

Green Home Building

“There is no such thing as the perfect green home. Every house is unique.”

Excerpted from [Green from the Ground Up](#)
By David Johnston, Scott Gibson



Finish Werks – An Introduction

Custom Green Home Builder

- > Modular/Prefab Homes
- > Modular Additions
- > Consulting
- > **ADVOCACY**



“Work and live to serve others, to leave the world a little better than you found it and garner for yourself as much peace of mind as you can. This is happiness

-- David Sarnoff

What Is Green Building?

- “A sustainable building, or green building is an outcome of a design philosophy which focuses on increasing the **efficiency of resource use** — energy, water, and materials — while **reducing building impacts on human health and the environment** during the **building's lifecycle**, through better siting, design, construction, operation, maintenance, and removal.”

- Frej, Anne B., editor. *Green Office Buildings: A Practical Guide to Development*. Washington, D.C.: ULI--The Urban Land Institute, 2005. Pp 4–8.

Background on Green Building

Human Race = Green From The Get-go

- For developed nations, up until the mid 18th century when the industrial revolution began
- Developing and 3rd World countries still living somewhat “green”

- Green Home Features →
(Note... it's not a McMansion)
 1. Roof gable vent
 2. Passive solar shading
 3. Sustainable materials
 4. Vehicle gets really good “fuel” economy...



Background on Green Building

Technology As Foe

- Replace sustainable building with carbon intensive technology and cheap energy.
- E.g.: 1900's Mr. Carrier invents the air conditioner eliminating any need to open our windows at night for cool, fresh air. Which is healthier and still free.



Energy On The Human Race

- Negative economic impact of unregulated speculation : \$4.11/gal for gasoline (July 2008)
- Geopolitical struggle for control of world energy sources
- Global Warming



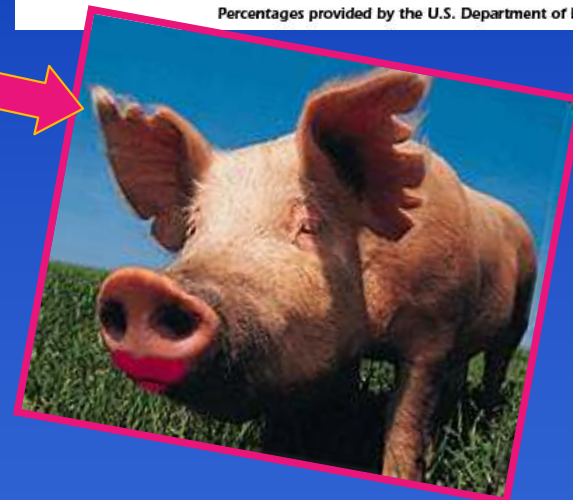
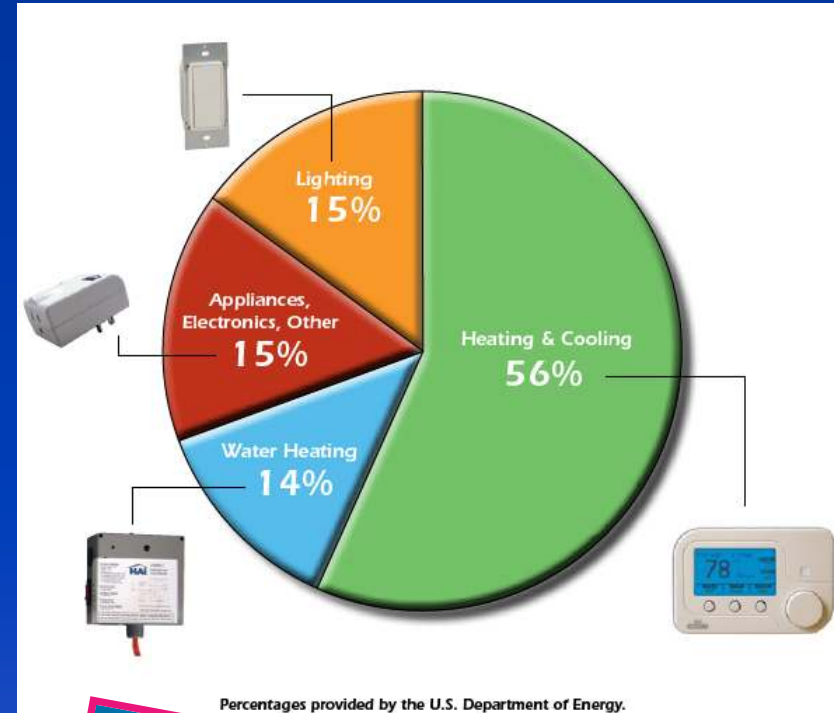
Background on Green Building

HOME ENERGY CONSUMPTION

- As of 2006, buildings used 40 percent of the total energy consumed in the US.
- 54% of that percentage was consumed by residential buildings

SOLUTION

- Reduction of Energy Use is the cornerstone of green building
- Understanding energy efficiency VS renewable energy generation
- Develop awareness of cradle to cradle cost = Production (embodied energy) + Operation/Maintenance cost (lifecycle) + Disposal (recycled or trashed)



AUDIENCE PARTICIPATION...

What's Right with this picture?

What's Wrong?

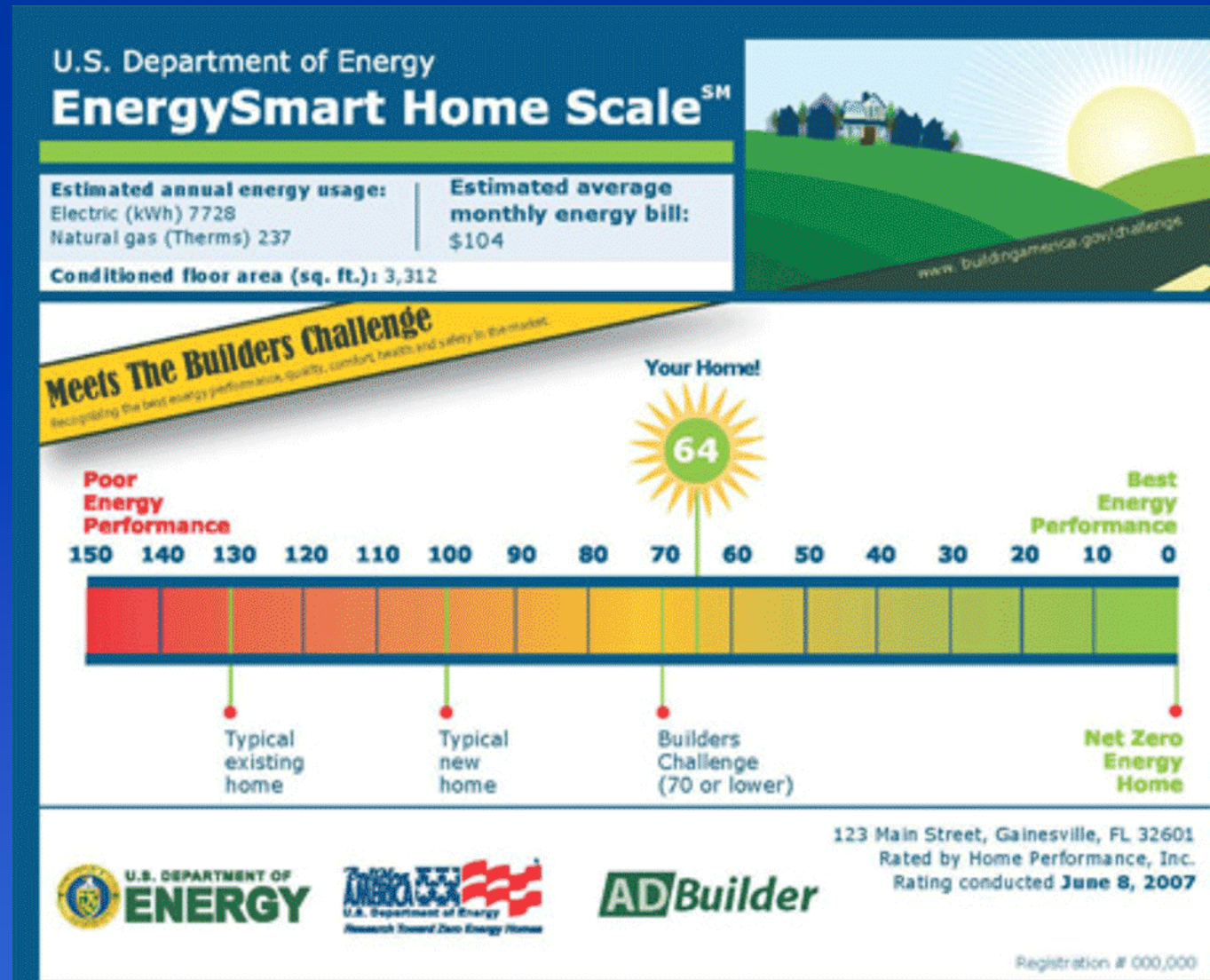


Background on Green Building

RATING HOME ENERGY CONSUMPTION

HERS Index:

- Designs are “energy modeled”
- Upon completion homes (or additions or renovations) are tested:
 - 1. Blower Door
 - 2. Duct Blaster
 - 3. TBC
 - 4. Thermal imaging
- REM/Rate software
- Resulting “score” >>



Background on Green Building

US Green Building Council

- Non-profit, grassroots since 1993
- 17,000 members
- Rating system: LEED for Homes



Energy Star & Builder's Challenge

- Joint venture: U.S. EPA & DOE early 1990s
- HERS Rating System: Energy Star = 85 / Builders Challenge = 70



NAHB Green Building Program

- National non-profit Builder's Trade Group
- Rating System: NGBS, ANSI Certified ICC 700-2008



+ *Dozens more national and regional programs*

Background on Green Building


BEYOND "ENERGY"

Threshold Point Ratings for Green Buildings

Green Building Categories			Performance Point Levels (1) (2)			
			BRONZE	SILVER	GOLD	EMERALD
1.	Chapter 5	Lot Design, Preparation, and Development	39	66	93	119
2.	Chapter 6	Resource Efficiency	45	79	113	146
3.	Chapter 7	Energy Efficiency	30	60	100	120
4.	Chapter 8	Water Efficiency	14	26	41	60
5.	Chapter 9	Indoor Environmental Quality	36	65	100	140
6.	Chapter 10	Operation, Maintenance, and Building Owner Education	8	10	11	12
7.		Additional Points from any category	50	100	100	100
Total Points			222	406	558	697

(1) In addition to the threshold number of points in each category, all mandatory provisions of each category shall be implemented.

(2) For dwelling units greater than 4,000 square feet (372 square meters), the number of points in Category 7 (Additional Points from any category) shall be increased in accordance with Section 601.1. The "Total Points" shall be increased by the same number of points.



LEED for Homes Project Checklist

Builder Name: _____

Project Team Leader: _____

Home Address (Street/City/State): _____

Project Building type: *Single detached*

of Bedrooms: *0*

Project type: *Custom*

Floor Area: *0*

Adjusted Certification Thresholds

Certified: *45.0*

Silver: *60.0*

Platinum: *75.0*

Project Point Total
Prelim: *0 + 0 maybe pts* Final: *0*

Certification Level
Prelim: *Not Certified* Final: *Not Certified*

Final Credit Category Point Totals

ID: *0* SS: *0* EA: *0*

LL: *0* WE: *0* MR: *0*

Min. Point Thresholds Not Met for Prelim. 0

date last updated: _____

last updated by: _____

Innovation & Design Process (ID) (Minimum 0 ID Points Required)

Max Pts. Available *11*

Preliminary Rating *Y:0 N:0*

Max Pts. Available *11*

Preliminary Rating *Y:0 N:0*

1. Integrated Project Planning

1.1 Preliminary Rating *Prelim.*

Target performance tier:

1.2 Integrated Project Team (meet all of the following)

a) Individuals or organizations with necessary capabilities c) Regular meetings held with project team

b) All team members involved in various project phases

1.3 Professional Credentialed with Respect to LEED for Homes *1 0 0 unavailable until further notice*

1.4 Design Charrette *1 0 0*

1.5 Building Orientation for Solar Design (meet all of the following)

a) Glazing area on north/south walls 30% greater than on east/west walls c) At least 450 sq. ft. of south-facing roof area, oriented for solar application

b) East-west axis is within 15 degrees of due east-west d) 90% of south-facing glazing is shaded in summer, unshaded in winter

2. Quality Management for Durability

2.1 Durability Planning (meet all of the following) *Prelim.*

a) Durability evaluation completed c) Durability strategies incorporated into project documentation

b) Strategies developed to address durability issues d) Durability measures listed in durability inspection checklist

c) Moisture control measures from Table 1 incorporated

2.2 Durability Management (meet one of the following) *Prelim.*

Builder has a quality management process in place Builder conducted inspection using durability inspection checklist

2.3 Third-Party Durability Management Verification *3 0 0*

US Green Building Council

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Green Building Today

- What to Look for in a Green Builder
- How Modular Homes Fit In
- Retro-fit vs. New Construction
- Signs of Green Washing
- Common Misconceptions

What To Look For In A Green Builder

- ◉ The usual “common sense” points
 - > Licensing
 - > Insurance
 - > [Verified] References
 - > Knowledge
- ◉ Do they listen?
- ◉ Personal philosophy – wasteful or efficient?

Signs Of “Greenwashing”

- Credentials – NAHB, LEED, EnergyStar (and check Angie's List, etc.)
- Builder Rep – Delaware “Green” story
- Ken Ulman, Howard County Executive – builder demands: CFL = Big Rebates!
- Do they “walk the talk”?

How Modular Homes Fit In

How Modular Homes Fit In (vs site building)

- Quality Control and Waste Reduction – Building Indoors is better
- Faster completion
- Security and site/exposure issues
- Money saved can be put into greener features



Common Misconceptions

- Green Building is way more expensive
- New windows will cut your energy bill in half!
- Modulares are glorified mobile homes
- Costs more to freight a new home to site
- Your mortgage lender knows the business – where's the EEM?
- Solar panels will fix everything!

Retrofit vs. New Construction

- Is it worth saving?
 - Cost, Energy, Materials, Waste, Time
- Can materials be salvaged? Recycled?
- Long term/
Life cycle costs



Building For The Future: Elements of Green Building

- ✓ Siting
- ✓ Foundation
- ✓ Framing
- ✓ Roofing
- ✓ Windows
- ✓ Plumbing
- ✓ HVAC
- ✓ Electrical
- ✓ Insulation and Air Sealing
- ✓ Siding and Decking
- ✓ Solar
- ✓ Indoor Air Quality
- ✓ Landscaping
- ✓ Homeowner Education



Elements of Green Building

○ Siting

- > Face the long axis of the house south. Size the **windows** for optimal passive solar gain. Size the **thermal mass** on the floor or illuminated walls relative to the glazed areas for a higher solar contribution. Provide enough **south-facing** roof area to accommodate current or future solar collectors. Plan early for **landscaping** that will help with shading the east and west windows in summer to reduce cooling loads.



Elements of Green Building

◎ Foundation

- > Always consider any foundation **material** as part of the building system. From slabs to crawlspaces to basements, **insulate** them as well as possible on the exterior before backfill. Grade foundation **drainage** away from the house and backfill with gravel that will allow water to flow to the foundation drainage system to prevent hydrostatic pressure on the foundation wall.



Elements of Green Building

○ Framing

- › Always use advanced framing (OVE) techniques with FSC-certified lumber. In cold climates, frame walls for R-24 or higher insulation. **Insulation** should reduce or eliminate the cavity effect by preventing air movement between the studs (structural insulated panels are one model of no-cavity effect). Place 1 in. of closed-cell rigid foam on the exterior of the sheathing to keep the dew point of the wall outside of the cavity. Install a drainage plane, and flash all penetrations and intersections perfectly to protect the building from moisture for its entire life span.



Elements of Green Building

◎ Roofing

- > Use the **longest-lasting material** you can afford that is designed for your climate. Make sure the entire roof assembly creates an **air barrier** from the living space below, which means no open areas around plumbing, ductwork chimneys. Insulate 50% higher than code requires.



Elements of Green Building

◎ Windows

- > Install **low-e** windows as a minimum. Wherever possible install super glass in fixed-glass locations. Design for **solar gain** and reduce exposure to western summer sun. Casement windows usually have better **air sealing** and can be opened to catch breezes. Use windows with a solar heat gain factor of 0.33 or lower for east and west windows, especially in hot climates.



Elements of Green Building

○ Plumbing

- > Optimize the **design** of the plumbing using a trunk and branch system. Reduce the size of supply lines to 3/8 in. to maximize flow and reduce heat loss. Install a sealed combustion water heater with an EF of 0.62 or higher. **Insulate** all hot water lines throughout the house. Install an on-demand hot water pump. Reduce flow rates at all fixtures and faucets below code. **Conserve** as much as possible. Use dual flush toilets. Pre-plumb for gray water segregation.



Elements of Green Building

◎ HVAC

- > Install only **high-efficiency** sealed-combustion furnaces and boilers with efficiencies above 90% and air conditioners with 14 SEER or higher. Better yet, use evaporative cooling in dry climates. Make sure the mechanical equipment is **sized properly** to meet the dramatically reduced energy load of the house and no more. Provide for **fresh air** with mechanical ventilation. Keep equipment and all ductwork inside the insulated envelope. Reduce air pressure differentials throughout the house. Seal all ducts with mastic. Have the ducts tested. Consider **geothermal** heat pumps. In humid climates, a **well-sealed and insulated** house may require central dehumidification when temperatures are moderate but humidity high.



Elements of Green Building

○ Electrical

- > Design **daylighting** to provide light to all rooms in daytime use. Design electric lighting carefully for the tasks and uses of each room. Use dimmers and occupancy **sensors** to minimize lighting requirements. Reduce electrical loads everywhere. Install **compact fluorescent bulbs** or LED fixtures wherever possible. Provide circuit switches to cut power to “always on” phantom loads. Install the most **efficient** appliances possible. (Energy Star isn't always the minimum-load appliance.)



Elements of Green Building

◎ Insulation and Air Sealing

- > **More** is always better. **Insulate** today to 50% above local code or DOE recommendations for your area. Make the **thermal envelope** continuous by eliminating thermal breaks or cold spots. Inspect for perfection of installation. Eliminate any air movement inside the wall cavities and through the building envelope. Create an uninterrupted building envelope with the insulation in contact with the air barrier. Keep the dew point outside the envelope by using exterior rigid foam. Use **spray foam** insulation between garage and all adjacent living spaces. Use spray foam or spray insulation on all band joists, preferably where any two materials meet. Conduct a **blower door test**. A well-sealed house, with proper ventilation, will maintain more comfortable humidity levels year round, reducing or eliminating the need for humidifiers in cold months and reducing the need for air conditioning in warm months.



Elements of Green Building

○ Siding & Decking

- > Use siding that is as **long lasting** as the intended life of the building. Cementitious siding or real stucco is fire resistant as well as durable. Don't use wood siding or decking unless it is FSC certified. Install **recycled-content** composite decking.



Elements of Green Building

☉ Solar

- > Integrate solar **hot water system** with radiant heating systems. Provide ample space for hot water storage to meet the heating load requirements. Install enough **PV** to meet at least 50% of the electrical load of the house. Install a battery back-up system if you want protection for variable grid availability.

Use feedback metering to tell you how much electricity you are using at any given moment. Look for net metering in your area that allows you to sell your “extra” electricity back to the local utility through the grid.



Elements of Green Building

◎ Indoor Air Quality

- > Eliminate as many synthetic **materials** from inside the envelope as possible. Be aware of the constituent chemicals in all surfaces and finishes. Use **zero VOC** paints and finishes. Seal formaldehyde-based products before installation. Eliminate solvent-based products from all adhesives and finishes. Provide adequate **ventilation** to every room. With forced air systems install MERV filters rated 6-12. Make sure that houses using forced-air systems have effective air sealing. Install a heat recovery ventilation unit.



Elements of Green Building

◉ Landscaping

- > Install landscaping that is **native** to your location. Plant **drought-tolerant** species. Use landscaping to help reduce **cooling** loads, especially around east- and west-facing windows. Plant edible landscaping for people as well as birds, butterflies, and **wildlife**. Install a water catchment system based on your annual **rainfall**.



Elements of Green Building

◎ Homeowner Education

- > Knowing how to operate and maintain your green home is as critical as getting it built right.

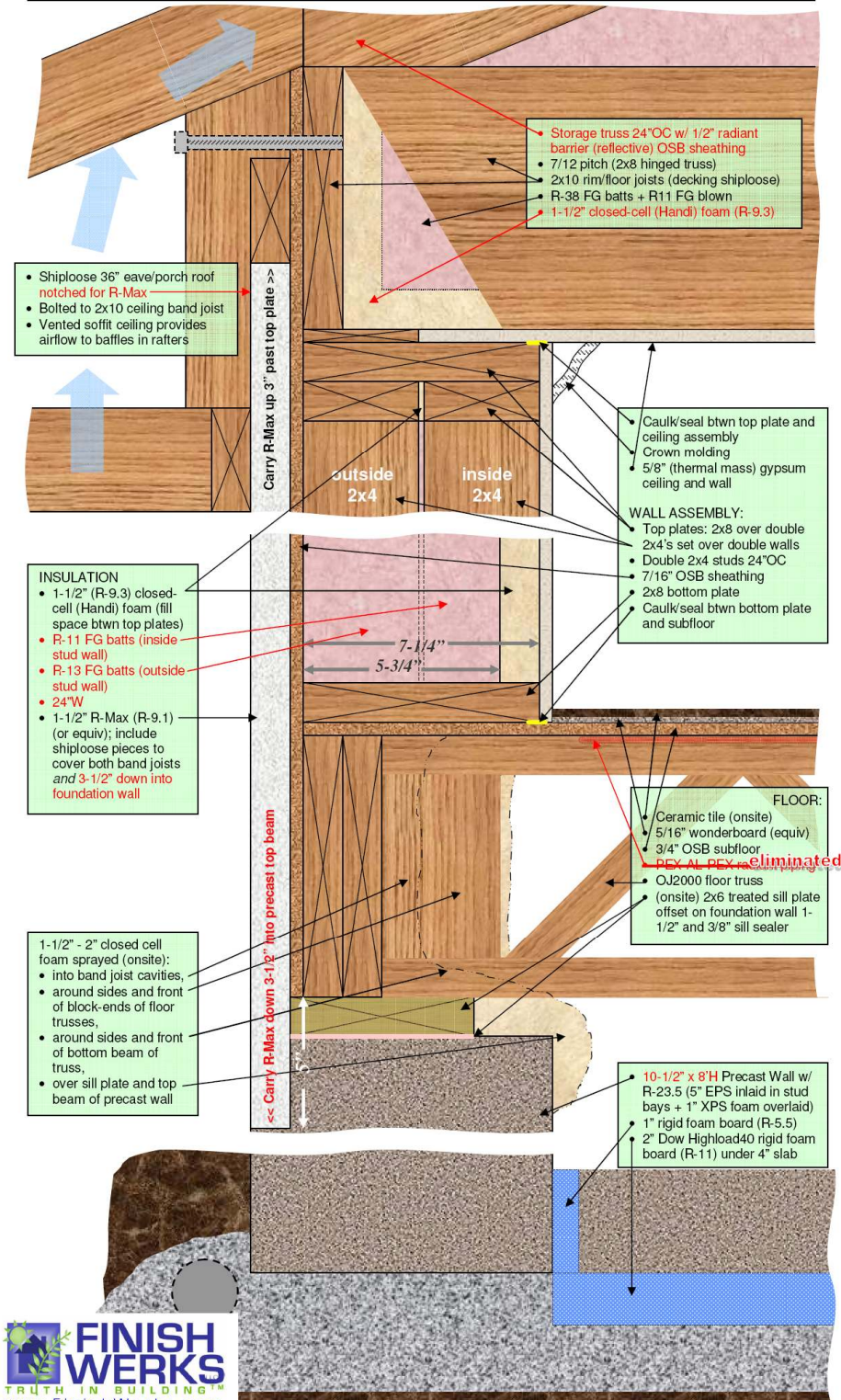


The Future of Green Building

- ◉ Gray-water and waste treatment systems
- ◉ LED and daylighting
- ◉ Solar and desiccant cooling systems
- ◉ Living home systems: green roofs/gardens
- ◉ Small-scale and building integrated wind power, such as vertical axis
- ◉ Sustainable engineered products: natural paints/coatings/adhesives, bamboo I-Beams, soy-based insulation foam
- ◉ Recycled materials
- ◉ Relearning the past: building to last, siting for solar, using thermal mass, design to suit local climate, etc.

The Future of Green Building

- EFFICIENCY FIRST
- EDUCATION
- INCENTIVES
- GET OFF FOREIGN ENERGY!



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ALERT Nov 5: First Time Home Buyer Tax Credit RENEWED

ALERT: View or download Harris's "Green Home Building" presentation from the August Green Building Network (GBN) meeting by visiting our [Green Home Building](#) page.

MD Governor O'Malley greets Finish Werks' Harris (L) and Lew Woodward (R) at the Maryland Green Registry Kickoff -- (C)2009 Governors Office



Serving the Maryland region, Finish Werks is a custom green builder dedicated to **TRUTH in Building**, which means

Click this image for a printable coupon to the **MD Green Show** Nov 7&8.

