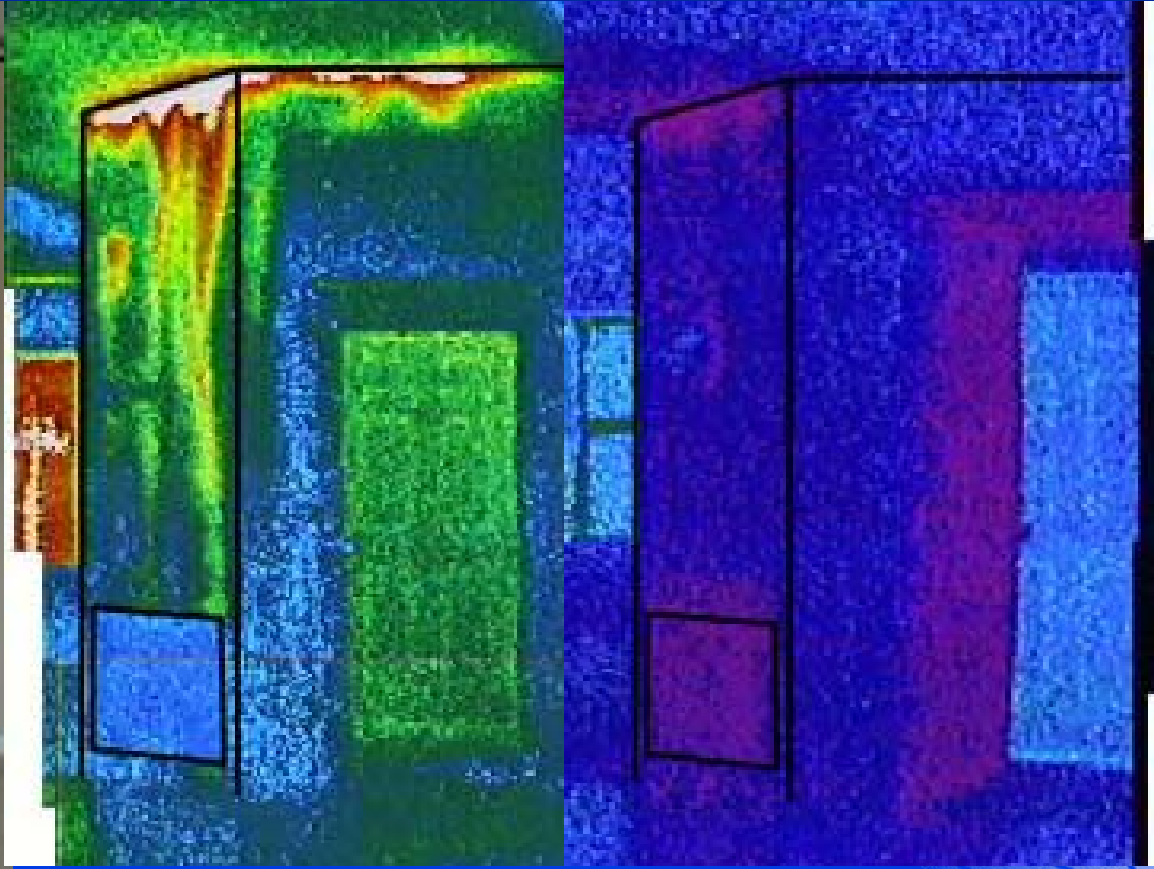


Duct Leakage & Uncontrolled Airflow





Duct Leakage & Uncontrolled Airflow



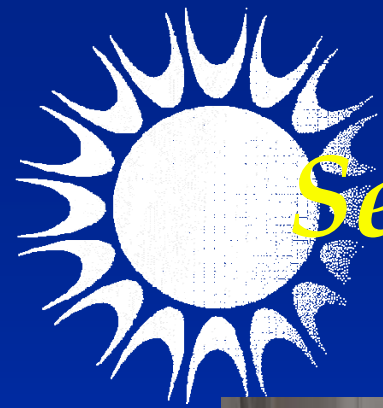


Sealed and Tested Ductwork



Ahh, that feels good!





Sealed and Tested Ductwork



$$Q_n = \frac{\text{CFM}_{25}}{\text{Conditioned Floor Area}}$$
$$0.00 < Q_n < 0.06$$





Sealed and Tested Ductwork

Duct Leakage Research - 1990



□ Florida

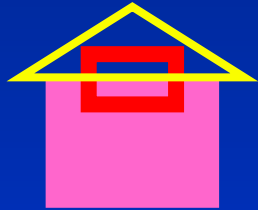


- 50 all electric homes
- 13% total building leakage in duct system
- 17% savings
- \$200 cost
- Typical: single story, slab on grade, duct board ducts in attic

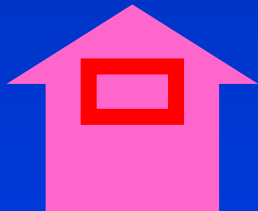




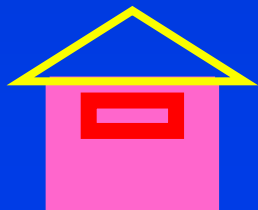
Reducing the Impact of Ducts in Unconditioned Spaces



- ❑ Sealed and Insulated Ducts: continuous thermal barrier and sealed with mastic and mesh *including the return plenum.*

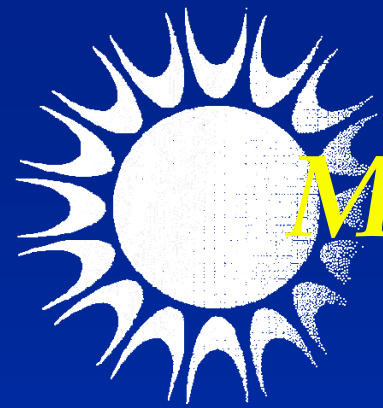


- ❑ Unvented Attics and Crawlspaces – move the air and thermal barriers to the other side of the air distribution system

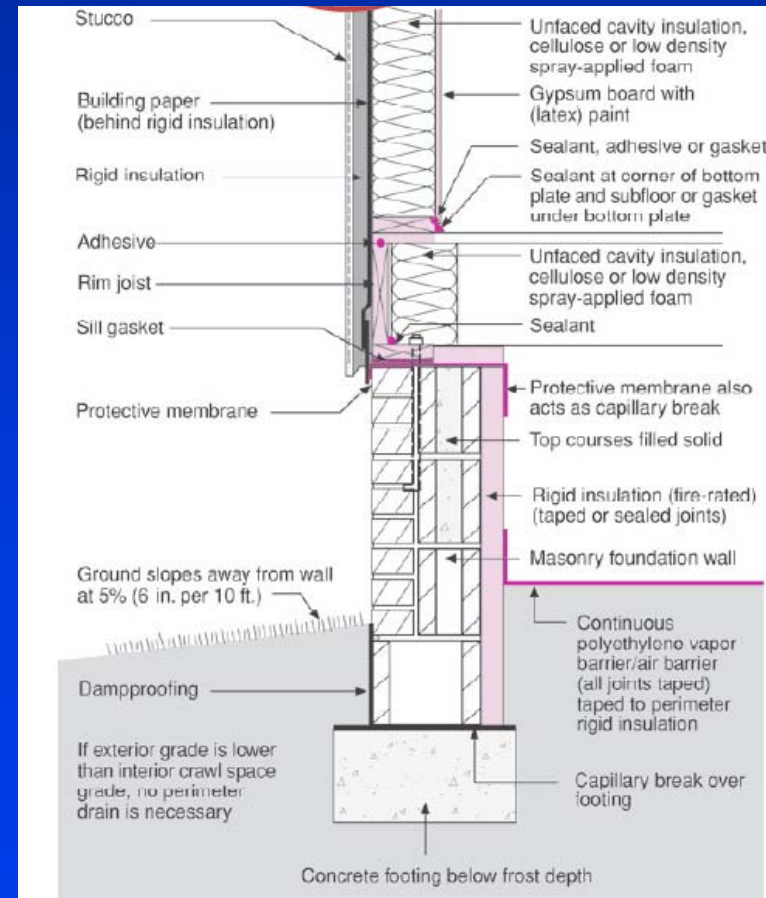


- ❑ Interior Duct Systems – move the air distribution system to the inside of the house's thermal and air barriers.



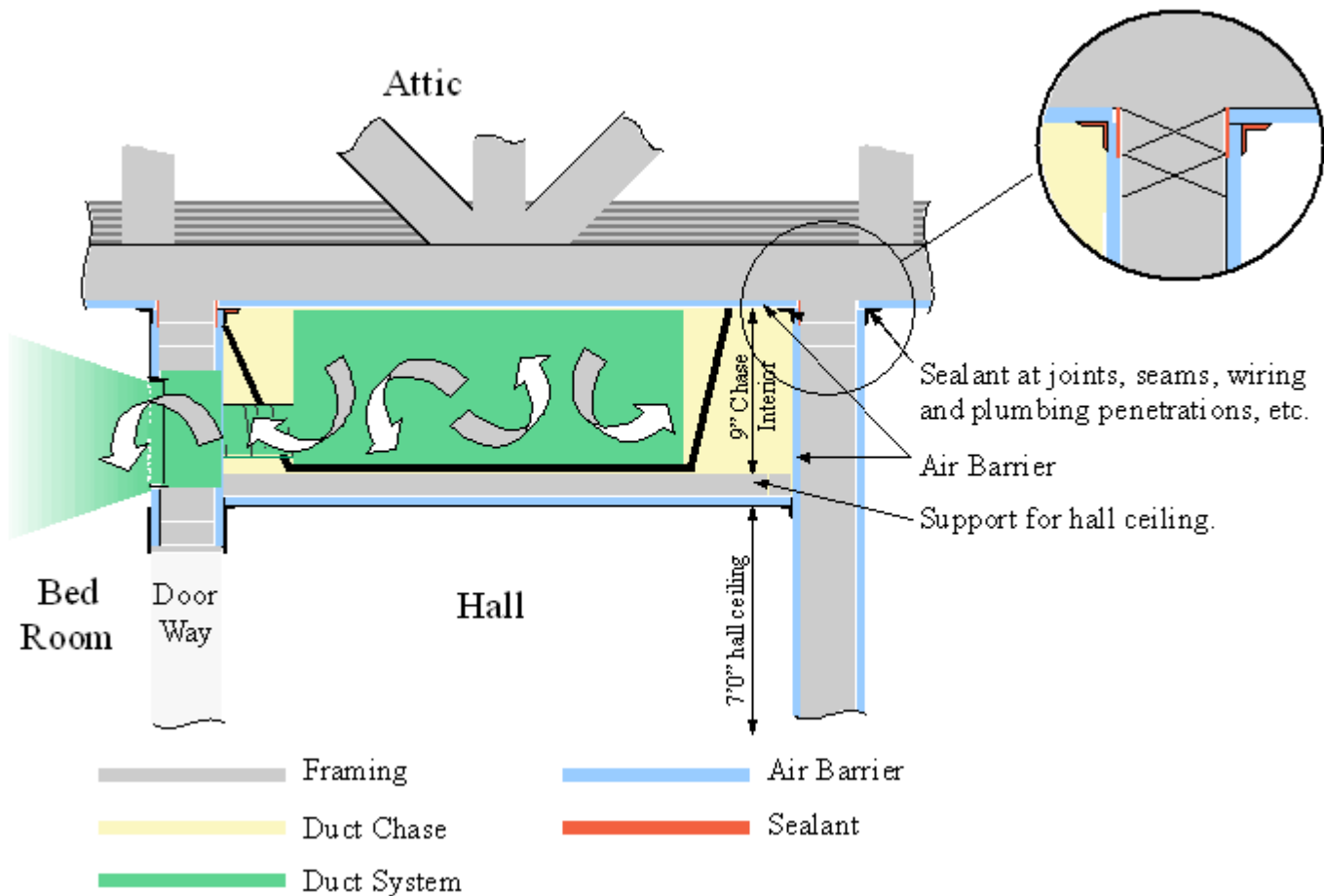


Move the air/thermal barrier



Interior Ducts - Schematic

Interior Duct System — Fur Down in Hallway

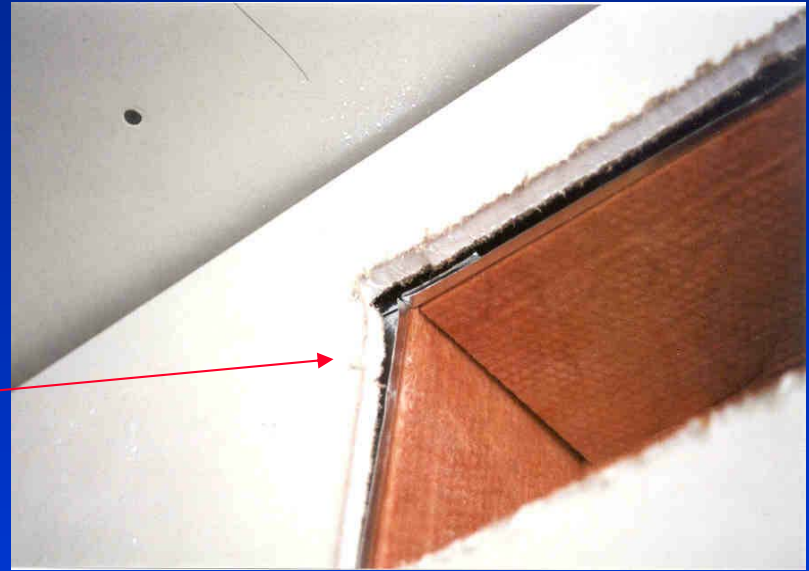




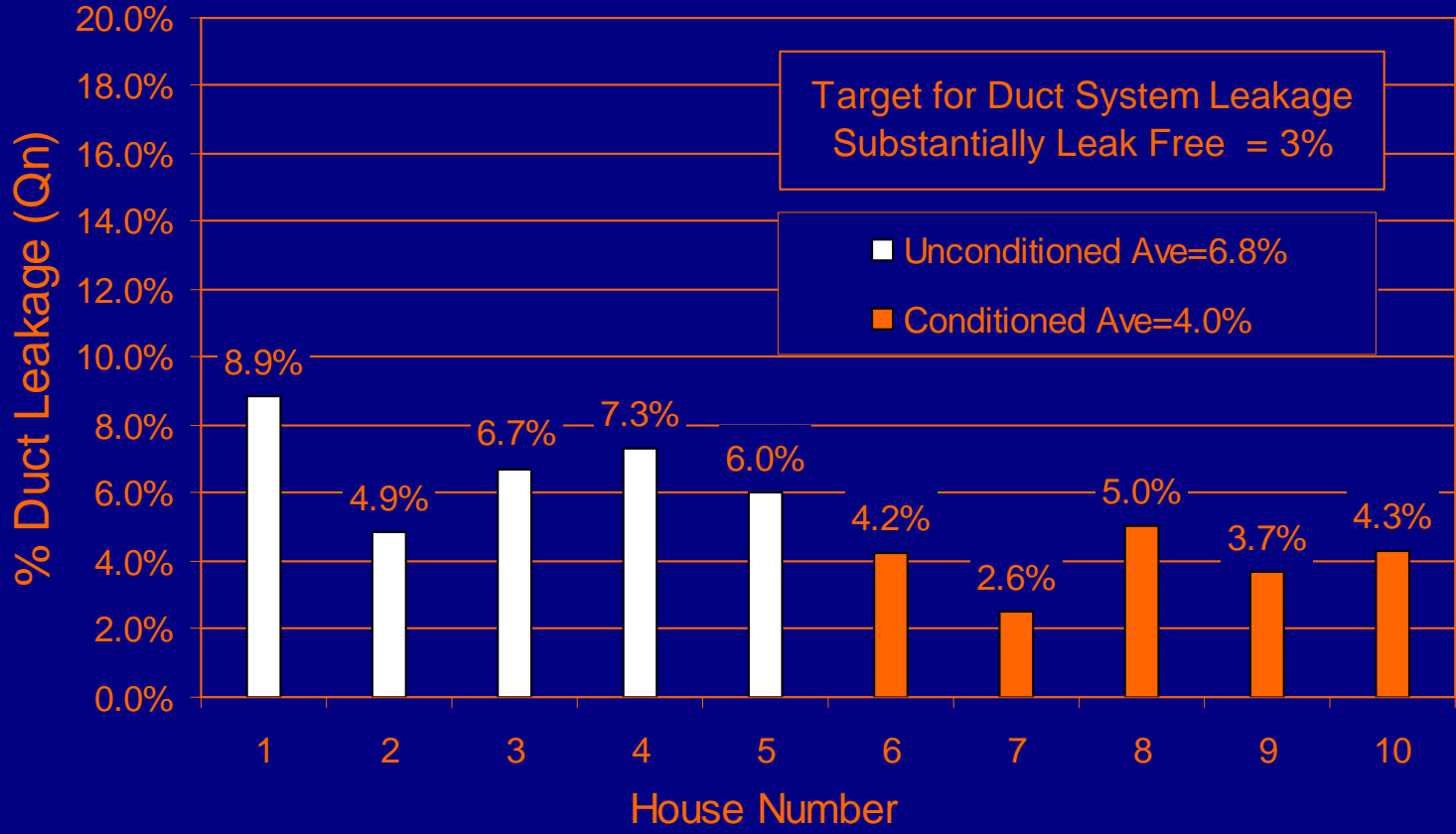
Interior Duct Chase - Air Barrier in Place



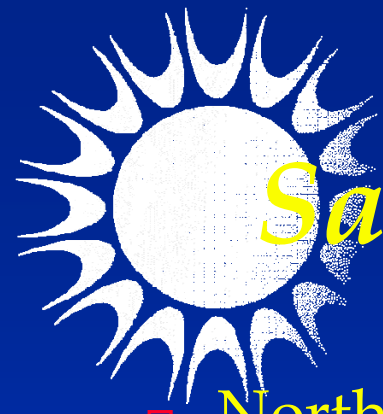
Interior Duct Chase - Finishing



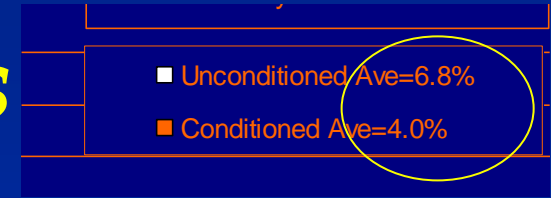
North Carolina Houses



$$Q_n = \frac{\text{Measured Duct Leakage to/from Unconditioned Spaces}}{\text{Conditioned Area of the House}}$$



Savings and Ratings



- ❑ North Carolina Houses: 1014 sq ft
- ❑ 5 with Ducts in Crawl Space
 - Average loss of air 6.8% (68.9 CFM25out)
 - Annual Estimated Energy Cost = \$1099
- ❑ Ducts in Conditioned Space with $Q_n = 4\%$ (average)
 - Average loss of air 4% (40.64 CFM25out)
 - Annual Estimated Energy Cost = \$1013
- ❑ Estimated Annual Savings = \$86

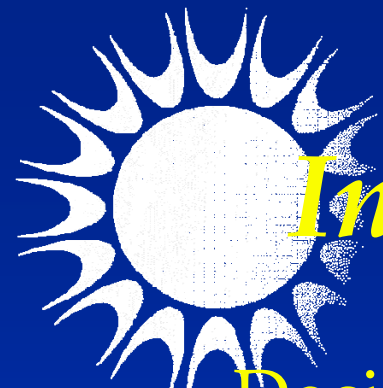




Cost Effectiveness

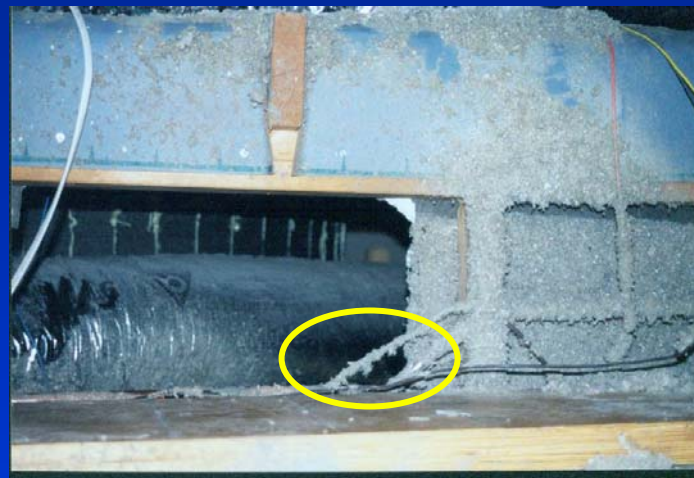
- Example Economics from North Carolina Houses
 - \$0 No incremental cost for duct installation
 - +\$200 Drywall for miscellaneous air barriers
 - \$0 Ceiling insulation will be thermal barrier
 - +\$350 Labor + materials to install and seal air barrier
 - - \$250 ~1/2 ton reduction in heating/cooling
 - **\$300 FIRST COST**
- Annual Savings = \$86
- Simple payback $\$300/\$80 = 3.75$ years

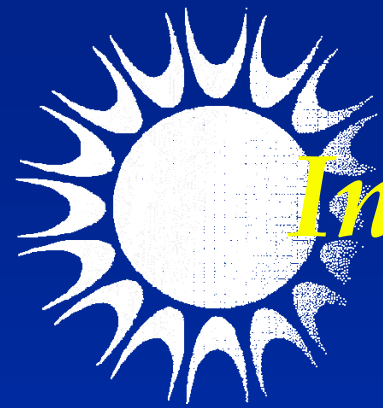




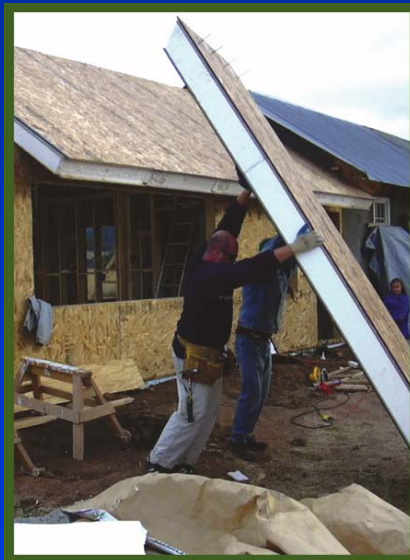
Interior Duct Challenges

- ❑ Decisions and planning during design phase.
- ❑ Coordination with trades.
- ❑ “He who drills it, seals it”
- ❑ Testing of chase.





Insulation & Air Sealing

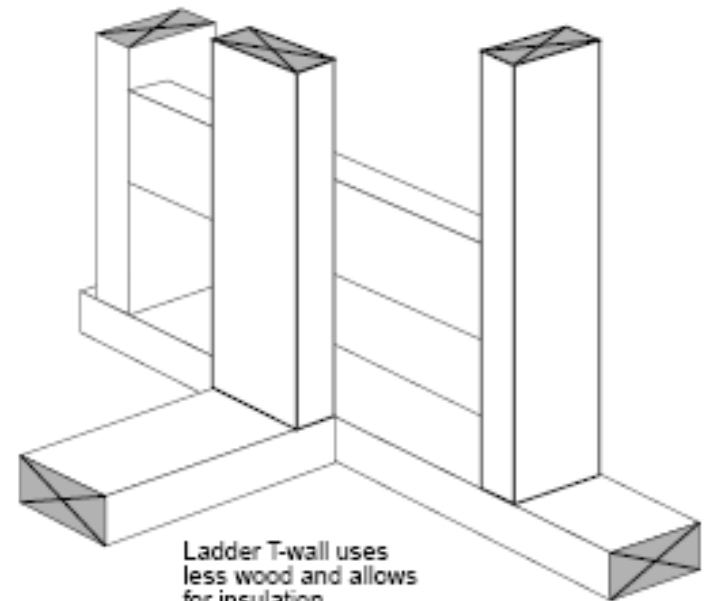
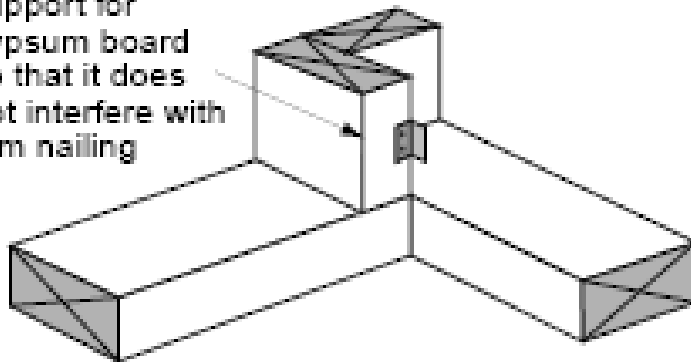




Insulation & Air Sealing

INSIDE "TWO-STUD" CORNERS

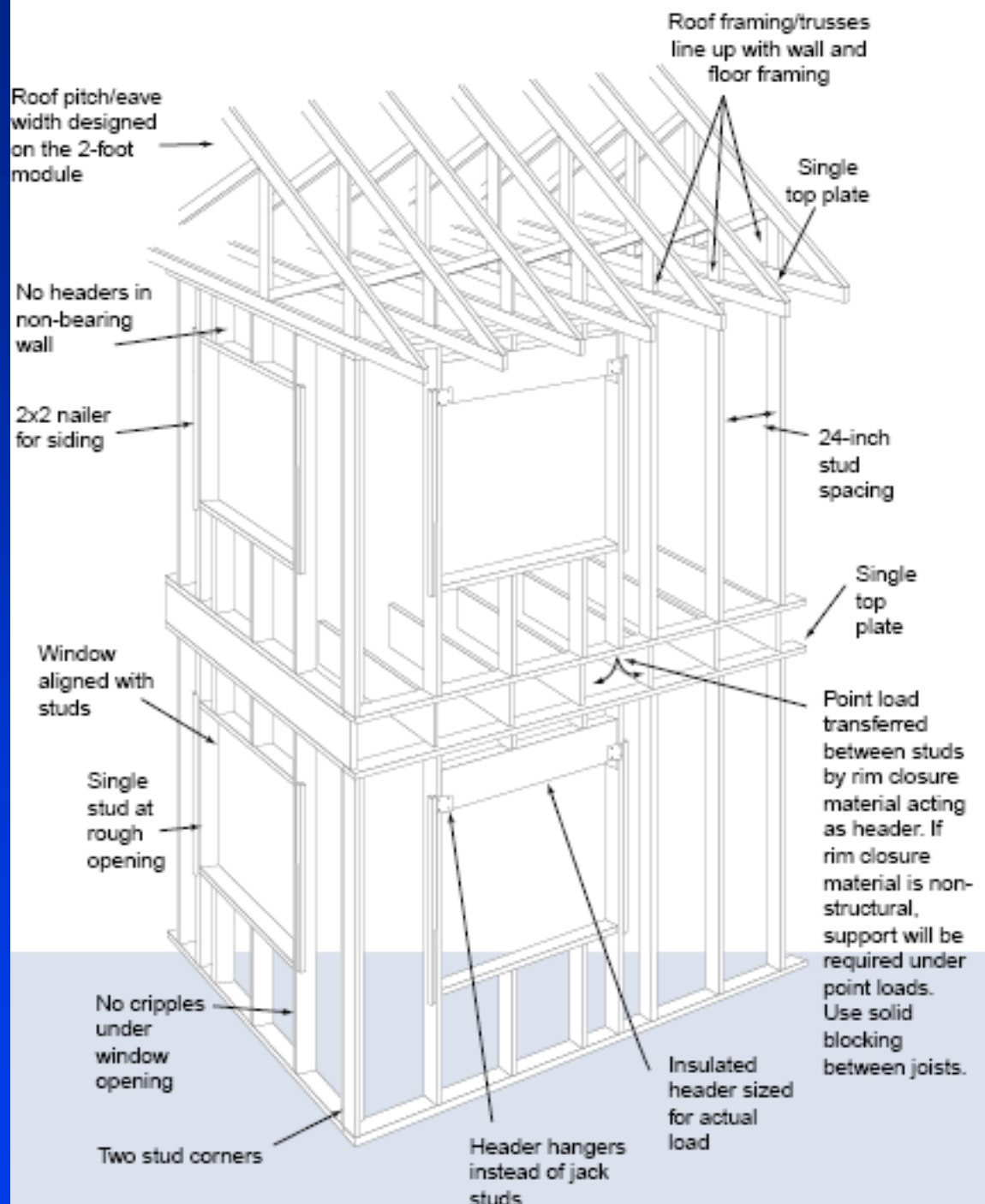
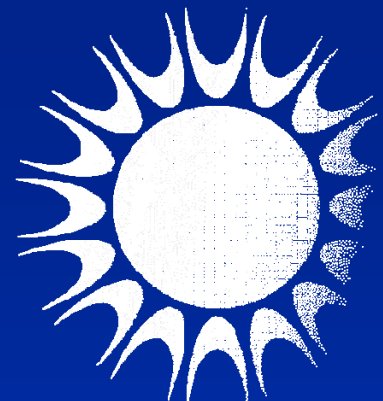
Position clip support for gypsum board so that it does not interfere with trim nailing

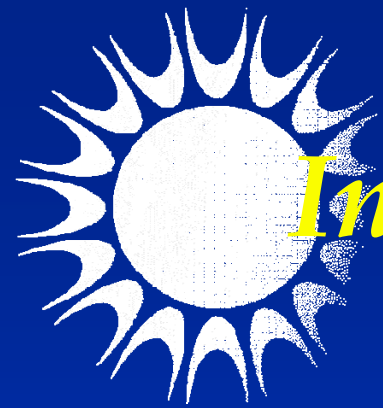


Ladder T-wall uses less wood and allows for insulation coverage behind partition walls

Techniques allow for more complete insulation.

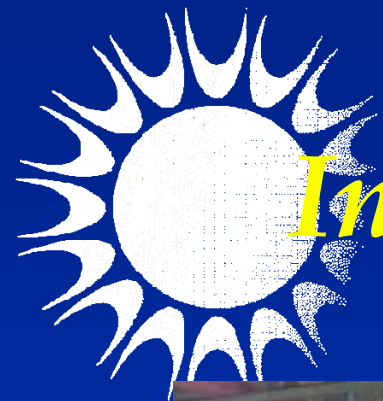




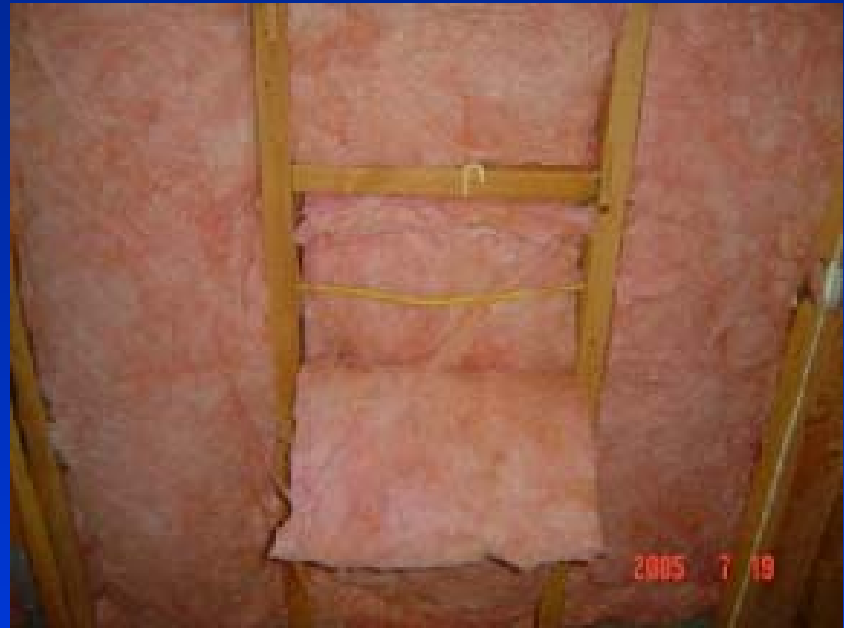


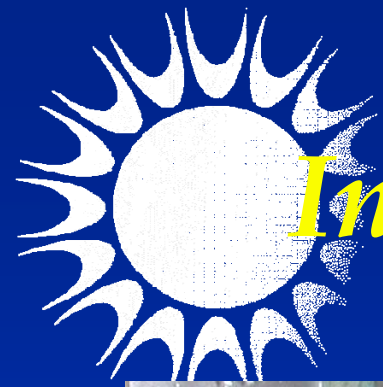
Insulation & Air Sealing



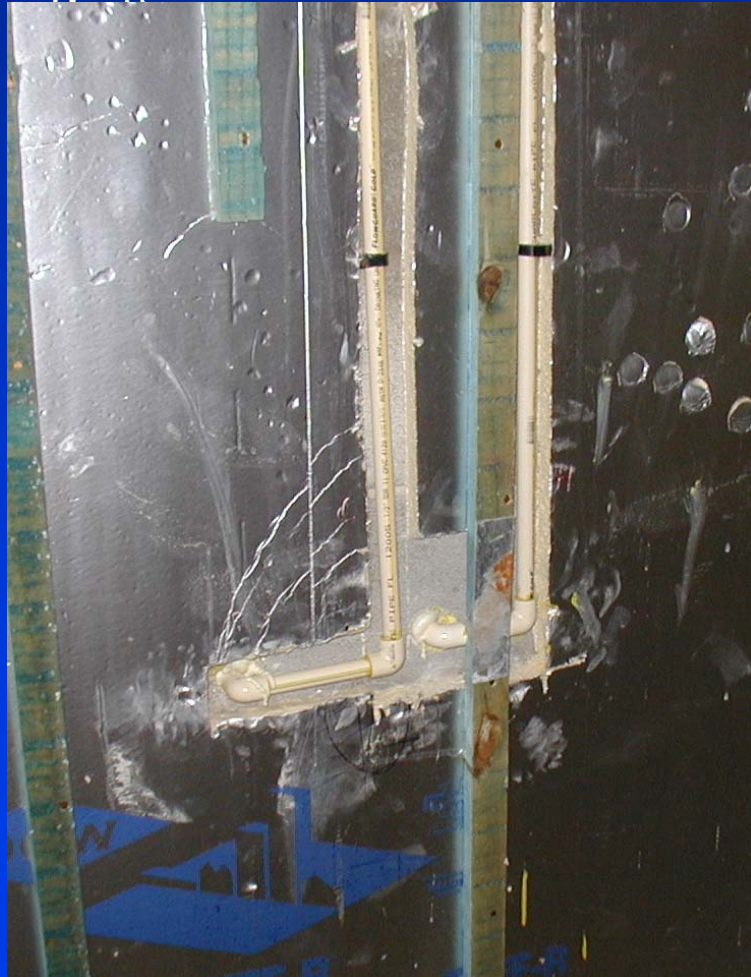


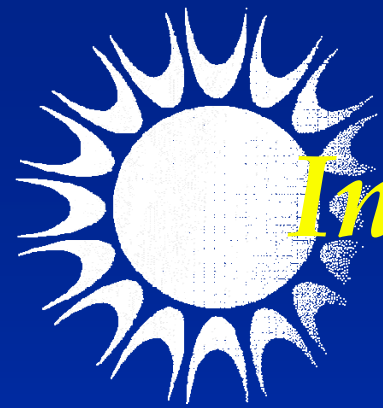
Insulation & Air Sealing



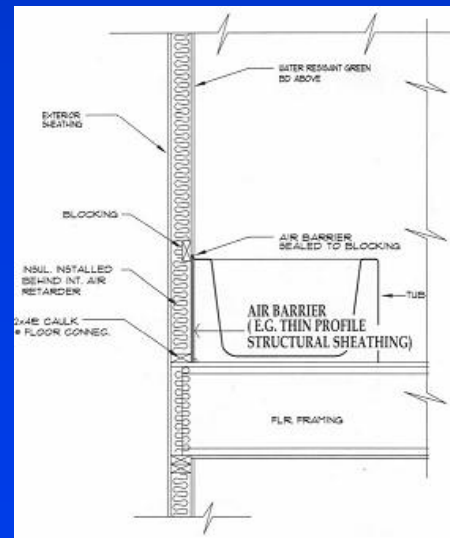
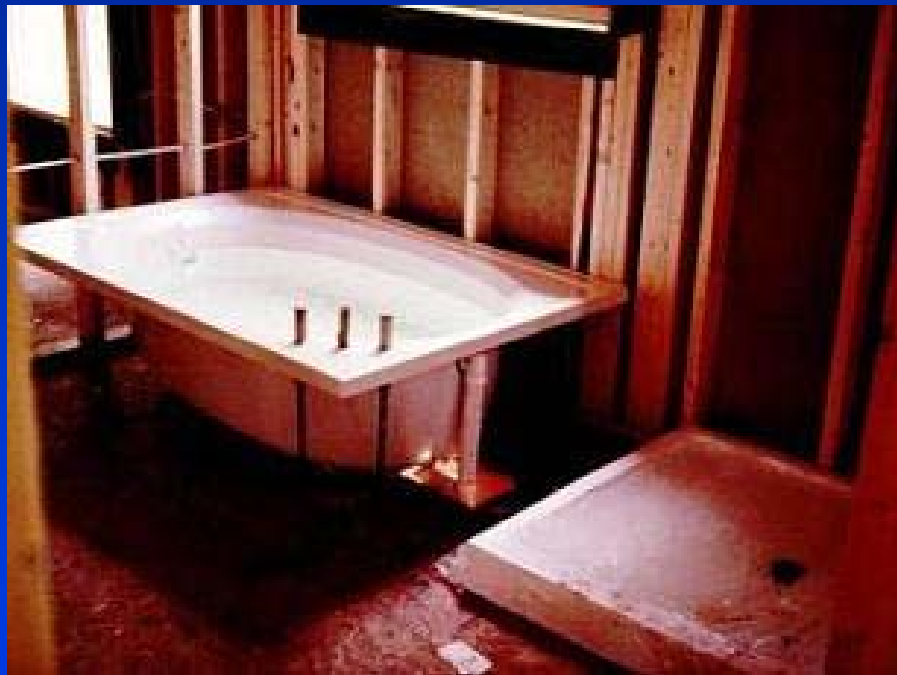


Insulation & Air Sealing





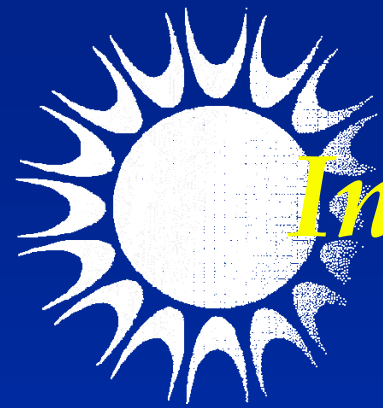
Insulation & Air Sealing





Insulation & Air Sealing



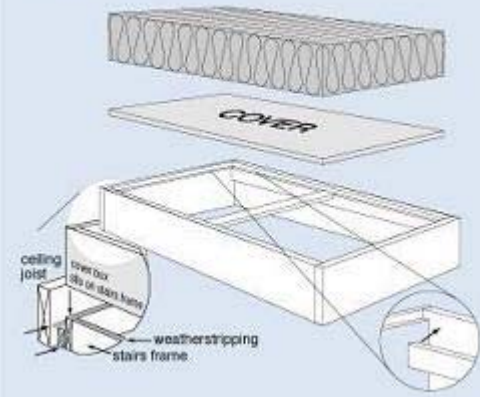


Insulation & Air Sealing



Insulation & Air Sealing

Attic Stairs Cover Box



Insulated Cover door:

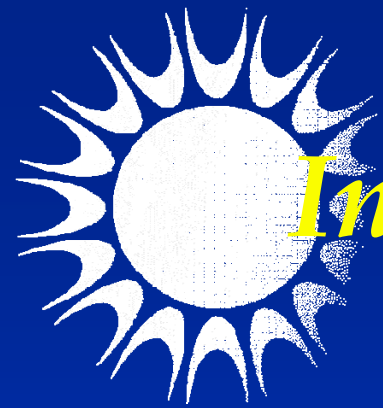
White MFD panel, 1/8" (3mm)

Foam core polystyrene insulation
1-1/2" thick cover door: 1-1/4" (30 mm),
1" thick cover door: 3/4" (20 mm)

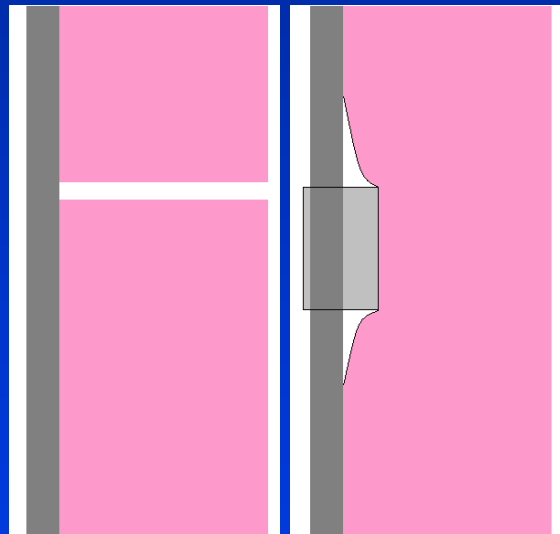
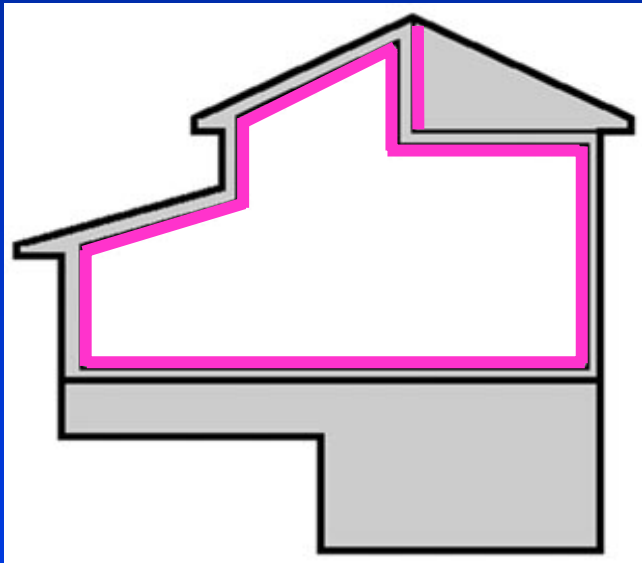
Solid wood edge, 3-1/2" (80 mm)

White MFD panel, 1/8" (3mm)



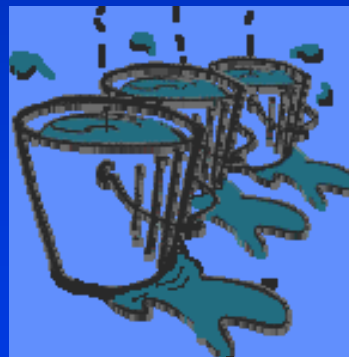
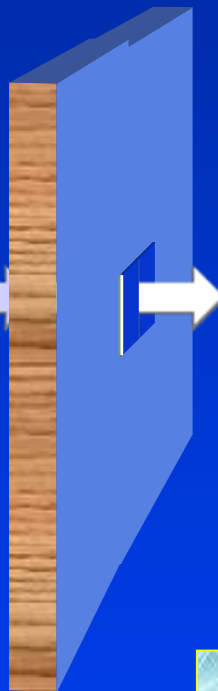


Insulation & Air Sealing



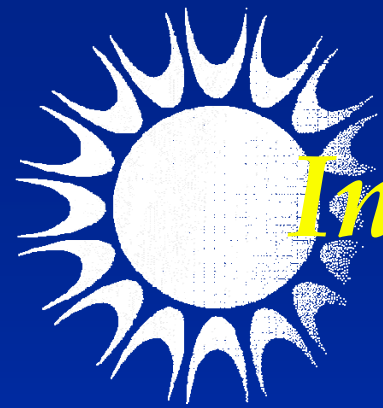
Insulation & Air Sealing

ONE CUBIC FOOT OF AIR PER MINUTE



150 Pints of Water
*During cooling season
in Orlando*





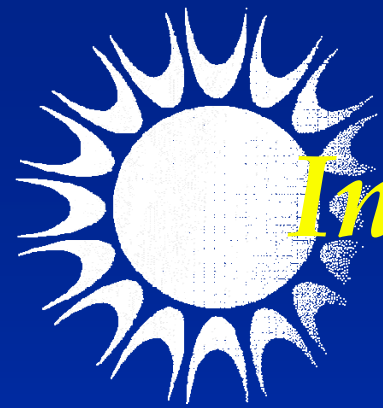
Insulation & Air Sealing



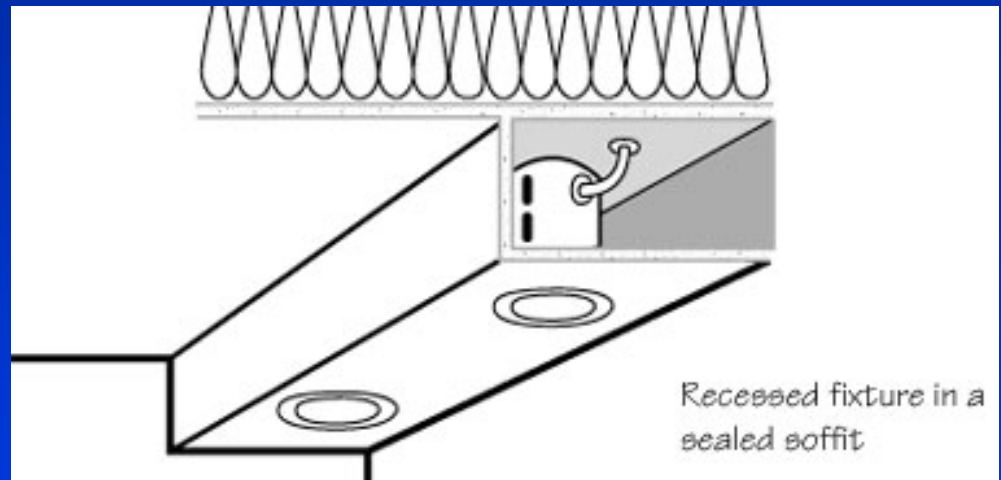
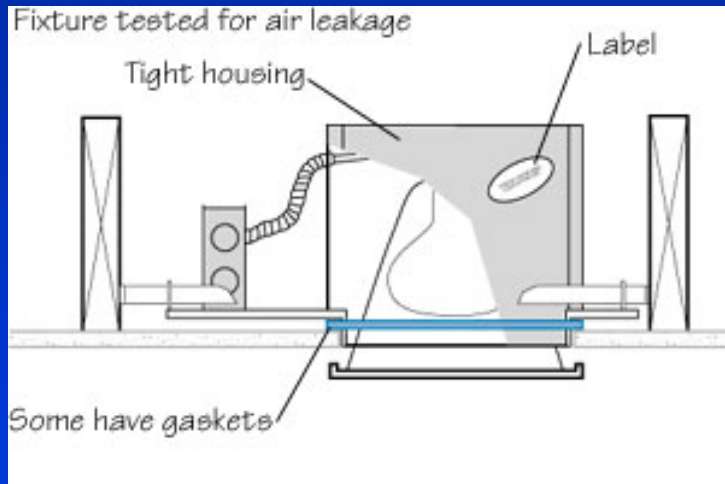


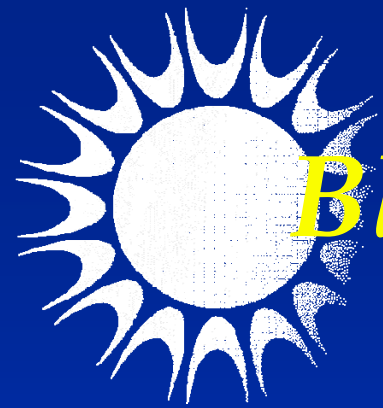
Insulation & Air Sealing





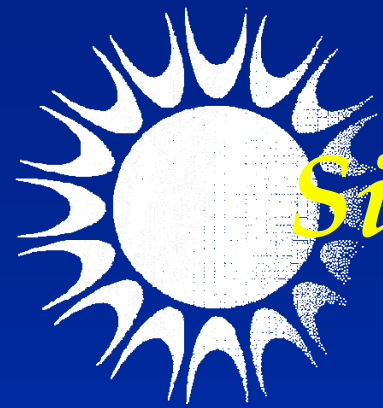
Insulation & Air Sealing





Blower Door Testing





Sizing of AC Systems

- ❑ Sizing needs to account for high-performance building features.
- ❑ Oversizing by 50% (e.g., a 3-ton unit where a 2-ton would be needed) results in about 10% greater energy use
- ❑ Shorter run times of larger systems leads to poor humidity removal





Sizing Methods



“Bigger is Better”



“Meanest Dog on the Block”



“Front Door Rule”

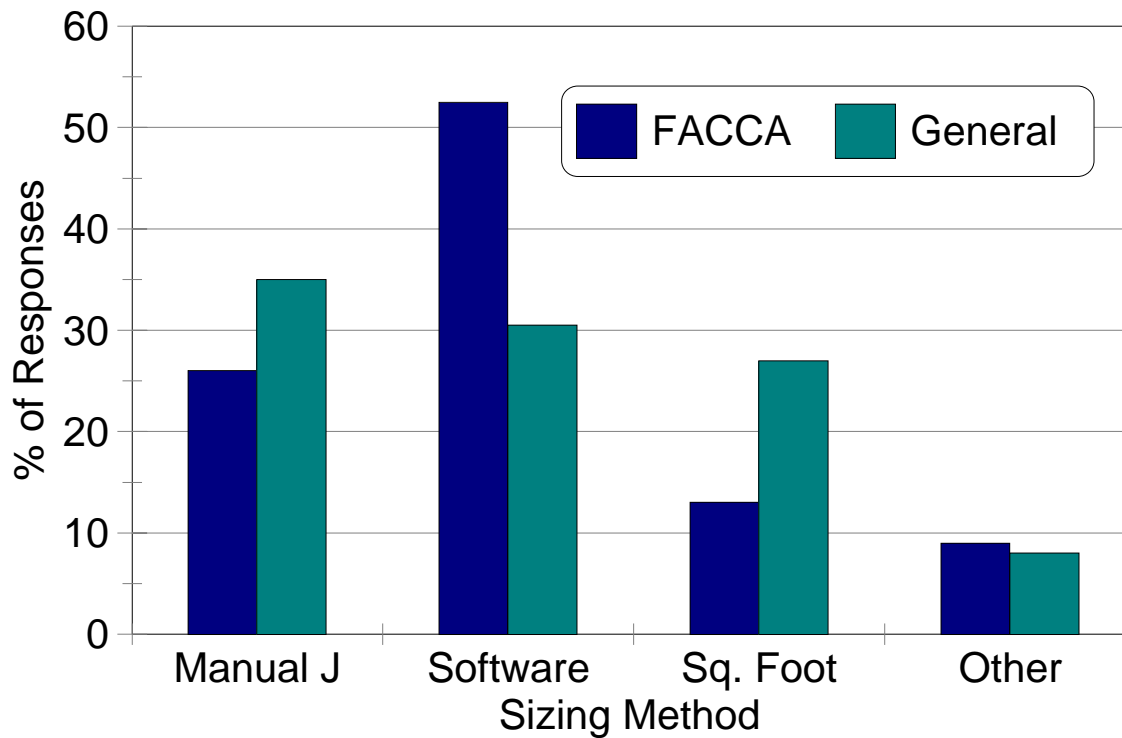
Source: Abrams (1986) AC Sizing Summary





Sizing Methods

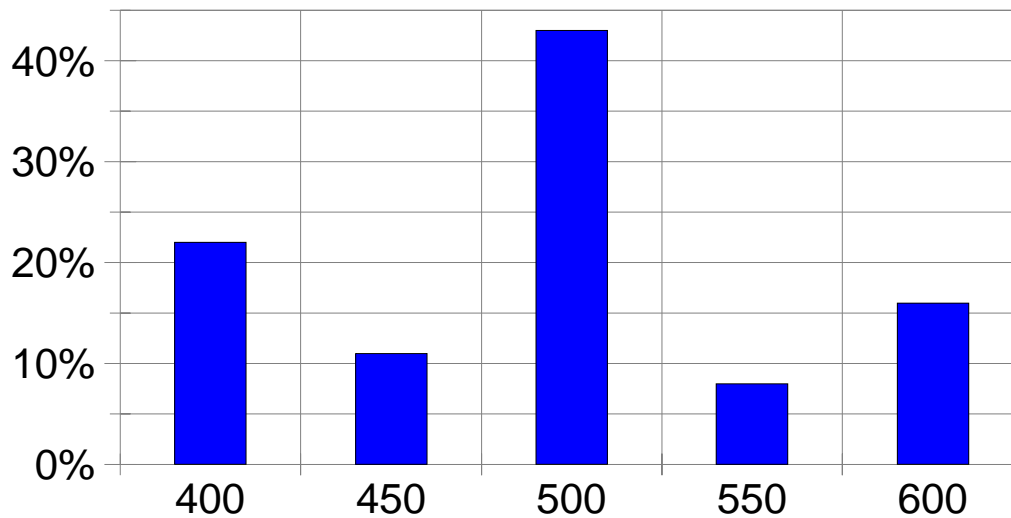
Typical Sizing Method by Survey Group





Sizing Methods

Square Foot Estimates
(of Contractors Who Size by Area)



Weighted Average = 502 sq. ft. / ton

Range was 350 - 700 sq. ft. / ton





FPL / FSEC Audit Study



386 new homes



Complete audit to calculate Florida Energy Code and Manual J.



Compared installed system size vs. calculated Manual J.



Grouped homes by ratio of installed / calculated Manual J cooling capacity:

< 1.0

1.0 – 1.2

> 1.2





FPL / FSEC Audit Study



Approximately 50% were sized 1.2 times Manual J or greater.



Peak day cooling electrical load about 13% greater for sizing >120% Manual J



3.7% and 9.3% increase in cooling energy for systems sized 120% and 150% of Manual J respectively.





Manual J vs. Manual J

Jeff's Manual J Calculation: 33,700 Btuh

A Large AC Company:

Modifying Design Conditions: 38,300 Btuh

No Internal Window Shading: 46,000 Btuh

100 CFM for Bathroom Fans: 52,500 Btuh

Rounding Up: 60,000 Btuh

**Difference is approximately 180%
Manual J, or 2.2 tons capacity**





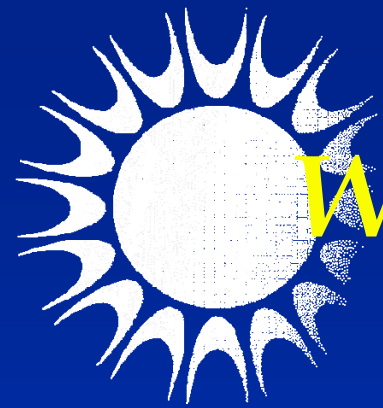
Solar Water Heating



Water heating can be a large portion of the energy bill in low-income households resulting from smaller space and higher occupancy.

Solar Weatherization Program: Detailed Monitoring of 30 sites \$250/year on hot water before solar, \$120 after.





Water Heater Efficiencies

- Electric Tanks EF ~ 0.92
 - Heat Pump Water Heater EF ~ 2.0

- Gas Tanks EF ~ 0.59
 - High efficiency tank EF ~ 0.62
 - Tankless EF ~ 0.82





Lighting



=

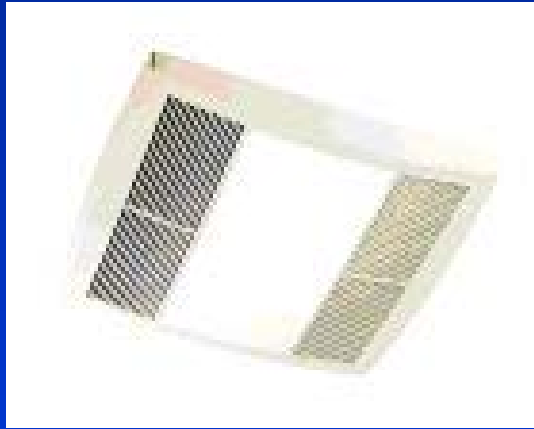


60 Watts
Life = 800 hours
 $\$0.50 \times 12.5 = \6.25
LC Cost = $\$54.25$

14 Watts
Life = 10,000 hours
\$4.00 each
LC Cost = $\$15.20$



Appliances



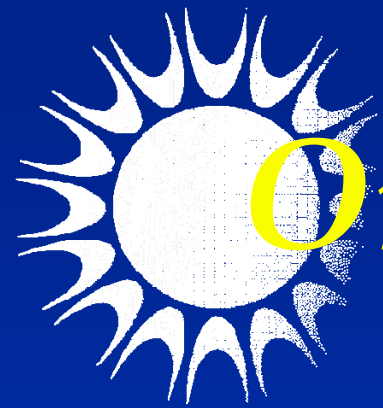


Example - Lakeland Habitat

HERS = 72

- ❑ 912 sqft
- ❑ R-11 wood frame walls
- ❑ 8% window to floor area ratio
- ❑ Sealed and tested duct system
- ❑ R-30 ceiling with Radiant barrier
- ❑ Standard electric hot water
- ❑ SEER 14 Heat Pump
- ❑ 75% fluorescent lighting and Energy Star Refrigerator



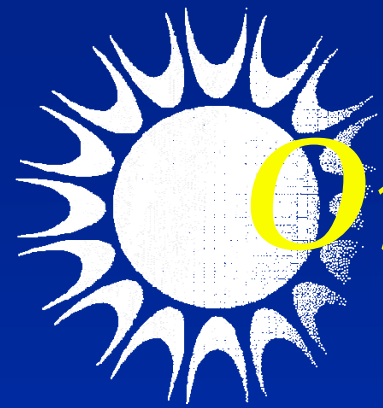


Orlando Example

HERS = 120

- ❑ 1500 sqft
- ❑ Concrete Block walls R-4.2
- ❑ Medium Shingle Roof - R-30 ceiling insulation
- ❑ 18% window to floor area ratio distributed equally
- ❑ Single pane clear glass w/ metal frame - 1ft overhang
- ❑ SEER 13 Heat Pump
- ❑ Ducts in attic / air handler in garage - default leakage
- ❑ Standard electric water heating
- ❑ 10% fluorescent lighting





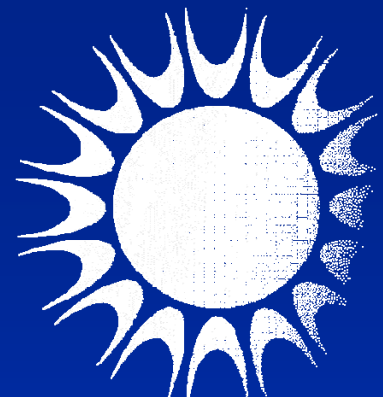
Orlando Example

HERS = 85

- ❑ Tight Ducts
- ❑ Move air handler and return inside
- ❑ Add radiant barrier
- ❑ Tinted window
- ❑ 1.5 ft overhang
- ❑ SEER 14 Heat Pump
- ❑ Ceiling fans, programmable t-stat, EStar refrigerator
- ❑ 90% fluorescent lighting



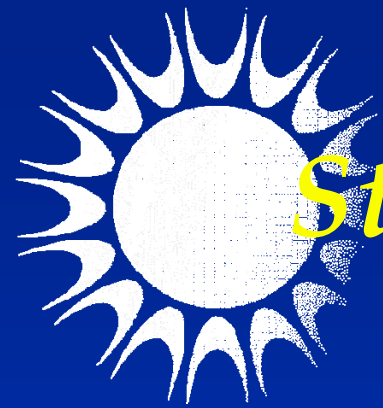
**System Size drops
by 1/2 ton**



Envelope ^{2,3,4}	Completed Thermal Bypass Inspection Checklist
Ductwork ^{5,6}	Leakage \leq 6 cfm to outdoors / 100 sq. ft.
ENERGY STAR Products ^{13,14}	Include at least one ENERGY STAR qualified product category: <ul style="list-style-type: none">▪ Heating or cooling equipment ⁷; <u>OR</u>▪ Windows ⁸; <u>OR</u>▪ Five or more ENERGY STAR qualified light fixtures ^{9,10}, appliances ¹¹, ceiling fans equipped with lighting fixtures, and/or ventilation fans ¹²
ENERGY STAR Scoring Exceptions	<ul style="list-style-type: none">▪ On-site power generation may not be used to decrease the HERS Index to qualify for ENERGY STAR.▪ A maximum of 20% of all screw-in light bulb sockets in the home may use compact fluorescent lamps (CFLs) to decrease the HERS Index for ENERGY STAR compliance. CFLs used for this purpose must be ENERGY STAR qualified.

\$25 per unit Rating Registration Fee

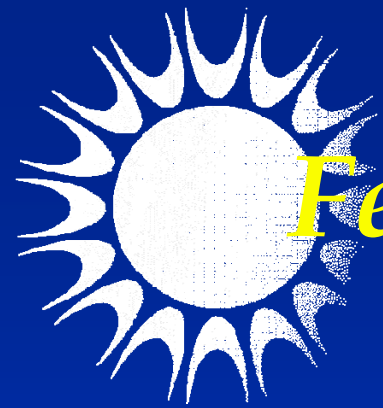




State of Florida Rebates

- ❑ **Solar Water Heating - \$500**
- ❑ **Solar Pool Heating - \$100**
- ❑ **Photovoltaics - \$4 per peak watt (\$20,000)**





Federal Tax Credits

- ❑ **Solar Thermal and PV – 30% (\$2,000)**

- ❑ **Efficient New Homes – \$2,000**

- ❑ **Existing Homes – 10% (\$500)**
 - **improvements (windows, roof, insulation)**
 - **Property (mechanical equipment) (\$300)**





Florida
**Green Building
Coalition, Inc.**



www.FloridaGreenBuilding.org



FLORIDA SOLAR
ENERGY CENTER

Categories

- ❖ Prerequisites – Pools and Waterfront
- ❖ Energy
- ❖ Water
- ❖ Lot Choice
- ❖ Site
- ❖ Health
- ❖ Materials
- ❖ Disaster Mitigation
- ❖ General

Water Efficiency



**FLORIDA
YARDS &
NEIGHBORHOODS**

Florida
WaterSM
Stewardship starts at home.

 **FLORIDA SOLAR
ENERGY CENTER**

Site – Tree/Plant Preservation

Did you know?

- ❖ Trees growing in urban settings live 13 years on the average.
- ❖ Trees in residential neighborhoods average 37 years.
- ❖ Trees in rural, undisturbed sites average 150 years.
- ❖ Some species live longer than others.



Site - Erosion Control / Topsoil Preservation

- ❖ Sedimentation: Settling out of particles transported by water / wind.
- ❖ Most beneficial for severe grades, areas near water, areas that share boundaries with streets/buildings.
- ❖ Soil most susceptible = silt / fine sand



1/3 of stormwater contaminants come from residences

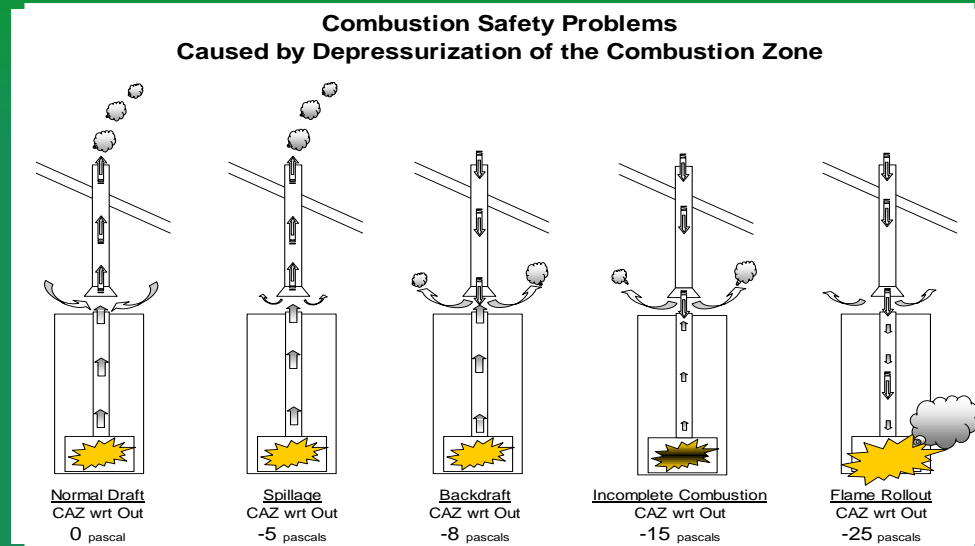
- ❖ erosion and sediment
- ❖ fertilizers
- ❖ pesticides
- ❖ herbicides
- ❖ fungicides
- ❖ sewers
- ❖ animal waste



Site Preparation



Indoor Environmental Quality



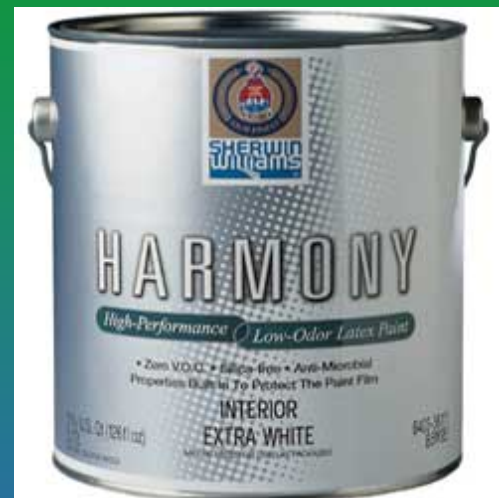
Health – Moisture Control

Internal sources

- ❖ People
- ❖ Cooking
- ❖ Showering
- ❖ Combustion



Indoor Environmental Quality



Health – Ventilation/Filtration

WHY?

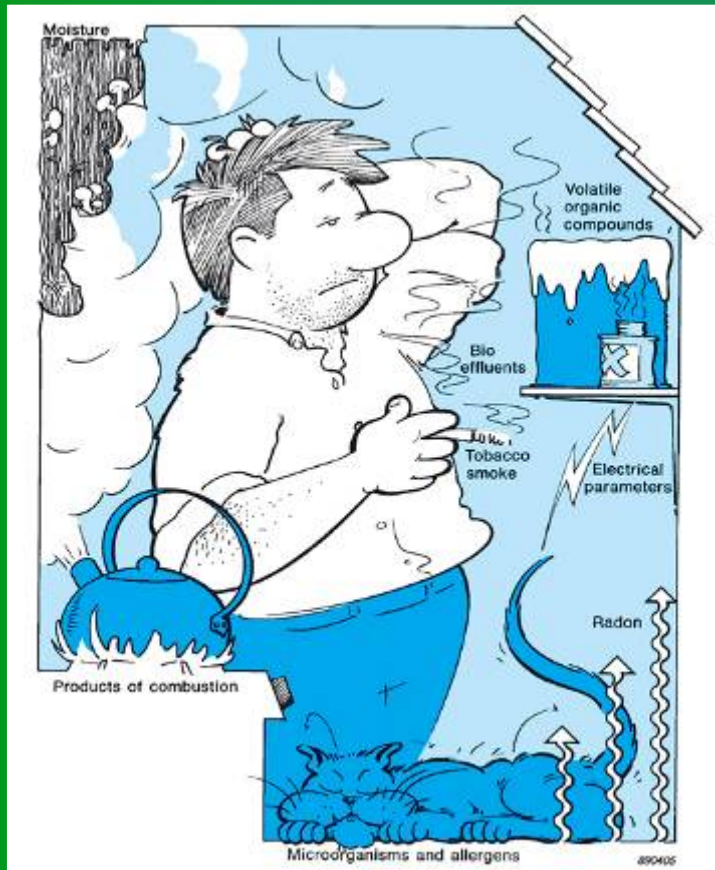


Illustration © Innova

New building techniques have been developed in an effort to reduce energy consumption. Tighter buildings have resulted in poor indoor air quality caused by:

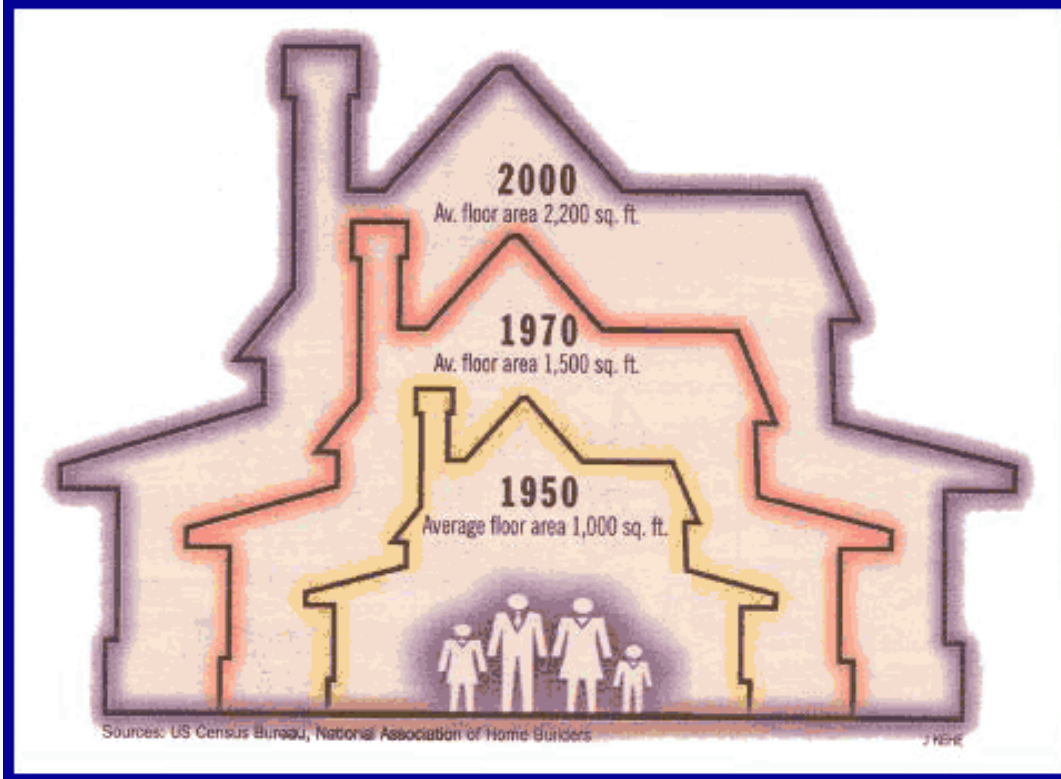
- Tobacco smoke
- Fumes
- Dust
- VOC from glues, paints & materials
- Combustion products
- Moisture from cooking & washing
- Bioeffluents from people
- Micro-organisms, allergens
- Fibres
- Radon



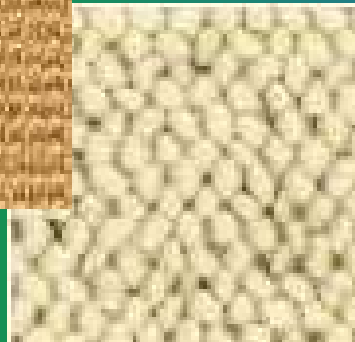
Materials and Resources

Small Home

1950 3.37 people per household - 297 s.f. per person
1970 3.14 people per household - 478 s.f. per person
2000 2.62 people per household - 840 s.f. per person



Materials and Resources



Waste Management?



Delivery or Disposal?



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Durability

Maintenance

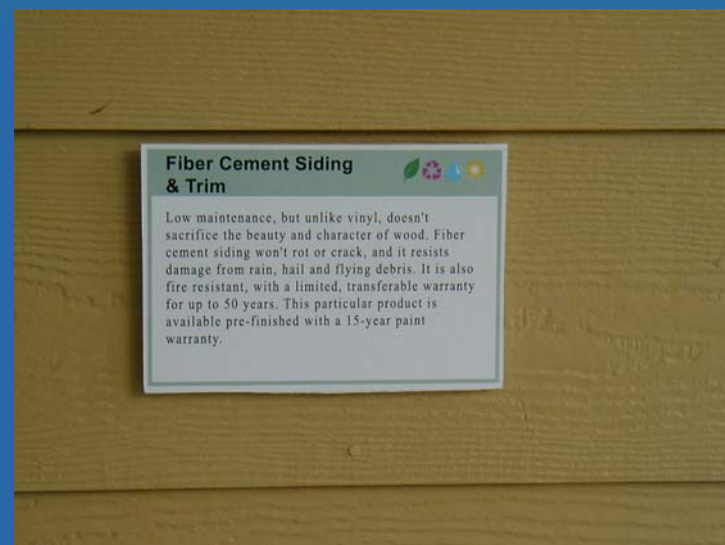
Moisture

Hurricanes

Flood

Wild Fires

Termites



Fiber Cement Siding & Trim

Low maintenance, but unlike vinyl, doesn't sacrifice the beauty and character of wood. Fiber cement siding won't rot or crack, and it resists damage from rain, hail and flying debris. It is also fire resistant, with a limited, transferable warranty for up to 50 years. This particular product is available pre-finished with a 15-year paint warranty.



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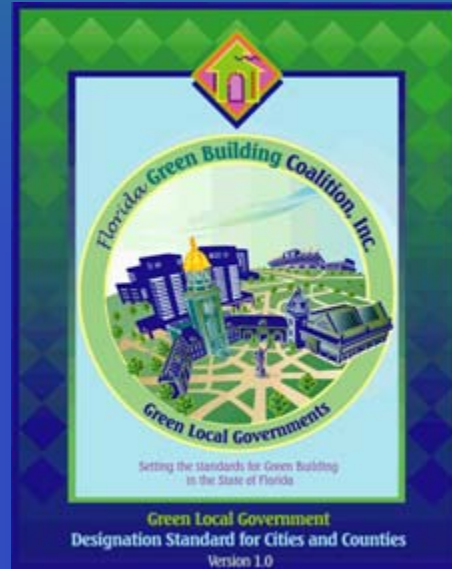
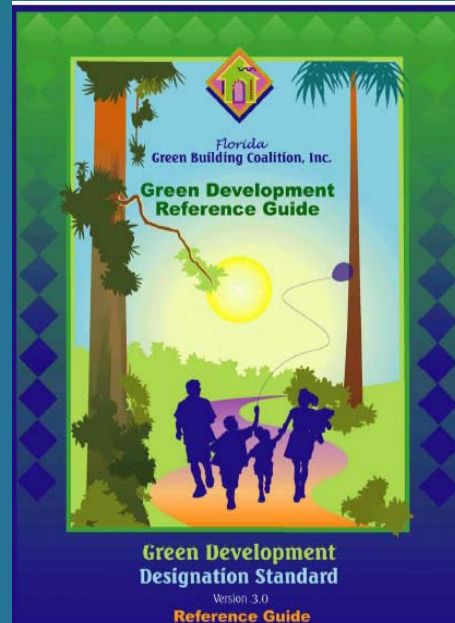
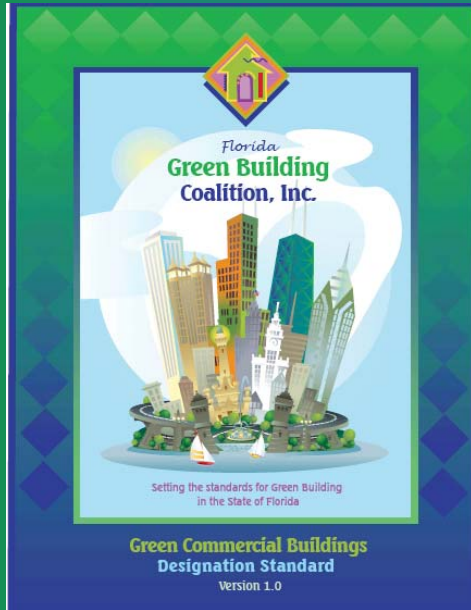
FGBC: More than just a rating organization

“To provide a statewide green building program with environmental and economic benefits.”

- ❖ Encourage green building in Florida
- ❖ Voluntary standards
- ❖ Guidelines and tools
- ❖ Education and promotion



FGBC Standards and Stewardship



FGBC Standards and Stewardship



Organizational Chart

Membership



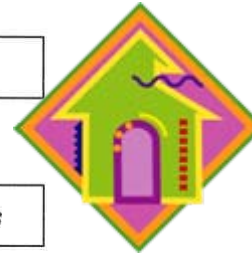
Board of Directors and Officers



Executive Committee



Executive Director



fgbc

Standing Committees

Education & Membership



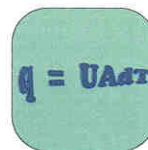
Nominating



Standards



Research & Technical



Program & Promotion



Initial Working Committees

Homes



Commercial Buildings



Developments



Municipalities & Neighborhoods



FLORIDA SOLAR
ENERGY CENTER

Annual Membership Fees



fgbc

Full-time Student	\$25
Individual	\$50
Non-profit org.	\$100
Government Agency	\$100
Small Business (1-15 employees)	\$100
Medium Business (16-49 employees)	\$250
Large Business (50 or more)	\$475

Floridagreenbuilding.org



FLORIDA SOLAR
ENERGY CENTER

Member Affiliations

Builders

Architects

Landscape Architects

Realtors

Home Builder Associations

Product Suppliers

Utilities

Energy & Green Building Consultants

City and County Governments

State and Local Regulatory Agencies

Researchers

Public Interest

Universities

County Extension

Students



Benefits of Membership

- ❖ Promotion and advertising
- ❖ Direct referrals
- ❖ Run for office
- ❖ Vote on issues
- ❖ Discounts on events and services



The Florida Green Home Designation Standard



Statistics

- ❖ Date of first release: July 2001
- ❖ Number of updates: 4
- ❖ Number of participating builders: >85
- ❖ Number of homes certified: >1200
- ❖ Number of Certifying Agents: 175

Green Home Standard: What is it?

- ❖ Compilation of Florida friendly construction criteria.
- ❖ Divided into categories to emphasize environmental implications.
- ❖ Suggests a goal everyone can achieve cost effectively, with little extra effort.
- ❖ Serves as a tool and a reference.
- ❖ Mechanism to provide incentives for both builder and owner.

Green Home Standard: What is it?

Comprised of 3 Documents

Provisions of the Standard

Program Details
Certifying Agents
Standard Revision

Credit Point Schedule (Checklist) – New Excel Version!

Program “Executive Summary”
Ready Reference & Scoring Worksheet
Heart of the Submitted Application

Reference Guide

Encyclopedia
Detailed Point Requirements / Submittals
Benefits of each measure (environmental, savings, etc.)
Suppliers of Good or Service
Pictures and Examples
Sources for More Information



What types of homes are eligible?

All housing units in the State of Florida, new or existing, classified as “residential” under the Florida Building Code (3 stories or less).



Why a State Wide Standard?

- ❖ Presents a unified concept.
- ❖ Presents clear and meaningful principles on which qualification and marketing are based.
- ❖ Trying not to dissociate the marketplace or the industry.

Method of Qualification

New Homes

- ❖ Satisfy prerequisites for pools and waterfront
- ❖ Achieve points for each criteria. Submittals may be required.
- ❖ Meet category minimums (sum=80).
- ❖ Accumulate at least 20 additional points from anywhere on the list (total=100).
- ❖ Cannot exceed category maximums.
- ❖ System incorporates flexibility.



Flexible Features

- ❖ Accumulate at least 20 additional points from anywhere on the list.
- ❖ If at any time a minimum cannot be achieved, total point requirement increases.
- ❖ Innovation Points.

Method of Qualification

Existing Homes

- ❖ Same as for new homes except:

Points are available in the General Category for
“Remodeling of an existing structure.”

Program Fee

- ❖ Builder or homeowner must pay FGBC a processing fee per home.
- ❖ Members of FGBC and FHBA - \$50 per home
- ❖ Members of FGBC or FHBA - \$75 per home
- ❖ Non-members - \$100 per home

Certification Process



Who's Who in the Process: FGBC Certifying Agent

- ❖ Agent responsible for in field verification and documentation.
- ❖ Agent provides general program oversight and acts as applicant's primary point of contact regarding program.
- ❖ Agent must be knowledgeable about the elements of the standard including qualification, certification, and benefits.

FGBC, Inc. acts as green building expert

FGBC Certifying Agent Accreditation Process

- ❖ Agent must sit for 1 introductory course.
- ❖ Agent takes exam with sections corresponding to categories of standard.
- ❖ To certify points in a particular category, agent must pass that section of exam.
- ❖ Agent must register via form and pay \$50 registration fee annually (\$100 for non-members).

Duties of Certifying Agent

- ❖ Agent acts as ambassador of FGBC.
- ❖ Agent reviews and submits all materials on applicant's behalf.
- ❖ Agent ultimately responsible for accuracy of submissions.
- ❖ Agent should assist applicant with implementation to the best of their ability.

Services of Certifying Agent

- ❖ Agent should assist applicant with implementation to the best of their ability.
 - Explain what program is and how it works.
 - See how current practice measures up.
 - Assess goals of applicant and make recommendations based on those goals.
 - Assist with locating supplier of good or service (including HERS & FY&N).

- ❖ When in doubt, contact FGBC.

Who's Who in the Process: Certified HERS Rater

- ❖ Person who has taken specialized training and is certified by the State to provide a Certified Florida HERS Rating.
- ❖ Confirmed Florida HERS Rating must be included if these points are desired.
- ❖ HERS Rater training is available to any interested individual.



Who's Who in the Process: FY&N Professional

- ❖ Generally an FY&N coordinator for the county or some other county extension employee.
- ❖ Required to certify points for certain Installed Landscape, Installed Irrigation, and Site criteria, when existing plant communities are present.
- ❖ One of the individuals allowed to “audit” the irrigation system.
- ❖ Should be brought on board to give the property the FY&N Designation as well as satisfy FGBC requirements.



FGBC Review Process

- ❖ FGBC reviews application.
- ❖ Any questions are directed to the Certifying Agent.
- ❖ Property may be spot-checked by FGBC.
- ❖ Certificate is awarded.
- ❖ Eventual homeowner must receive information that discloses all features that qualified the home.



Florida
Green Building Coalition, Inc.

Be it known that

Builder Name

diligently attended to energy efficiency, resource conservation, health, and durability during the design, construction, and commissioning of the home located at

Home Address, in City, FL Zip

Which, having been verified by an FGBC agent, is officially
acknowledged as a

Certified Florida Green Home

President, Florida Green Building Coalition Inc.

Date



Certifying Agent, FGBC Inc.

Date

This certification is provided by an individual who has been accredited by the Florida Green Building Coalition, Inc. to perform Green Home Evaluations. Any questions, comments, or complaints regarding the individual performing this service may be directed to the Florida Green Building Coalition, Inc.

Building Green: Green Home Qualification Example

Prerequisites

Prerequisite 1: Swimming Pool / Spa

- Sanitation system that reduces chlorine use
- Pool cover
- Solar pool heating system
- Efficient pool pumping
- No swimming pool/spa

Prerequisite 2: Waterfront Considerations

- Use native aquatic vegetation in shoreline area
- No turf adjacent to water (Low maintenance plants instead)
- Use of terraces, swales, or berms to slow storm water
- Home site does not border natural water body



Category 1: Energy

HERS Index—Energy Rating

Points Achieved	Points Possible	Criteria
22	2-74	Confirmed Florida HERS Rating— 2 points for each HERS Index point below 100

Design, finishes, amenities

1	1	Document proper sizing of HVAC system
1	1	Ductwork joints sealed with mastic
	1	Cross vent and ceiling fans code credits
	1	Min 100ft ² roofed porch min 3 sides open
	1	Passive solar space heat system
	1	Passive solar day-lighting
	1	Deciduous trees on south
	1-4	House shaded on east and west by trees
	1	Washer and dryer outside of <u>cond.</u> space
	1	Floor joist perimeter insulated and sealed
	1	Light colored exterior walls
	1-2	Light colored interior walls, ceilings, carpet/floors
1	1	Max 100W fixtures in bathrooms
	1	South roof area for future solar use

	1	Pre-plumb for solar hot water
	1	Compact hot water distribution
1	1	Insulate all hot water pipes
	1	Energy-efficient clothes dryer
	1	Energy-efficient oven/range
	1	Energy Star Clothes Washer
	1	Buyer given information on Energy Star appliances
	1	Efficient well pumping
	1	Efficient envelope volume
	1	Attached unit, zero lot-line, row house
2	2	Recessed, sealed IC fixtures
	3	Energy Star Advanced Lighting Package
2	2	Outdoor lights are energy efficient

30 Total points for Category 1 (30 min/75 max)



Category 2: Water

Points
Achieved

Points
Possible

Criteria

Fixtures

2-3	Water saving clothes washer (2: WF<8, 3: WF<6)
1	Low-flow shower heads (<2.5 gpm)
1	All showers equipped with 1 showerhead
2	No garbage disposal
2	Dual flush or low flow toilets (<1.25gpf)
1	Toilet with UNAR MaP Rating (350gpf)

Installed Landscape

2	Drought tolerant turf, no turf in densely shaded areas
2	50%, 80%, 100% of plants/trees from <i>Water-wise: Florida Landscapes</i> or local drought tolerant list
2	Plants/trees selected to be compatible w/ local environment/microclimate
3	Turf less than 50% of landscape
2	Evenly shaped turf areas, no turf on berms
2	Plants with similar maintenance requirements grouped together
2	Mulch applied 3-4 inches deep around plants
2	Non Cypress mulch used
2	Soil tested and amended where necessary

Category 2: Water (continued)

10	No permanent installed irrigation system
2	Innovative irrigation technology
5	Meet or exceed <u>WaterStar</u> standards
	<input type="checkbox"/> Head to head coverage for Rotor/spray heads
	<input type="checkbox"/> Minimize overspray on impermeable surfaces
	<input type="checkbox"/> Irrigation heads have matched precipitation rates
	<input type="checkbox"/> Separate zones for turf and landscape beds
	<input type="checkbox"/> Micro-irrigation only in landscape beds
	<input type="checkbox"/> Provide owner & FGBC with plan and instructions
	<input type="checkbox"/> Functioning rain sensor installed in an operable location
	<input type="checkbox"/> Install multi-programmable timer clock
	<input type="checkbox"/> High volume irrigation does not exceed 60% of landscape
1	> 10,000 sqft irrigated to FGBC Standards
2	7,500 – 9,999 sqft irrigated to FGBC Standards
3	5,000 – 7,499 sqft irrigated to FGBC Standards
4	2,500 – 4,999 sqft irrigated to FGBC Standards
5	1 – 2,499 sqft irrigated to FGBC Standards

15 Total points for Category 2 (15 min/40 max)



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Category 3: Lot Choice

1-6	House built within designated FGBC green land development
4	Home within a certified green local government
2	Build on an infill site
2	Site within 1/2 mile of existing infrastructure
2	Site within 1/4 mile of mass transit
2	Site within 1/2 mile public open/green space
2	Site within 1/4 mile of basic community resources
2	Site located in TND or small lot cluster development
2	Brownfield site

0 *Total points for Category 3 (0 min/15 max)*

Certifying Agent Category 3: _____

Table _____



Category 4: Site

Native tree and plant preservation

- 2 2 No invasive exotic species
- 2 2 Maximize tree survivability
- 2 2 Minimize soil compaction
- 1 1 25% of site protected from mechanical soil compaction via barrier
- 2 2 Replant or donate removed vegetation
- 1-9 1-9 Preserve or create wildlife habitat/shelter

Category 4: Site (continued)

On site waste management

- 1 1 Use Offsite salvaged/remanufactured material
- 1 1 Reuse cleared materials for mulch/landscape
- 2 2 Mill Clear trees

Erosion Control / Topsoil Preservation

- 2 2 Develop an erosion control site plan
- 1 1 Stabilize disturbed soil
- 2 2 Stage disturbance
- 1 1 Control sediment runoff during construction
- 1 1 Save and reuse any removed topsoil

Drainage / Retention

- 2 2 Onsite designated retention area
- 2 2 Direct filtered rooftop runoff to infiltration area
- 1 1-4 Maintain pervious surface area

6 *Total points for Category 4 (5 min/30 max)*

Category 5: Health

Combustion

- 3 Detached garage, carport, or no garage
- 2 Attached garage with air barrier between garage and living space (including attic)
- 1 Attached garage—exhaust fan on motion sensor and timer
- 1 Direct vent, sealed combustion fireplace w/ electronic ignition, factory built wood burning fireplace or no fireplace
- 2 No unsealed space or water leaking combustion located inside the conditioned area - or electric.
- 1 Carbon monoxide alarm

Moisture Control

- 1 Drainage tile on and around top of footing
- 1 Drainage board for below grade walls
- 1 Gravel bed beneath slab on grade floors
- 1 Seal slab penetrations
- 1 Capillary break between foundation and framing
- 3 Central dehumidification system
- 1 No vapor barrier on inside of assemblies

Source Control (materials)

- 1 No exposed urea-formaldehyde particleboard
- 1 Low/Zero VOC paints, stains, and finishes
- 1 Low VOC sealants and adhesives
- 1 Minimize carpet use
- 1 Healthy flooring (100%)
- 1 Healthy insulation
- 1 Protect ducts during construction
- 3 Integrated pest management

Cleanability

- _____ 1-2 Central vacuum system
- 1 1 Grout lines < 1/4"
- _____ 1 Useable entry area
- 1 1 Low dust collecting window coverings

Design

- _____ 1 Barrier free entrance
- _____ 1-3 Universally designed living area

Ventilation

- _____ 4 Controlled mechanical ventilation
- _____ 1 Radon/soil gas vent system installed
- _____ 1 Floor drain sealed
- _____ 1 Energy Star bath fans with timer or humidistat
- _____ 1 Kitchen range hood vented to exterior
- _____ 1 Laundry rooms inside conditioned spaces must have window or other make-up air source
- _____ 3 Whole house filtration
- 1 1-2 Air filter > MERV 8 (1) Air filter > MERV 10 (2)
- 1 1 HVAC filter easily accessible
- _____ 1 Install screens on all windows and doors (excluding front door)
- 3 3 No air handler /return ducts in garage or unsealed garage attic
- 1 1 Written plan for exhaust and intake vents
- _____ 1 Manual D duct design

20

Total points for Category 5 (15 min/35 max)

Category 6: Materials

Components

- _____ 1 Recycled content roof material
- 1 1-2 Engineered wood products for roof and/or floor
- _____ 2-3 Certified sustainable lumber
- _____ 1 Engineered/alternative material for outdoor living
- _____ 1 Concrete with fly ash or blast furnace slag
- _____ 1 Recycled content siding or soffit material
- _____ 1 Eco-friendly insulation
- _____ 1 Recycled content drywall
- _____ 1 Recycled content paint
- _____ 1 Recycled content air conditioner condenser pad
- _____ 1 Finger jointed or laminated products
- 1 1 Eco-friendly trim
- _____ 1 Steel interior studs
- _____ 1 Eco-friendly flooring materials
- _____ 1 Eco-friendly ceiling materials
- _____ 1-2 Locally produced materials

Waste Reduction

- _____ 3 Resource efficient wall system w/ integral insul
- 2 2 Develop waste management plan
- 2 2-4 Implement job site waste management
- _____ 1 Compost bin/built in collection of recyclables
- _____ 1 Perimeter based on 2 foot dimensions
- _____ 1 Interior floor plan based on 2 foot dimension
- _____ 1 Stack framing
- _____ 1 2 stud corners with drywall clips
- _____ 1 T-Walls with drywall clips

Durability

<u>1</u>	1	3 in 12 \leq roof slope \leq 6 in 12
	1	Large overhangs (eave and gable)
	1	Air admittance vents
	1	Wood frame house uses vented rain screen
<u>1</u>	1	Siding and exterior trim primed all sides
	1	Window and door flashing
<u>1</u>	1	Plants/turf minimum of 2 ft. from foundation
<u>1</u>	1	Armored/metal hoses from service to all fixtures
	2	Automatic in home water sensor/shut off system installed
	1	Access panel to non-accessible plumbing fixture
<u>1</u>	1	User-friendly (lever) clothes washer water shutoff
	1	Laundry room below living floor or drain installed

11

Total points for Category 6 (10 min/35 max)



Category 7: Disaster Mitigation

Hurricane (wind, rain, storm surge)

- _____ 3 Safe room
- _____ 2 Baffled roof vents or unvented attic
- _____ 2 Window and skylight protection
- _____ 1 Attached garage door protection
- 2 2 Exterior structures properly anchored
- _____ 2 Secondary water protection installed on roof
- _____ 2 Adhesive applied to roof sheathing
- _____ 2 Roof covering above and below flashing
- _____ 5 Comply with Fortified for safer living standards

Flood - *comply with all to receive points*

- Finished floor level at least 12" above 100 yr. flood
- Bottom of slab at least 8" above the top of backfilled dirt, graded for proper drainage
- Grade slopes away from building on all sides
- Garage floor and driveway properly sloped to drain out. Garage floor at least 4" lower than living floor.

_____ 3

Wildfire- *comply with all to receive points*

- Fire resistant exterior wall cladding
- Fire resistant roof covering or sub-roof
- Fire resistant soffit and vent material

_____ 3



Termites- *comply with all to receive points*

- Seal slab penetrations (Cat 4)
- Vegetation > 2 ft. from foundation (Cat 5)
- Slopes graded away from building (Cat6)

AND

- Exterior cladding installed to prohibit intrusion
- Rain gutters installed **or** meet 2' Overhangs"
- Downspouts discharge a minimum of 3' from home
- Irrigation/sprinkler water does not hit building
- Condensate line (s) discharge a minimum of 2' from home and are 5' from dryer vent
- Damage replacement warranty issued and available for annual renewal

10

- Chemical soil treatment avoided
- Alternative Florida Building Code approved method of foundation protection employed
- All wood lumber, sheet products, and exterior finish material are borate or ACQ treated
- Alternatives to wood investigated and used

10

5

Total points for Category 7 (5 min/30 max)



Other

<u>2</u>	1-2	Home builder/designer/architect/landscape architect member of FGBC
<u>2</u>	2	Homeowner's manual given to homeowner
<u>2</u>		Educational material given to homeowner
<u>2</u>		Training provided to homeowner
<u>2</u>		Plan for edible landscape/food garden
<u>2</u>		Guaranteed energy bills
<u>2</u>		Cooling system uses non-hcfc
<u>1-5</u>		INNOVATIVE CREDITS

Category 8: General

Small House Credit

<u>16</u>	0-40	Conditioned house size
-----------	------	------------------------

Adaptability

<u>2</u>		Roof trusses designed for addition
<u>2</u>		Unfinished rooms
<u>1</u>		<u>Prewired for security and sound</u>

Renewable Power Generation

<u>0-5</u>		Reduce peak demand or annual load
------------	--	-----------------------------------

Remodel

<u>10</u>		Remodeling Structure
<u>3</u>		Toilets 1.6 <u>gpf</u> & showers 2.5 <u>gmp</u> or less
<u>2</u>		Upgrade existing installed irrigation with rain gauge, timer, and code irrigation heads

20 *Total points for Category 8 (0 min/40 max)*



FGBC Home Score

Insert your scores below—verify that you have achieved each category minimum—total your score

CATEGORY	YOUR SCORE	REQUIRED MIN—MAX
Category 1: Energy	30	30—75
Category 2: Water	15	15—40
Category 3: Lot Choice	0	0—15
Category 4: Site	6	5—30
Category 5: Health	20	15—35
Category 6: Materials	11	10—35
Category 7: Disaster Mitigation	5	5—30
Category 8: General	20	0—40
TOTAL	107	80—300
Your TOTAL NEEDED (if you missed a category minimum)	100	



Case Study



- ❖ Hartley Brothers Construction – Walnut Creek
- ❖ FGBC Green Home Certified by *Green\$mart*®
- ❖ ENERGY STAR®
- ❖ Environments For Living® - silver level completed
- ❖ FY&N Florida-Friendly Yard Certification
- ❖ Base price \$143,450 home + lot



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ENERGY CENTER

Case Study



- ❖ Fannie Mae EEM through Country Wide provided \$500 off closing cost and qualified buyer for additional \$4950 in purchase power based on energy savings.



R
R

Case Study



Based on standard U.S. Government tests


ENERGYGUIDE

Refrigerator-Freezer
With Automatic Defrost
With Top-Mounted Freezer
Without Through-the-Door Ice Service

Model: GTH16DBR, GTH16DOR,
GTH16DBS, GTH16DOS, GTH16JBR,
GTH16JLS

Capacity: 13.0 Cubic Feet

Compare the Energy Use of this Refrigerator with Others Before You Buy.

This Model Uses	
410 kWh/year	 ENERGY STAR A symbol of energy efficiency
Energy use (kWh/year) range of all similar models	
Uses Least Energy 414	Uses Most Energy 489

THE ESTIMATED ANNUAL ENERGY CONSUMPTION OF THIS MODEL WAS NOT AVAILABLE AT THE TIME THE RANGE WAS PUBLISHED

kWh/year (kilowatt-hours per year) is a measure of energy (electricity) use. Your utility company uses it to compute your bill. Only models with 16.5 to 18.4 cubic feet and the above features are used in this scale.

Refrigerators using more energy cost more to operate. This model's estimated yearly operating cost is:

\$34

Based on a 2001 U.S. Government national average cost of 8.29¢ per kWh for electricity. Your actual operating cost will vary depending on your local utility rates and your use of the product.

Important: Purchase of this label before purchase indicates the Federal Trade Commission's Approval. Listing No. 1370425SP05A

\$2,840 Green Home Option:

- ❖ 16.5 SEER Air Conditioner
- ❖ Dual-paned windows,
- ❖ >75% fluorescent lighting,
- ❖ Energy Star refrigerator & dishwasher
- ❖ FY&N certified Florida yard.



FLORIDA SOLAR
ENERGY CENTER

Case Study



\$2,000 Healthy Home package including:

- ❖ Whole House Vacuum Option
- ❖ CO₂/Smoke alarm combos
- ❖ Mechanical ventilation
- ❖ Cellulose insulation
- ❖ Efficient filtration
- ❖ Low-VOC paints and finishes



FLORIDA SOLAR
ENERGY CENTER

Case Study

\$500 closing cost discount helped pay for additional options such as whirlpool spa upgrade and deep stainless steel sink.



Other features of this *FGBC Certified Green Home* featuring ENERGY STAR® include:

- ❖ Ducts Sealed with Mastic, Gold Sealing Package
- ❖ Honeywell 7-day 2-program Programmable Thermostat
- ❖ Low maintenance fiber-cement siding & aluminum soffit & fascia





transforming
the built
environment

LEED[®]
for **HOMES**



USGBC

- 10 members in 1995 – FSEC was one of them
- Now > 11,000 members
- 13,000 people attended annual conference in 2006
- 70 chapters and affiliates nationwide
- Florida has seven
- Mainly commercial and institutional buildings to date
- New standards for homes and neighborhoods



Rinker School of
Building Construction
UF, LEED Gold



USGBC LEED Rating System

- > 9000 registered and certified buildings
- 12 federal agencies specifying LEED
- 24 states committed to LEED
- 90 cities building to LEED standards
- 40,000 LEED Certified Professionals
- Projects are Certified at Platinum, Gold, Silver or Certified Level



EPA New England
Regional Laboratory

LEED RATING SYSTEMS

LEED-NC new construction

LEED-EB existing buildings

LEED-CI commercial interiors

LEED-CS core & shell

LEED for HOMES

LEED-ND neighborhood development

Commercial Buildings

Low-Rise Housing

Mixed-Use Developments

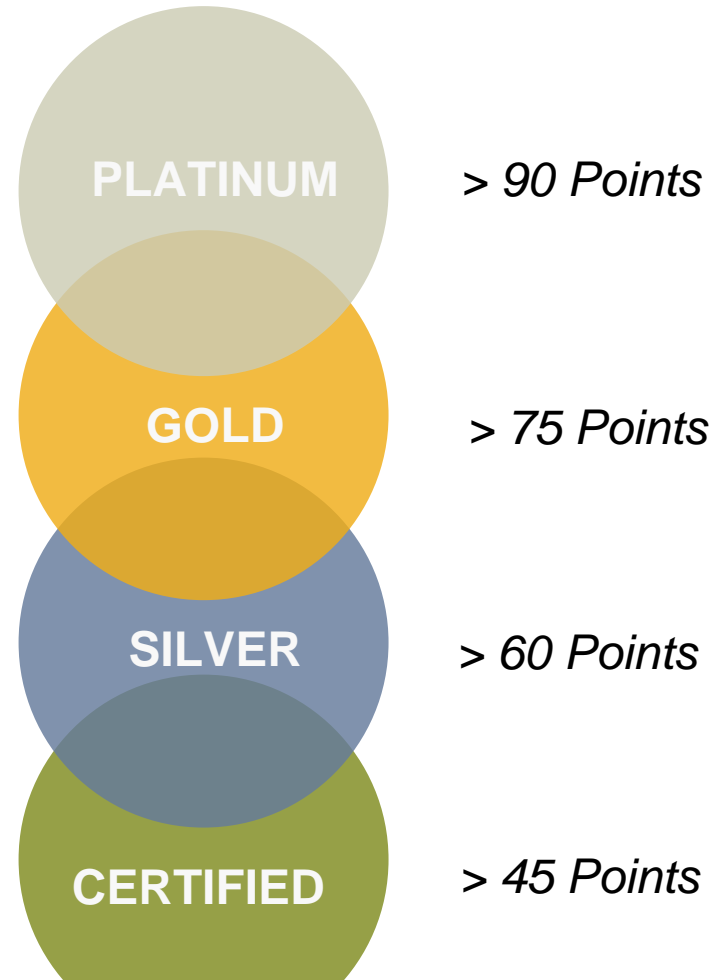
- Retail
- Multi-building Campuses
- Multi-family Residential

application guides



Consensus-Based Standards

USGBC has four levels of LEED:



LEED for Homes Alliances

National Programs

Local and Regional Programs



ENVIRONMENTS FOR Living



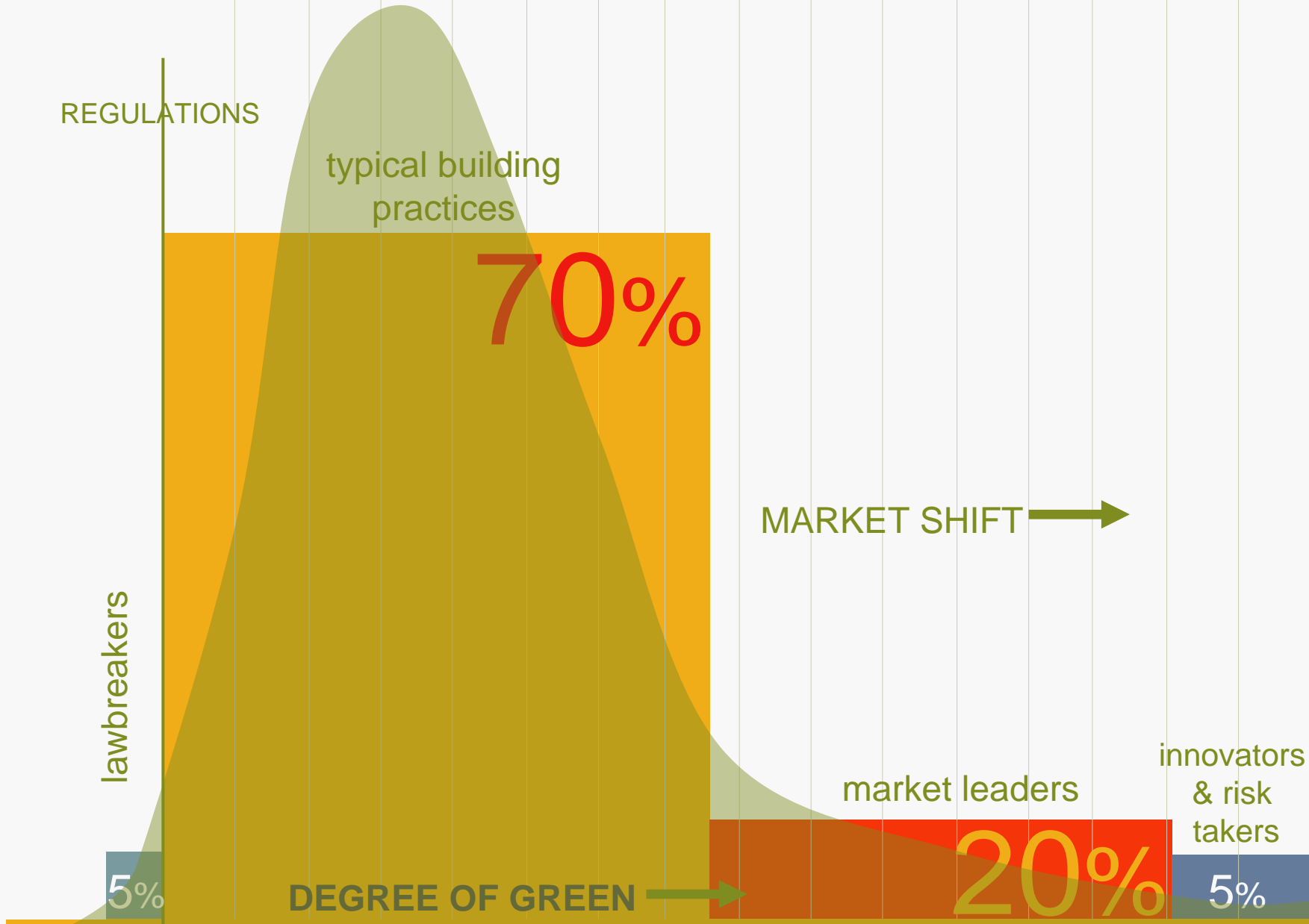
Green Home Building Programs

Alaska Craftsman Home Program, Inc. (ACHP)
APS Performance Built Homes™
Aspen Efficient Building Program
Build It Green / Green Building Program
Build Green Washington
Build It Green/GreenPoint Rated (2002)(2006)
Build San Antonio Green
Building America Program
Building Science Corporation
Built Green Colorado
Built Green NW
Built Green Santa Barbara
California ENERGY STAR® New Homes Program
California Green Building Program (CBG) (2001)
Chicago Center for Green Technology
Chula Vista GreenStar Building Efficiency Program (2000)
Consumer Products Program(VOC's)
Earth Advantage™ (1999-2005)
Earth Craft House™ (2003)
EcoBuild Program (2003)
Emerging Renewables Program Rebates
Engineered For Life™ (1998)
Environmentally Sustainable Affordable Design (ESAD) program
Environments for Living® (2001)/Diamond Class (2005)
E-Star Colorado
Florida Green Building Coalition, Inc.
Fore-Solutions
Forest City Development
Frisco Green Building Program (2001)
G/Rated (2001)
GHBA Green Building Program
Greater Cleveland Green Building Coalition (1999)/7-Chapters
Green Builder Program (1997) /Building America Partner Program (2001)
Green Building Alliance
Green Building Corps
Green Building Council
Green Building in Alameda County (2000)
Green Building Initiative of St. Louis

Green Built Program (2001)
Green Communities Initiative
Green Energy Ohio
Green Guide (2001)
Green Home Choice (2003)
Green Home Destination (2001)
Green Home Remodel (2004)
Green Homes NorthEast (GHNE)
Green Permit Program-Residential
Green Points Program (1997)
Green Points Remodeling Program (2001)
Green Roofs Program
GreenHOME(1999)
Greening Affordable Housing Initiative
Hawaii BuiltGreen (2001)
Health House® (1993) - St. Paul MN
Healthy Built Homes (2005)
Home Remodeling Green Building Guidelines(2001)
Innovative Building Review Program (1995)
Keystone Green Building Initiative
Laclede Gas/Inspections & Testing
Maryland Environmental Design Program (1998)
NAHB Model Green Home Building Program
NC HealthyBuilt Homes Program (2004)
New Jersey Affordable Green Program (1998)
Northeast Ohio Green Building Initiative
NWEBG-Northwest EcoBuilding Guild (1993)
Park City Green Building Initiative
Remodelers Advantage (2005)
Sonoran LEED for Homes/City of Scottsdale Green Building Program
Southern Nevada Green Building Partnership
Sustainable Building Program (2000)
Sustainable Development Initiative
Tacoma-Pierce County Built Green™ (2003)
TEP Guarantee Home Program (1997)
The Built Green™ Program (2000)
Unity Homes/Gulfport, Miss
Vermont Builds Greener Program (2003)
Wisconsin Green Building Alliance (WGBA)



Varying Performance Levels



Applicable Building Types

Single Family



Market Rate
& Affordable

Multi-Family



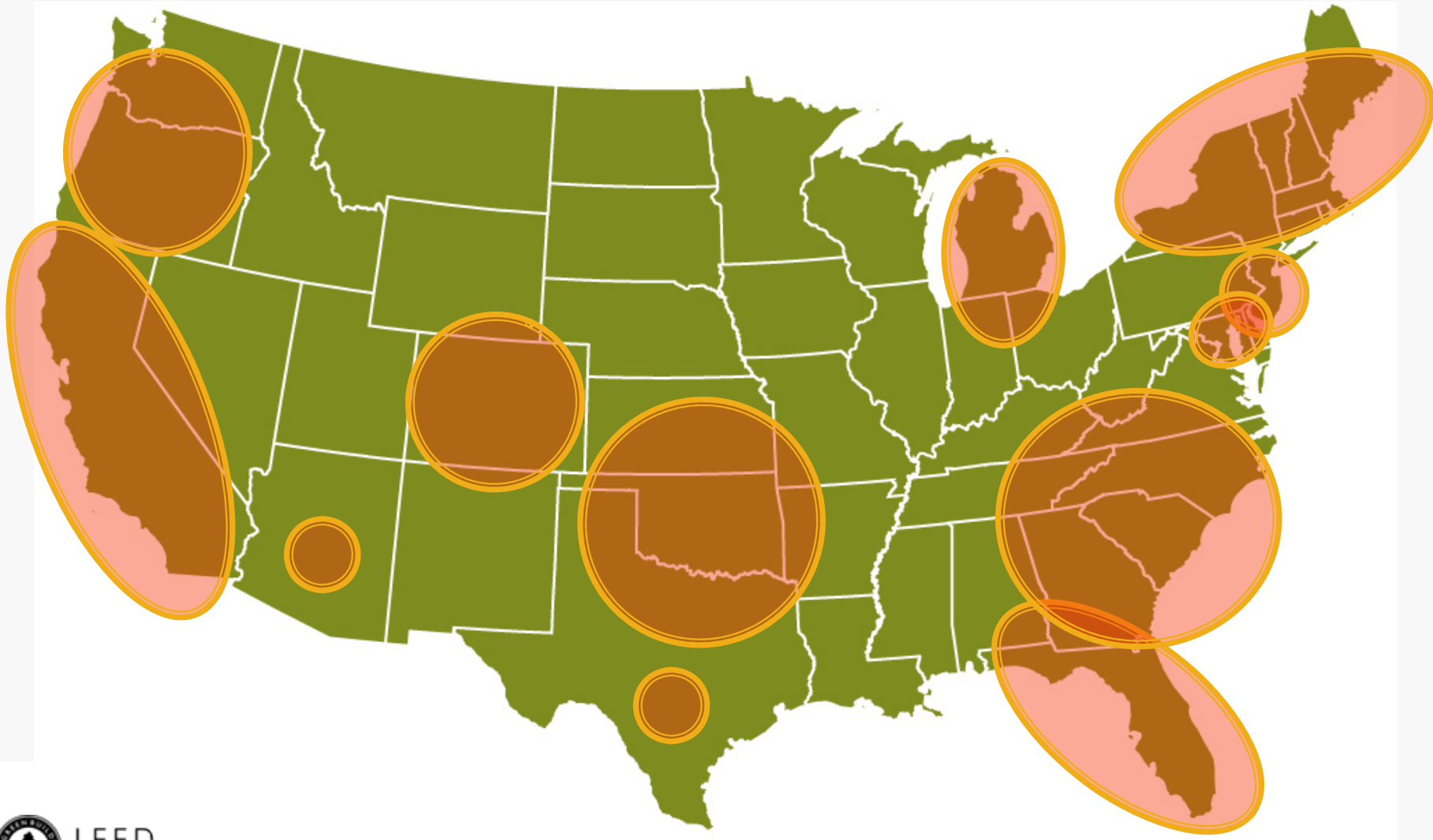
Up to 3 Stories

Gut Rehab



Strip to Studs
on One Side

Pilot Markets



Pilot Status as of September 24, 2007

☐ Number of Registered Builders: 487

☐ Number of Registered Buildings: 2916

☐ Number of Registered Units: 8204

☐ Number of Registered Affordable Housing Projects: 91

☐ Number of Registered Affordable Housing Units: 1368

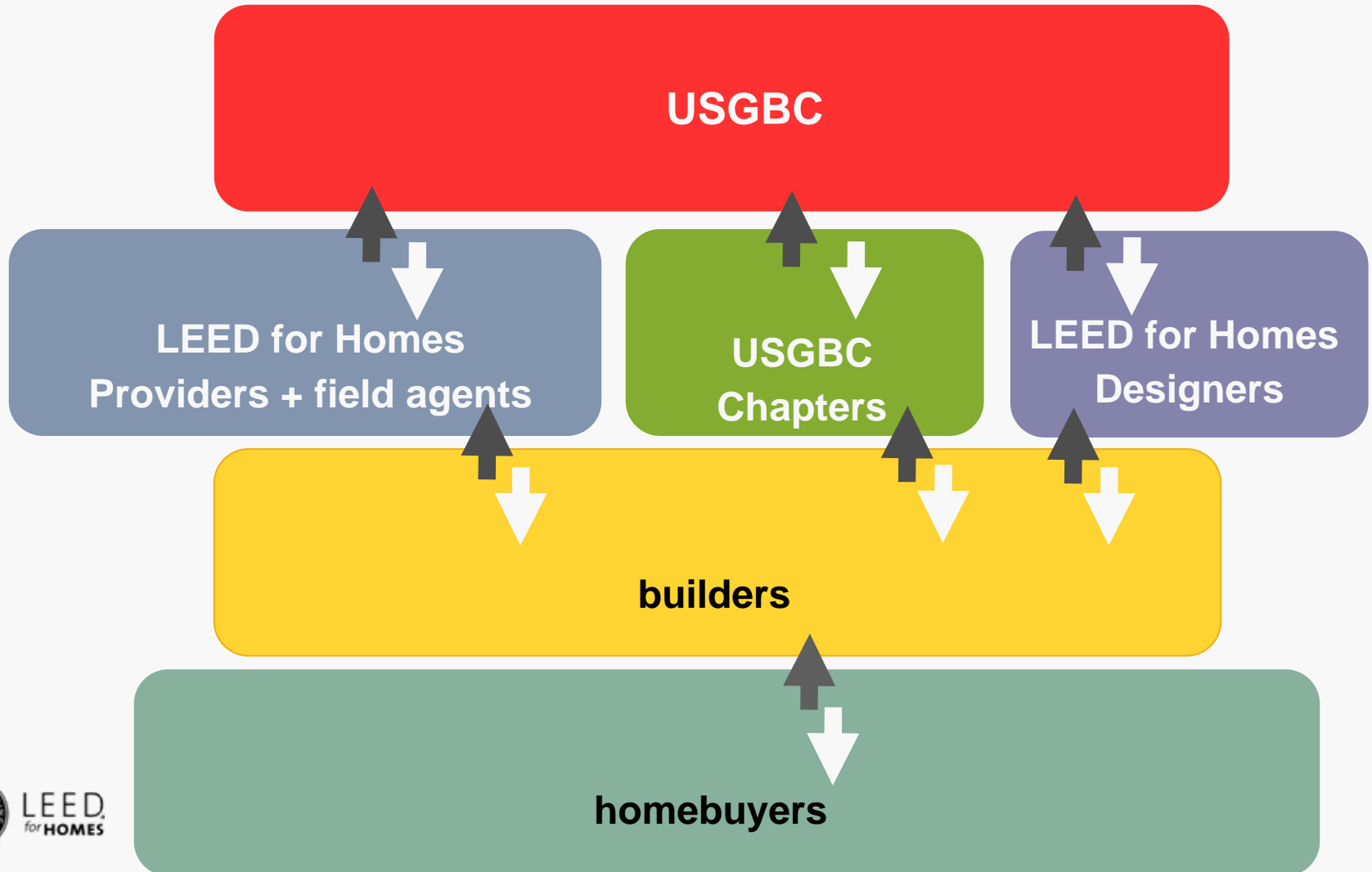
☐ Number of Certified Projects: 127

☐ Number of Certified Units: 272



Roles of Key Stakeholders

(Decentralized and Localized)



Mandatory Measures

ENERGY STAR Labeled Home

- ❑ Use an energy rater
- ❑ Seek HERS Index of 85 or less
- ❑ Involves efficient envelope, equipment and appliances

Health and Safety Measures
Combustion Venting
Controlled Ventilation

Durability Plan

Identify Issues
Develop strategies
Document



LEED.
for **HOMES**

Mandatory Measures

Moisture Control

Non-paper faced board adjacent to tubs, showers

Water-resistant flooring in kitchens, baths and within 3-feet of doors

Water heater tanks must have drain if over or in living space

Same for washing machine



LEED.
for **HOMES**

Mandatory Measures

Quality Management Program
Assure implementation
of durability plan

Erosion Control Measures
Silt fencing
Protect soil

No Invasive Plants

Homeowner Guide



Mandatory Measures

Framing Waste Factor $\leq 10\%$

Tropical Woods Must be FSC certified

Document waste diversion

MERV filters ≥ 8
ACCA Manual D
No Air Handler or Return in Garage
Radon Resistant if in EPA Zone 1



Bedrooms and House Size

-10, Neutral and +10 adjustment levels

1 bedroom	2 bedrooms	3 bedrooms	4 bedrooms	5 bedrooms
510 ft ²	840 ft ²	1140 ft ²	1410 ft ²	1530 ft ²
870 ft ²	1430 ft ²	1950 ft ²	2400 ft ²	2600 ft ²
1480 ft ²	2440 ft ²	3320 ft ²	4090 ft ²	4430 ft ²



- Larger homes receive larger penalties – no cap
- Mixed unit multifamily use an averaging procedure

Verification Process

Step 1: Initial Review and Project Planning

Preliminary Rating - required

- Explain LEED for Homes program and rating system
- Identify credits (CIR & ID) and develop verification plan
- Identify and facilitate technical assistance needs
- Calculate preliminary LEED for Home score / rating

Optional services

- Detailed plan review of a builder's home design to identify / prioritize additional measures
- Detailed tech assist (performance testing of a typical example LEED home, design assistance)
- Conduct or attend project charrette



LEED
for **HOMES**

Verification Process (cont'd)

Step 2: Intermediate Inspections

Pre-Drywall Inspection - **required**

- Inspect LL and some SS
- Check on waste management plan
- Inspect other applicable credits

Optional services

- Completion of Energy Star Thermal Bypass Checklist by energy rater
- Midpoint duct (smoke) test by energy rater
- Additional inspections related to durability plan verification



LEED
for **HOMES**

Verification Process (cont'd)

Step 3: Final Rating

Final Inspection - **required**

- Inspect remaining credits

Completion of project documentation file – **required**

- Checklist, performance test reports, accountability forms, photos and other documentation

Final LEED for Homes score and rating – **required**

Optional Services

- Final confirmation of Energy Rating / Energy Star qualification
- Optional performance testing –exhaust/intake, supply air flows



LEED
for HOMES

Remaining durability plan verification

Verification Process (cont'd)

Step 4: Certification

(by LEED for Homes Provider)

- Review of project documentation file that was prepared by the field agent
- Completion of LEED for Homes rating
- Presentation of LEED for Homes certificate to builder / homeowner.
- Send notification of rating to USGBC



Certification and Verification Fees

LEED for Homes

\$150 builder registration fee
LEED Verification (\$250-\$800/unit)
Energy Rating Required
\$50 per unit certification fee

LEED Affordable fee discount

Single family - \$500
2-21 unit - \$1000
> 21 units - \$3000

FGBC Home Standard

No builder registration.
FGBC Verification (similar)
Energy Rating Optional
\$50 - \$100 per unit certification fee

Energy Rating Discount for Green Projects - 321-638-1437

Utility Companies

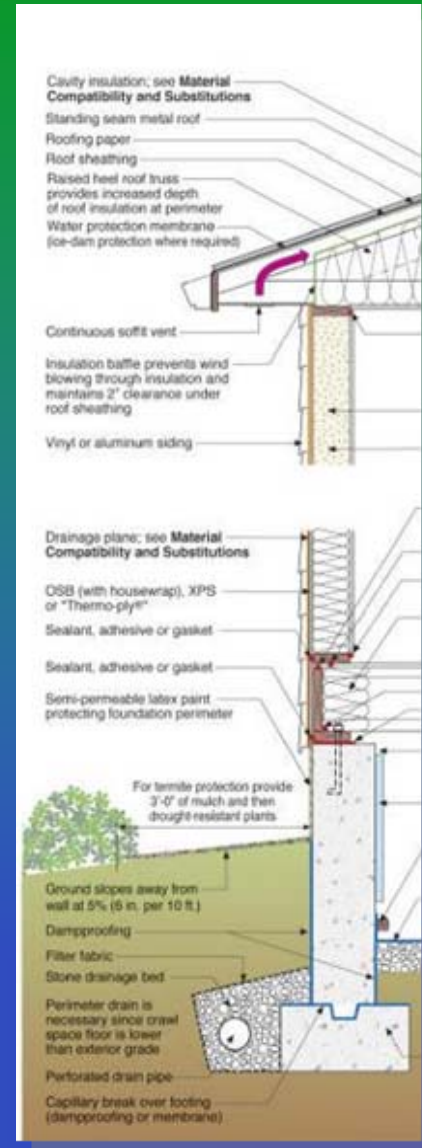
Integrated Design Approach

Keeping Green Affordable Housing Affordable – common concerns

- First Costs
- Architectural and Engineering Costs
- Finding Green Building Materials
- Choosing Green Building Materials

Integrated Design

- ❖ Integrated building design is a process of design in which multiple disciplines and seemingly unrelated aspects of design are integrated in a manner that permits synergistic benefits to be realized.
- ❖ The goal is to achieve higher performance at a lower cost.
- ❖ Process involves integrating green design strategies into conventional design criteria for building form, function, performance, and cost.



Integrated Design

“You can actually make a system less efficient, simply by not properly linking up those components. If they’re not designed to work together, they’ll tend to work against one another.”

-Hunter and Amory Lovins and Paul Hawken, *Natural Capitalism*



All the right pieces, just misplaced



FLORIDA SOLAR
ENERGY CENTER

Integrated Design

When just 1% of a project's up-front costs are spent, up to 70% of its life-cycle costs may already be committed.

-Joe Romm, energy expert and author of *The Hype About Hydrogen*



Aachua County Housing Authority Green House



Integrated Design Process

- ❖ Holistic and Total-Systems Approach
- ❖ Goal to Establish a Written Commitment
- ❖ Involves the “Complete” Design Team
- ❖ A Process of Incorporating Green-Building Goals in the Design Program:
 - What will be Addressed?
 - What Materials are Available?
 - What New or Special Techniques Need to be Learned or Adapted?
 - Who is responsible for what?
- ❖ Use of a Charrette Process



The Design Team

- Developer
- Architect
- Engineer (and energy analysis)
- Landscape Architect
- Green Building Specialist (could be Architect)
- Contractor
- Asset and Property Management Staff
- Resident Representative



Using the Charrette Process

- ❖ A Creative, Intensive Workshop to Address the Environment, Social and Financial Issues of the Building
- ❖ Multiple Disciplines Working Together Find Creative Options That Individuals Working Alone May Overlook
- ❖ Early Planning Always Leads to a Better Result
- ❖ Opportunities and Problems Identified Early
- ❖ Good Facilitation a Must.

The Results – Affordable Green Building

- ❖ A Written Plan to Implement and Monitor
- ❖ Cost Savings Identified
- ❖ Details – Materials and Installation identified
- ❖ A Much Greener Building at an Affordable Cost
- ❖ A Project to Be Especially Proud Of



=



60 Watts
Life = 800 hours
 $\$0.50 \times 12.5 = \6.25
LC Cost = $\$54.25$

14 Watts
Life = 10,000 hours
 $\$4.00$ each
LC Cost = $\$15.20$



Available Conferences



July 11-14, 2007
Orlando, FL



Nov 7-9, 2007
Chicago, IL



May 11-13, 2008
New Orleans, LA

For more detailed green training

Building Science Training and Certification Center



http://www.fsec.ucf.edu/en/education/cont_ed/bldgs.htm

University of Florida



<http://energy.ufl.edu> – Florida Energy Extension Service

<http://treeo.ufl.edu> – UF TREEO Center



Thank You

The Thin Blue Line

“Many astronauts have reported seeing that delicate, thin blue aura at the horizon of the daylit hemisphere – that represents the thickness of the entire atmosphere – and immediately, unbidden, contemplating its fragility and vulnerability. They worry about it. They have reason to worry.”

*Carl Sagan,
Billions & Billions, 1997.*



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