

# Improving your Building Performance *and* your Bottom Line With SIPS!



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



## Improving your Building Performance *and* your Bottom Line with SIPS!

### Overview/Objectives:

- History of Energy codes
- Complying with Current, upcoming Markets/Codes
- “Above Code”
- Building Envelope/Water (aka: “The Enemy”)/Air
- Interior Comfort/Health
- Remodeling
- Marketing Energy Efficient/High Performance Buildings

# Energy Standards

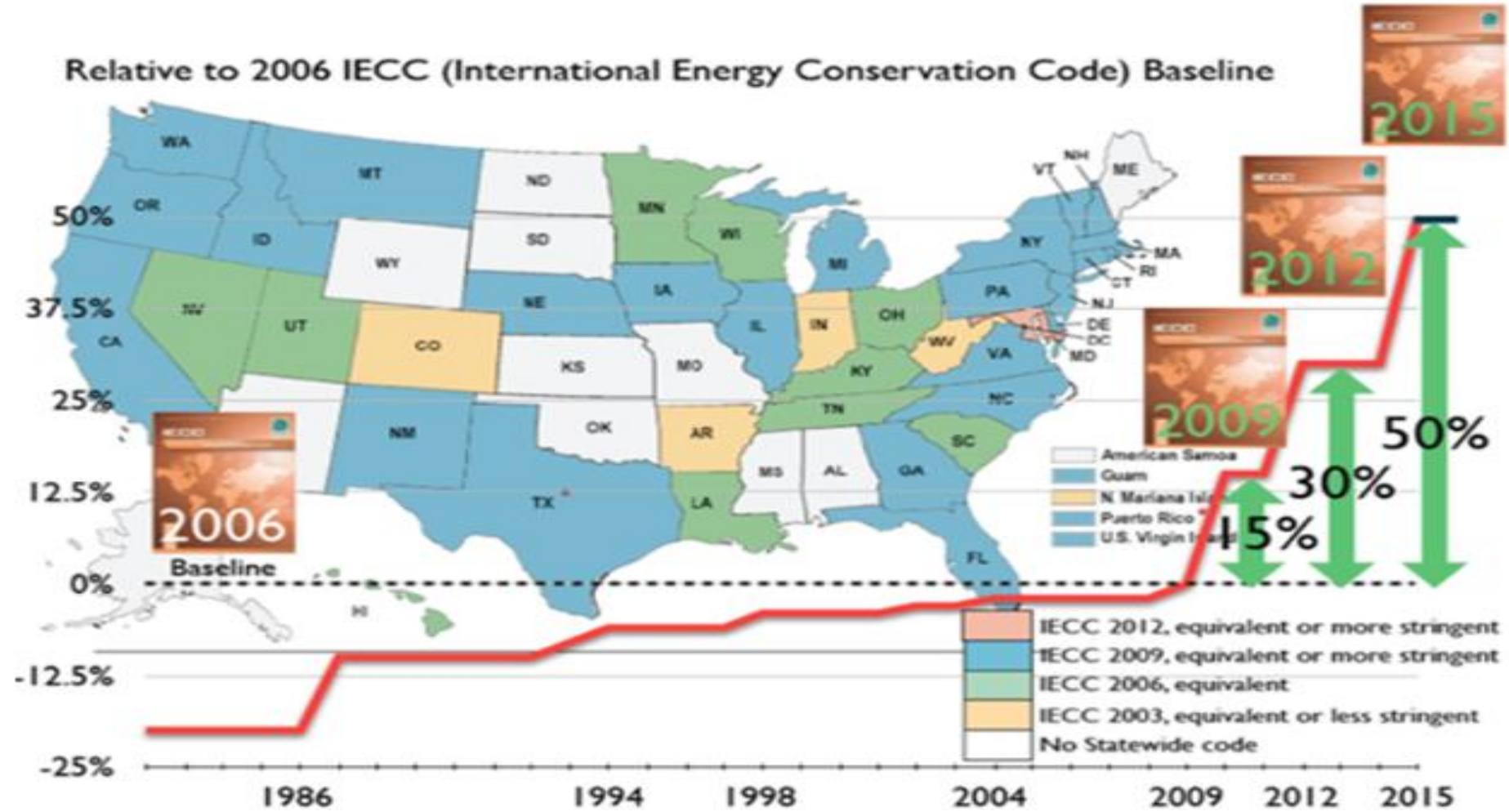
Model Energy Code: 1980s

Austin Energy Green Building Program; “Grand Daddy” of Energy Star

EPA’s ***Energy Star*** program;

- Launched in 1992 for Appliances
- In 1995 EPA launched Energy Star for Homes
  - Homes Built 30% more efficient than the Model Energy code
- In 1996 Energy Star became formal partnership between EPA and D.O.E.

# Residential Energy Codes Improving Faster



Interpreted from: [www.energycodes.gov](http://www.energycodes.gov); Jan. 2012, J. Brew, RMI

# 2012 IECC / IRC Section 11

- Basics:

As voted and passed at 2011 ICC Conference:

**Requires 30% above 2006 IECC (15% above 2009)**

**More testing and verification.**

**Energy Labeling (MPG Sticker for Home)**

# 2015 International Energy Conservation Code

- Creates a Residential Energy Code splitting it from Commercial
- Advances Energy Code approximately 10% +/- over 2012 IECC
- Uses the HERS index as an “equivalent” for residential applications
- Creates “Solar Ready” zones for applicable roof areas
- Adjusts U-Factor calculations to better align with R-Values
- *2018 IECC Code review has begun w/committee meeting 4/16*

# Federal Actions 2015

- Clean Power Plant Rule (Enforced at *other* than Power Plant)
  - Renewables
  - Increased Codes Green/Energy
  - Energy Efficiencies
- Comprehensive Energy Bill:
  - Bi-Partisan (so far) Broad Bill w/many facets
  - Moving quickly through House Slower through Senate
- Rule 45L

# “Above and Beyond Code”

- National Green Building Standard (ANSI ICC-700)
- Energy Star
- Indoor Air Program
- Water Sense
- Building America’s Builder’s Challenge (Challenge Home)
- Active House
- LEED-H
- Scoring/Certification



# Above Code Standard Compliance

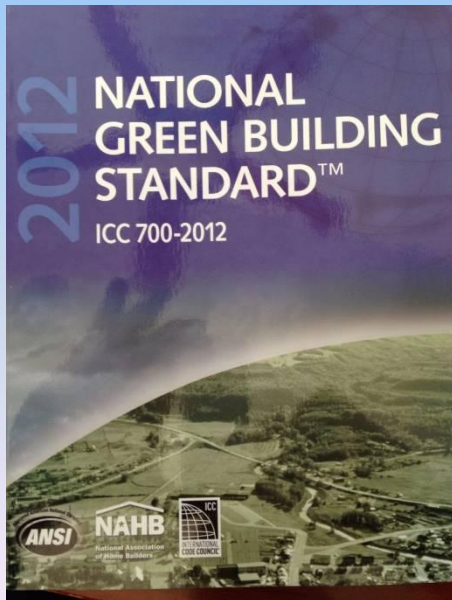
Building with SIPs not only helps you with Code Compliance (now *and* as they advance) but also with Above Code programs such as:

-Energy Star

-Builder's Challenge (Challenge Home)'

-LEED-H

*And of Course* The National Green Building Standard (ANSI ICC-700).



## Resource Efficiency

- **601.5: Prefabricated components – Maximum 12 points**
- SIPs qualify as a panelized building system. Four points will be awarded for each system used (walls, roof, floor).
- **606.2: Wood-based products – Maximum 4 points**
- If the SIPs used in the project are made of OSB certified under an approved forestry certification program, builders will receive points for using certified wood materials.
- **607.1: Resource-efficient materials – 3 points**
- SIPs use engineered wood products to achieve equal or better structural performance with fewer natural resources.
- **609.1: Life cycle analysis – 3 points**
- SIPs are eligible for three points if they are selected using an ISO 14044 compliant Life Cycle Assessment (LCA) tool. LCA conducted on SIP homes demonstrates that by improving energy efficiency, SIPs have a positive environmental impact over their product life cycle.

## Energy Efficiency

- **PERFORMANCE PATH**
- **702.2: Energy cost performance levels – Maximum 120 points**
- Under the Performance Path, the home is awarded points based on overall energy performance, as determined by an accredited energy rater. Homes must be 60% more efficient than the 2006 IECC to receive the full 120 points.
- **PRESCRIPTIVE PATH**
- **703.1.1: Building envelope – Maximum 35 points**
- The solid foam core of a SIP delivers continuous insulation and is available in a variety of thicknesses to help builders increase their building envelope performance.
- **703.1.2.1: Grade 1 insulation installation – 15 points**
- SIPs are deemed to provide Grade 1 insulation installation in the Chapter 7 Appendix.
- **703.2.1.1: Insulation and air sealing – Maximum 15 points**
- SIPs qualify as a complete air barrier if all interfaces and penetrations are properly sealed.
- **704.4.4: Ducts – 12 points**
- If a complete SIP building envelope is used, all ductwork will be located in conditioned space.
- **704.6.2.1: Installation and performance verification – Maximum 15 points**
- The builder can earn up to 15 points if a blower door test is conducted by a third party inspector. SIP homes routinely test below 1 ACH50, earning the maximum 15 points.

## Indoor Environmental Quality

- **901.4.5: Wood materials – 4 points**
- SIPs use OSB structural panels that meet indoor air quality requirements for this credit. All other wood structural panels used on the home must be compliant to earn the credit.
- **901.11: Insulation – 4 points**
- The foam insulation used in SIPs meets the indoor air quality standards of this credit. Four points are awarded if qualifying insulation is used in the walls, roof and floor of the home.



# Key: Establishing a Knowledgeable Team

- Begins with /Builder/Design Professional
- Customer/Client
- Building Trades
- Suppliers/Sub-contractors
- Certifications
  - NAHB Certified Green Professional (CGP) (MCGP)
  - LEED-AP

# Panelized, Systemic construction



# Structural Insulated Panels are a Cost effective Design Component to meet Envelope performance requirements!





Structural Insulated Panels are a Cost effective Design Component to meet Envelope performance requirements!



- Envelope Performance allows for:
- Cost effective High-Efficiency HVAC
- Sized appropriate for the HP Home or Building
- Cost effective Higher SEER A/C



Better Envelope  
Performance combined  
with better design:

Simple Design  
Configuring all water  
demand in one general  
area allowed for use of a  
single tankless water  
heater to serve this  
Family of four...





***SIPS and Simple* Building Envelope Science;**  
**-What makes proper**  
**Construction/Remodeling Important!**  
**Air-Water-Thermal-Durability**

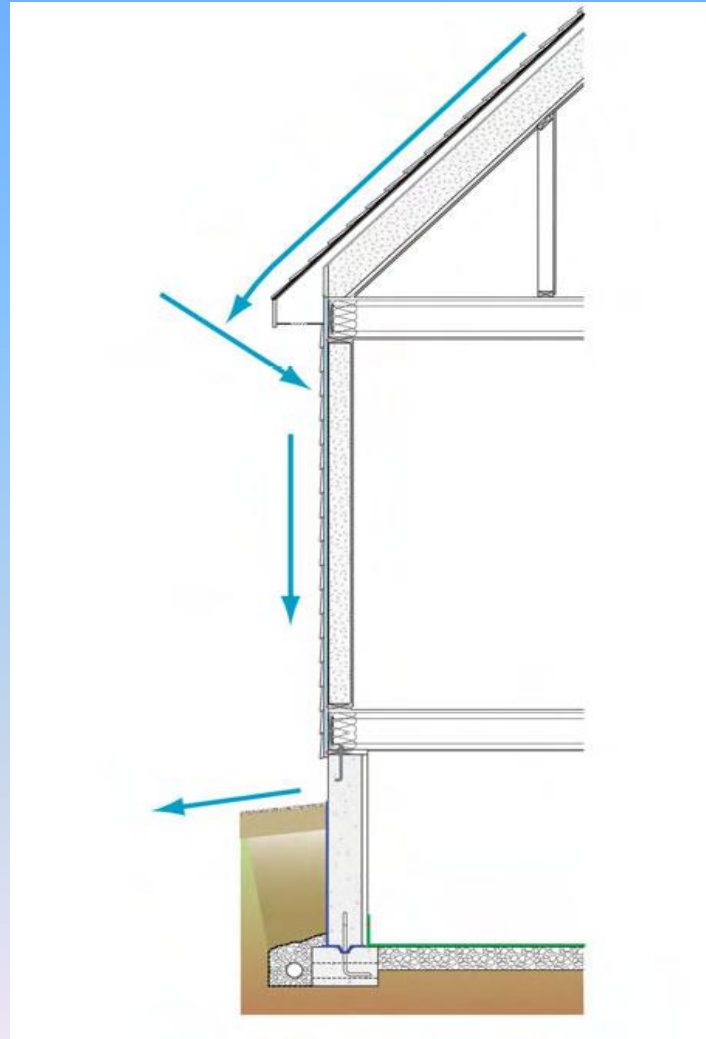


Drainage

Air Tight

Resilient

Thermal  
Performance



### Exterior Conditions

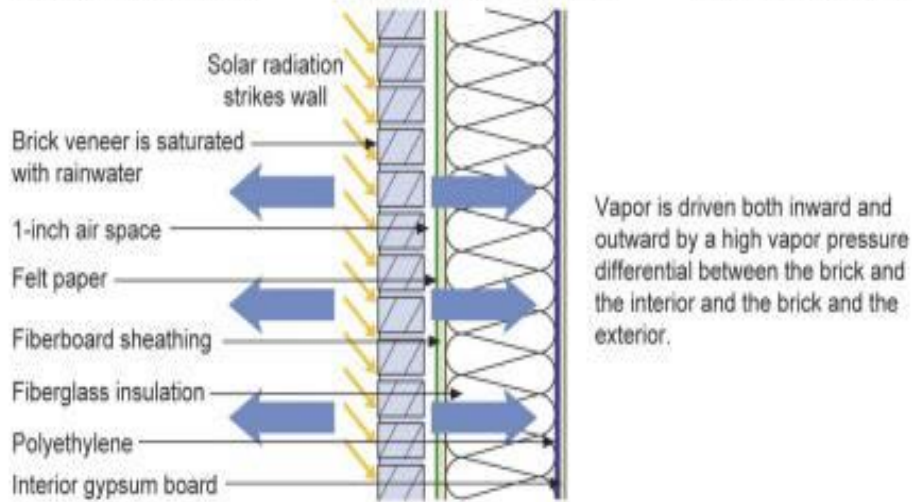
Temperature: 80°F  
Relative humidity: 75%  
Vapor pressure: 2.49 kPa

### Conditions within Cavity:

Temperature: 120°F  
Relative humidity: 100%  
Vapor pressure: 11.74 kPa

### Interior Conditions

Temperature: 75°F  
Relative humidity: 60%  
Vapor pressure: 1.82 kPa



- Do not install a vapor barrier on the inside of an air conditioned assembly. Vinyl wall coverings, foil-backed batt cavity insulation and polyethylene vapor barriers should be avoided.
- Vapor permeable exterior sheathings, housewraps or building papers should not be used with absorptive claddings such as brick veneers unless a ventilated cavity is provided in conjunction with high inward drying potentials (i.e. no polyethylene vapor barriers).
- Failure will occur when brick is installed over a frame wall constructed with felt paper, fiberboard sheathing and a polyethylene vapor barrier. Kraft-faced fiberglass batts should be used in place of unfaced batts and a polyethylene vapor barrier. OSB, plywood or foam sheathing should be used in place of the fiberboard sheathing.
- Similar problems occur with stucco.



Structural Insulated  
Panel Association



# Diffusion – Priority #4

- Diffusion

- Migration of moisture by means of vapor pressure differential
- Occurs in either direction based on climate conditions and exterior/interior levels of humidity

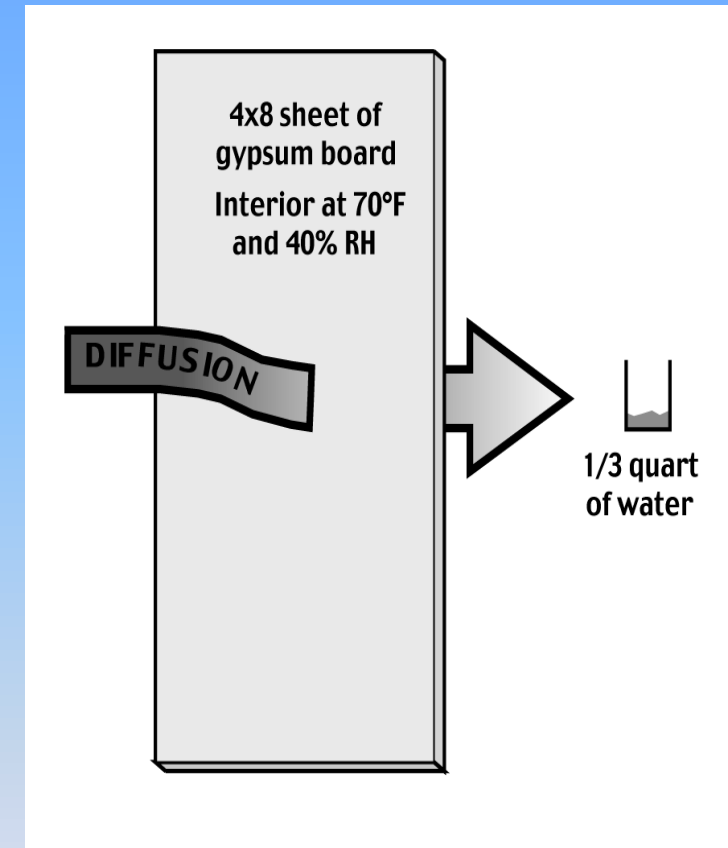
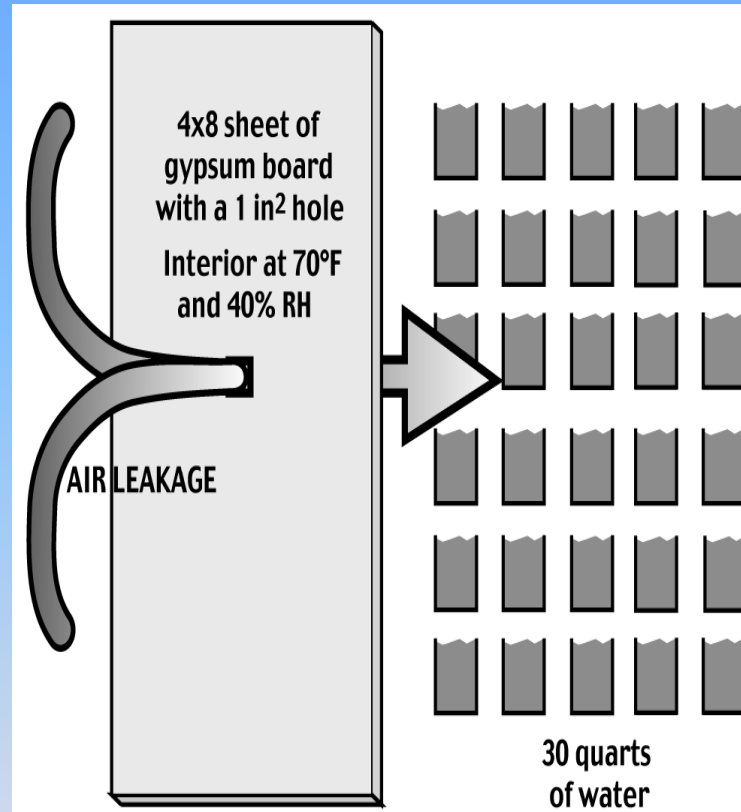


Image courtesy of Building Science Corp.

# Air Transport of Water Vapor –

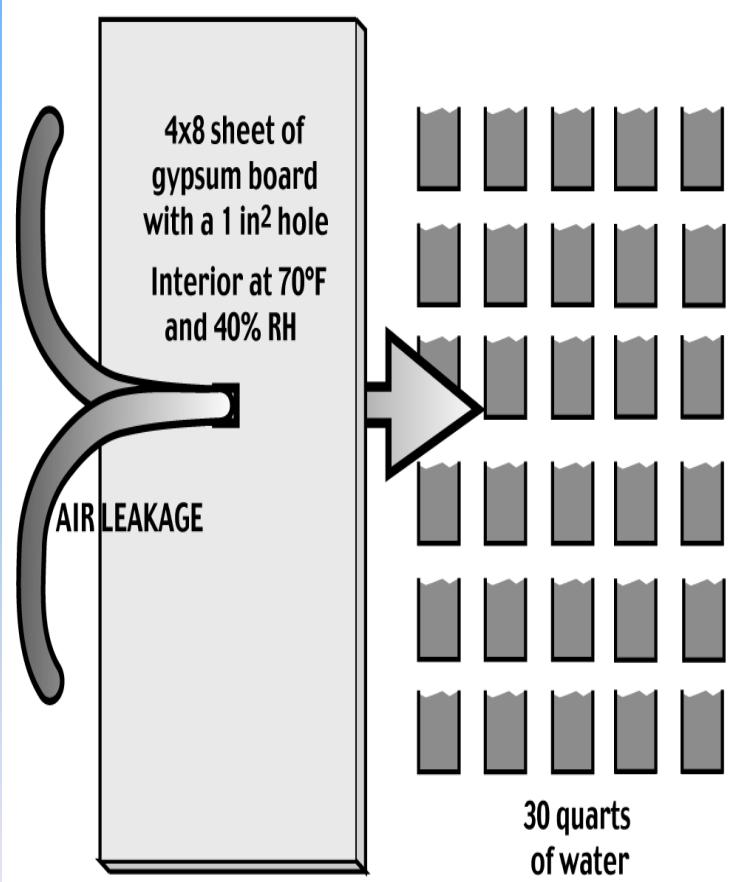


Image courtesy of Building Science Corp.

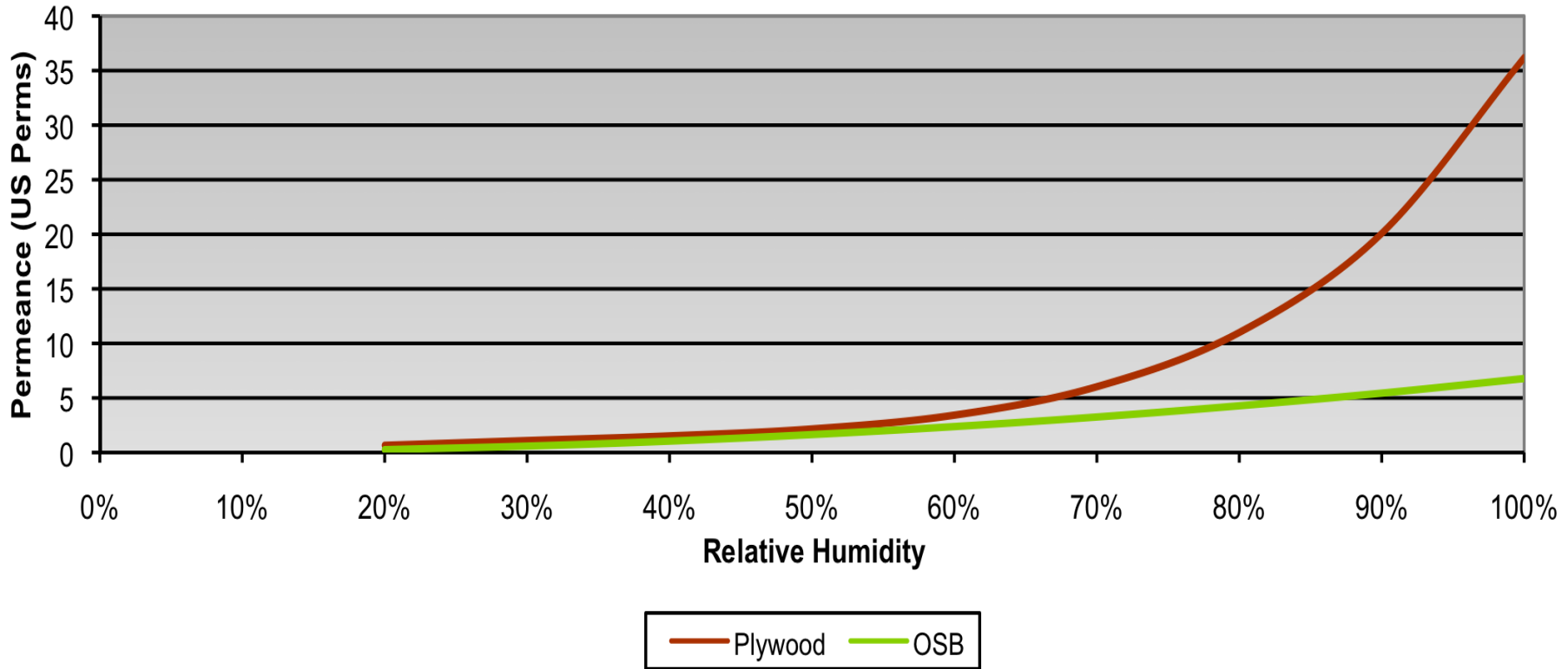
# How Moisture Affects & Moves Through Common Building Materials

- Vapor permeability and “perms”
- Vapor permeability variability
- An example of when all this can be critical

Vapor permeance:

$$\text{Perm} = \text{grain}/(\text{hr} \cdot \text{in Hg} \cdot \text{ft}^2)$$

# Permeance for 1/2" OSB & Plywood

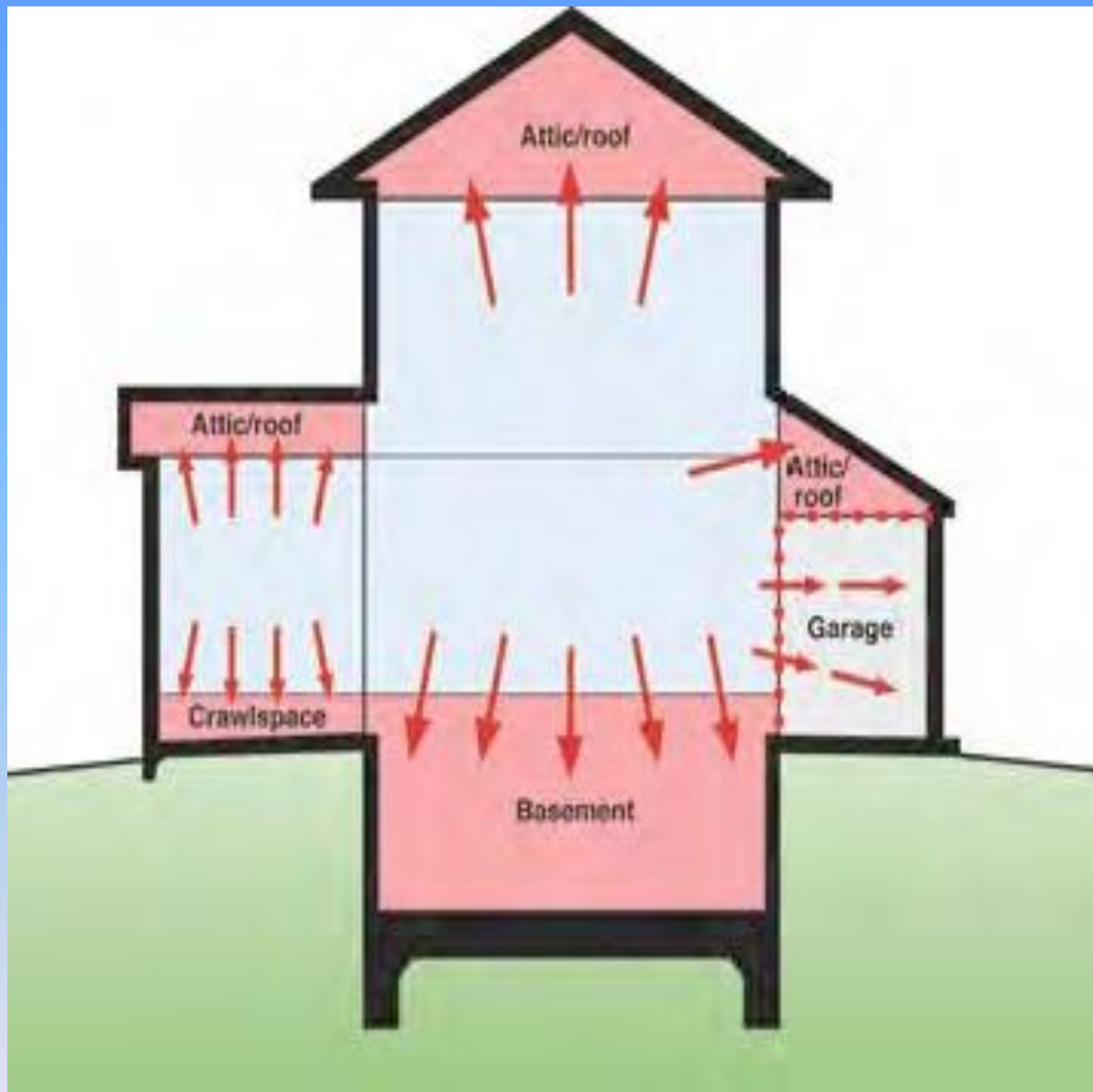


Relative Humidity

# The major “damage functions”

- Liquid water (bulk and capillary)
- Air-borne water
- Vapor
- Radiation (uv degradation)
- Pests
- People





## Expansion of Conditioned Space

- Conditioned space boundaries moving towards exterior surfaces of building
- Garage isolated from house by air barrier/pressure boundary
- Garage ventilated and conditioned independently of rest of conditioned spaces



# Qualities of the major protection systems

- Systematic
- Comprehensive
- Continuous
- Best Practices
- Each system should be addressed by at least one, preferably two, ideally three of the following:
  - Design; Materials; Workmanship

# Quality Management



- Moisture Control testing prior to cover up.
- Final Testing/ verification and Commissioning
- Certification



# Ventilation and I.A.Q

- Building Envelope
- Air Sealing Package
- HVAC Design, Equipment & Installation. ERV/HRV
- Water Heating Design
  
- = Comfort



# Healthy Homes and Buildings

- Healthy buildings means:
  - Energy efficiency
  - Well ventilated
  - Clean
  - Accessible
  - Safe
  - Pest free
  - Dry
  - Contaminant free
  - Well maintained
- These are basics for family health and a VALUE to Buyers!.



Time = Money



Enclosed *and* Insulated in a week!

# Remodeling/Retrofit Housing

128,649,000  
Housing Units in the USA

-U.S. Census Bureau

**At its peak: new Construction added about  
1.6% to this number per year  
(Approximately 10 years)**

**-But only About 2.5% of all Homes**



# Remodeling Preferences by Consumers: Energy Savings A Must

Energy Savings

Windows

Insulation

HVAC

Better Indoor Air Quality

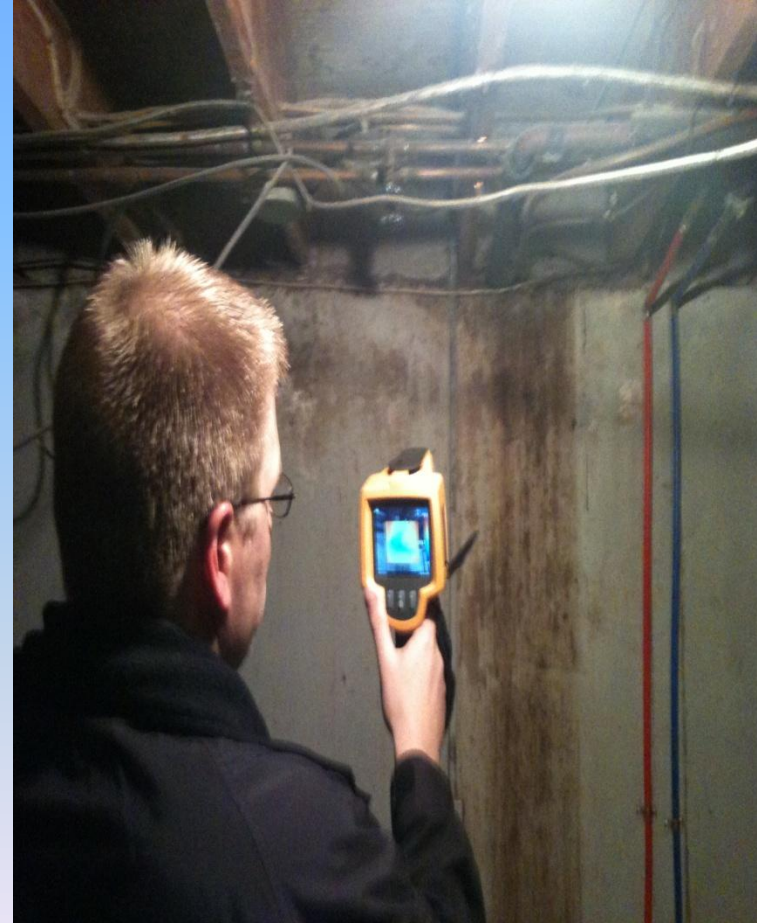
Water Efficiency

Sustainable Materials

Motivations: #1 Save Money, #2 Improved Living



# “Baseline” Testing





## E-Mail from Remodel Client 2013:

Also, wanted to share that this month was officially lower for electricity at the new (5000 sq ft) house than the old (2200 sq ft) house. The old house used **1013kWh** last month in 31 days **vs. 634 kWh** used in 29 days at the new house. Add on the 264kWh that the solar panels generated and it was *almost 3 times less usage with twice the square footage.*



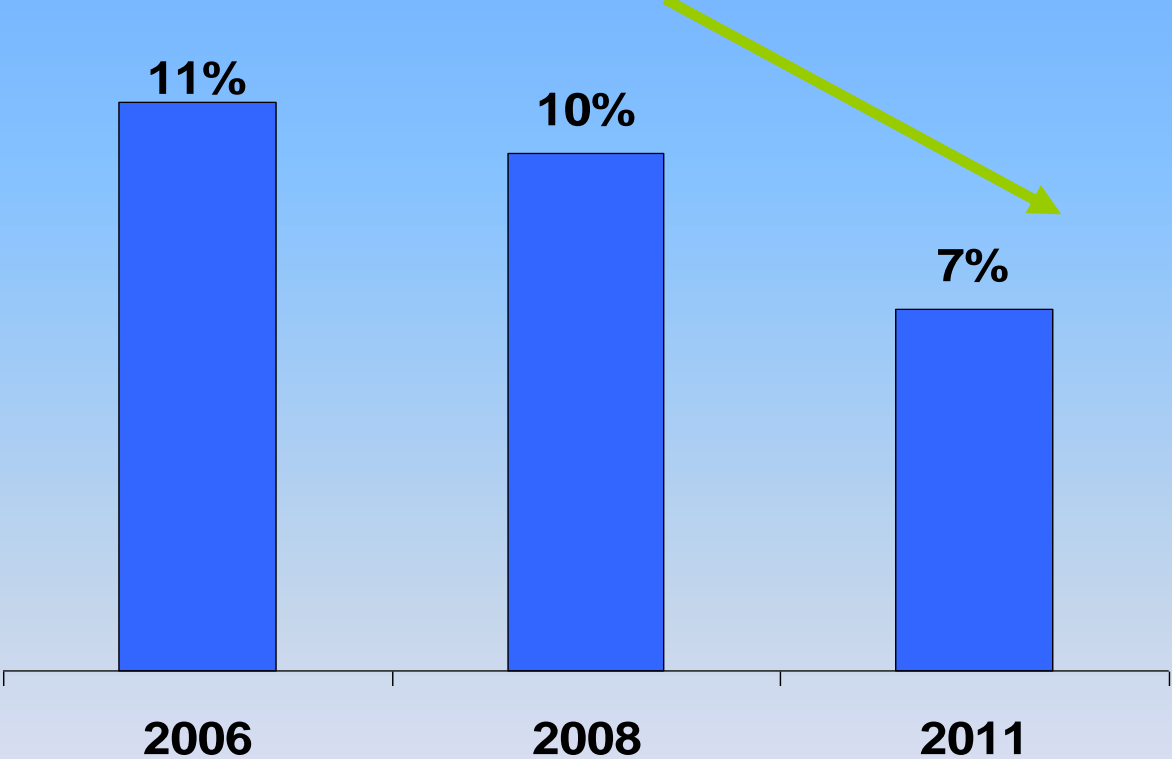
# Business Case: Moving HP Housing forward

- Affordability (cost effective)

\$1000 increase in price of the median-priced new home would mean 217,000 U.S. Households from being able to qualify for a mortgage to purchase that home.

*Source: U.S. Census*

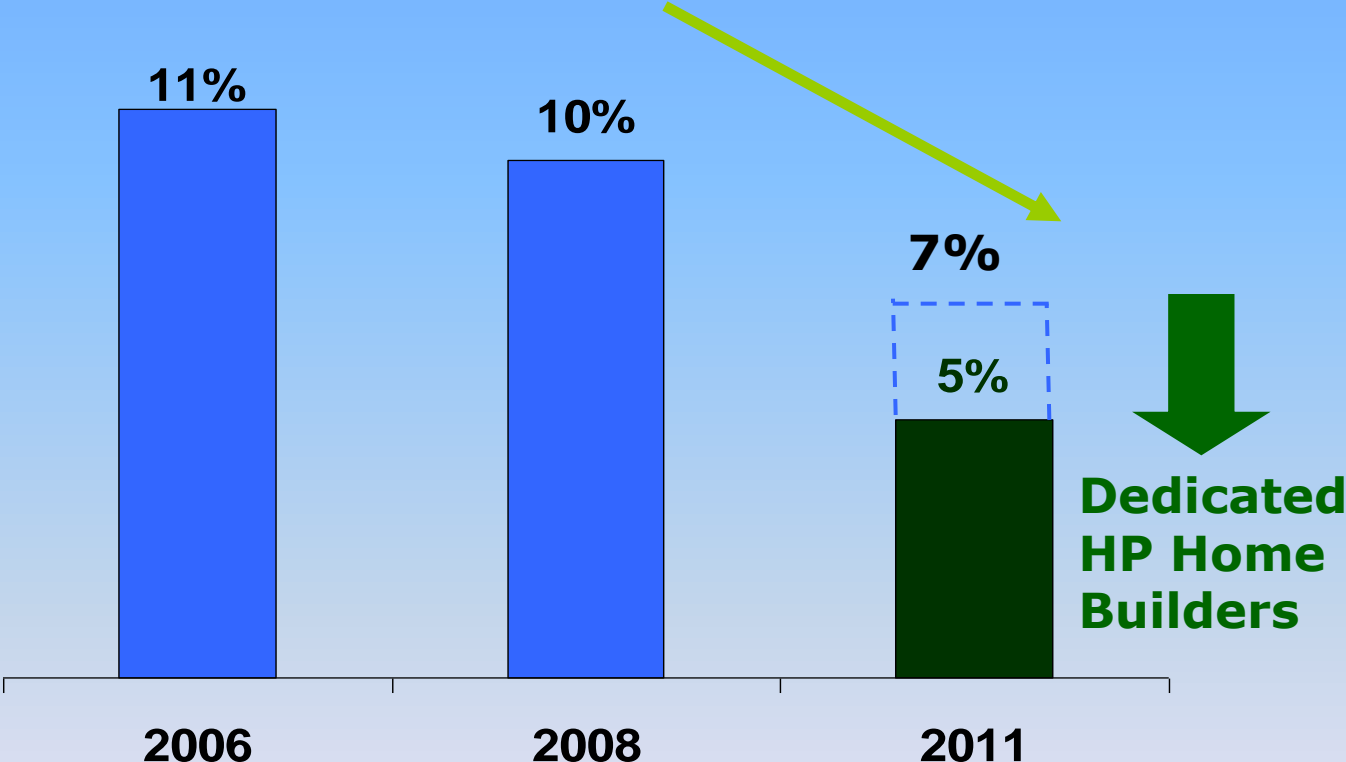
# Incremental Cost of New Energy Efficient High Performance Homes Has Decreased According to Builders.



Source: Home Building survey, McGraw-Hill Construction, December, 2011



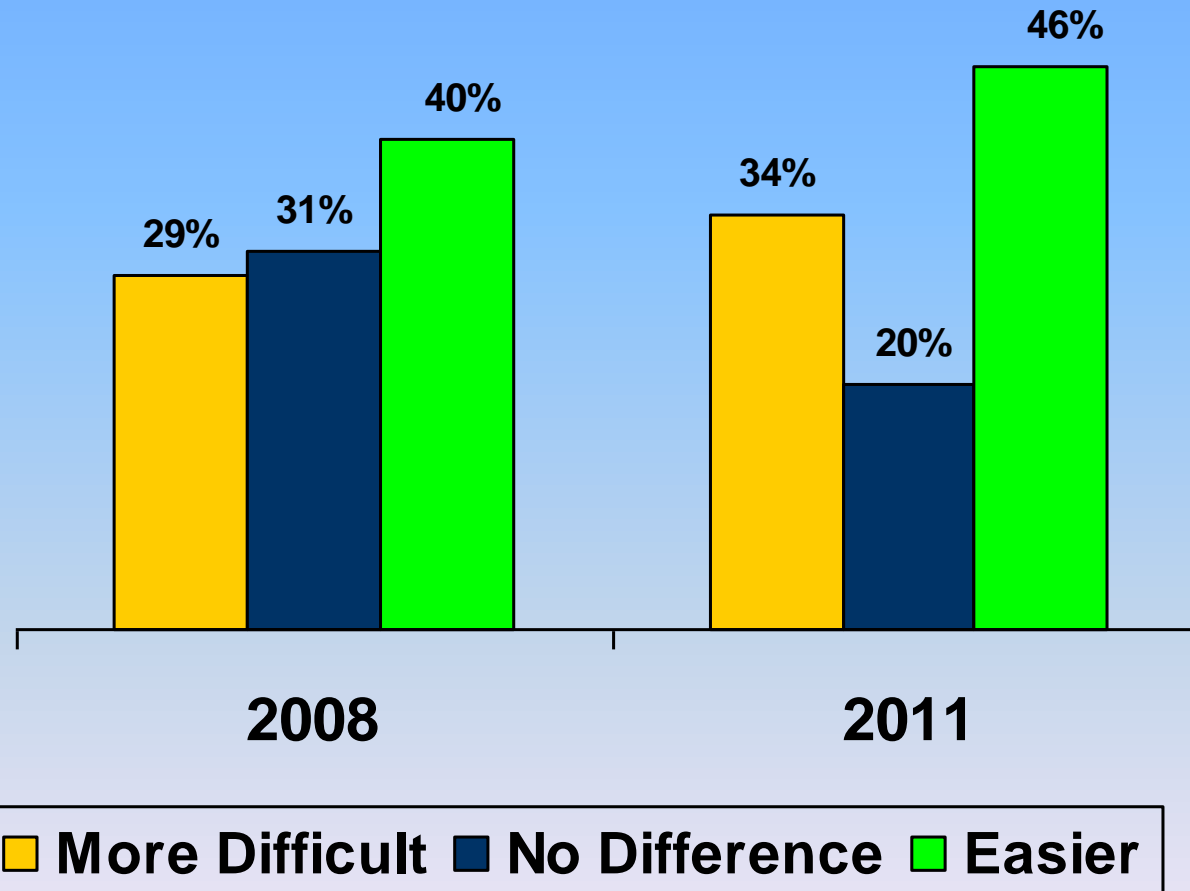
# Incremental Cost of New EE/HP Homes Has Decreased According to Builders



Source: Home Building survey, McGraw-Hill Construction, December, 2011



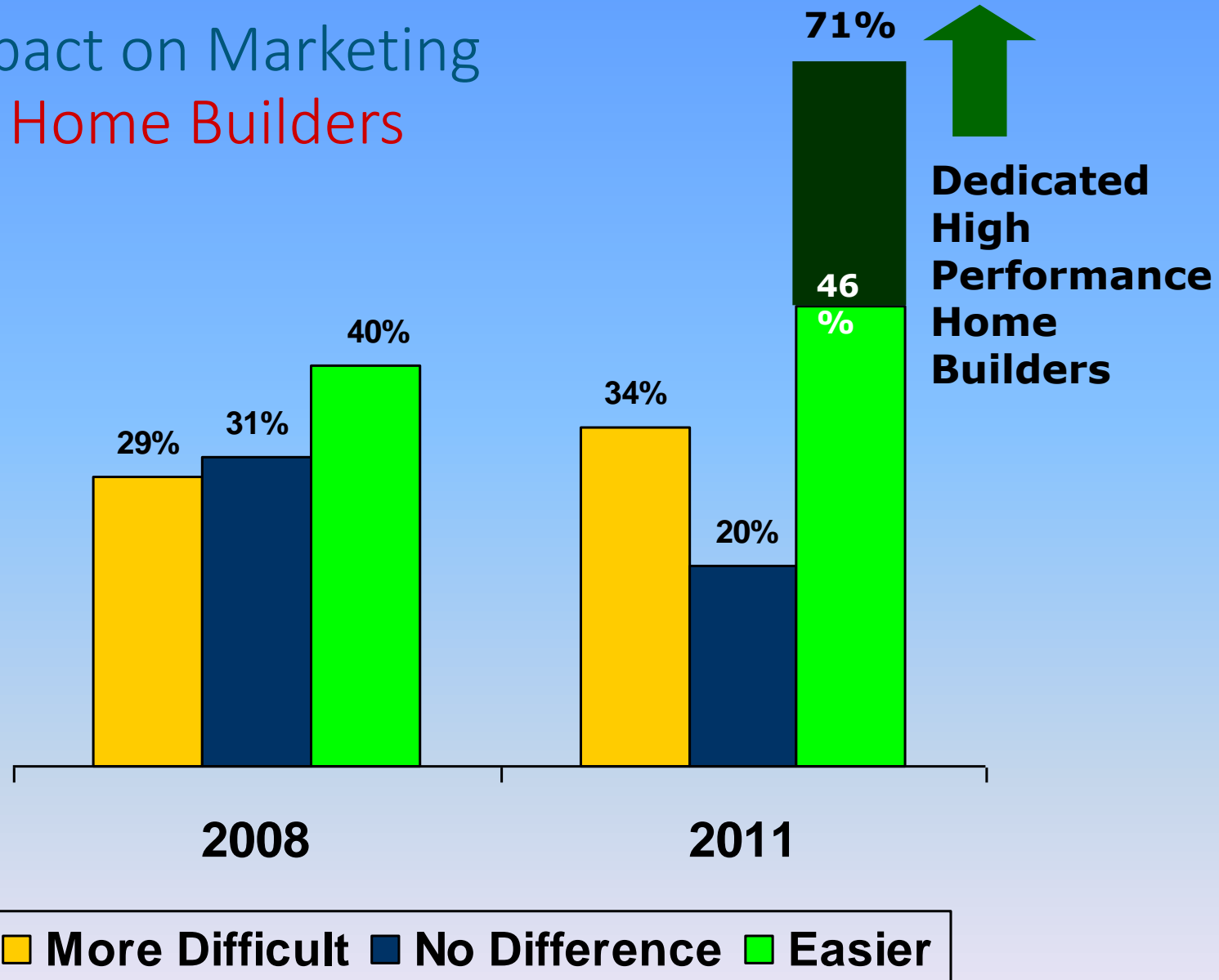
# Impact on Marketing for HP Home Builders



Source: Home Building survey, McGraw-Hill Construction, December, 2011



# Impact on Marketing for Home Builders



Source: Home Building survey, McGraw-Hill Construction, December, 2011



# Bottom Line = Bottom Line

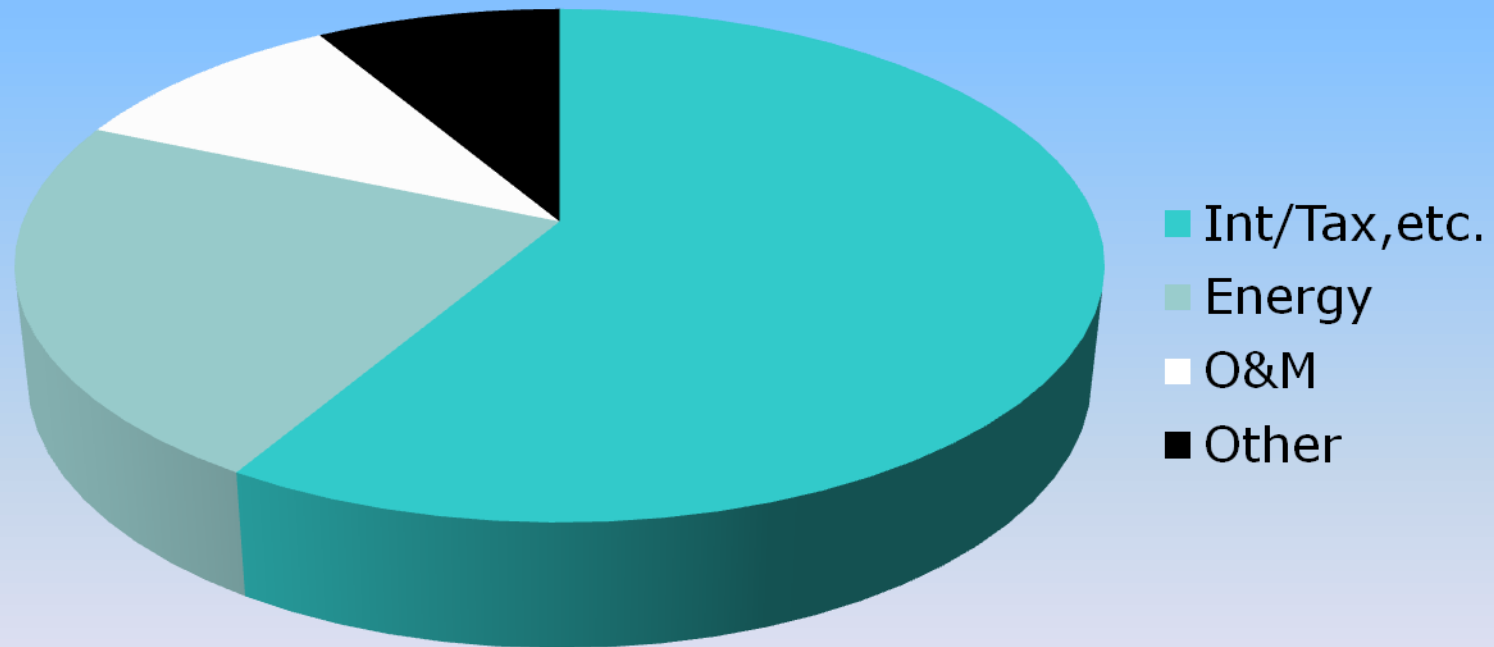
- “Right Sized” better design
- Comfort
- Durability (*and* Resilient)
- Competitively Priced
- Energy Savings + Reduced Maintenance

Cash Savings= Equity



# Equity!

## Cost





# Lender Specification;

*“This Home is being built/renovated/updated to standards above prevailing code. It is designed and constructed with unique features and materials and with high efficient equipment and in accordance with high efficiency standards. The Lender shall choose an Appraiser educated and knowledgeable in this type of valuation of these specialized Homes. It is understood that unless said Appraiser can provide verification of education and knowledge, they will not be permitted to conduct the appraisal for this project.”*



**AI Reports® Releases New Form 820.04:  
Residential Green and Energy Efficient Addendum!**

The Appraisal Institute is pleased to offer the new Form 820.04: Residential Green and Energy Efficient Addendum. This is the first residential green and energy efficient appraisal report addendum made by appraisers, for appraisers

[http://www.appraisalinstitute.org/education/green\\_energy\\_addendum.aspx](http://www.appraisalinstitute.org/education/green_energy_addendum.aspx)


<http://www.appraisalinstitute.org/>



# Using the EE/Green HUD Appraisal Addendum w/SIPS

Reference to use of SIPS panels are entered in the "Insulation" section and a detailed description added in the comments section.

That way the *Trained/Qualified Appraiser* has full information regarding the construction and type of materials used!

		Client File #:	Appraisal File #:
<h2>Residential Green and Energy Efficient Addendum</h2>			
Subject Property: <b>219 Gray Ave.</b> City: <b>Webster Groves</b>		State: <b>MO</b>	Zip: <b>63119</b>
Additional resources to aid in the valuation of green properties and the completion of this form can be found at <a href="http://www.appraisalinstitute.org">www.appraisalinstitute.org</a>			
<b>ENERGY EFFICIENT ITEMS</b>			
The following items are considered within the appraised value of the subject property:			
<b>Insulation</b>	<input type="checkbox"/> Fiberglass Blown-In <input checked="" type="checkbox"/> Foam Insulation <input type="checkbox"/> Cellulose <input type="checkbox"/> Fiberglass Batt Insulation		R-Value: <b>45 (roof)</b>
	<input checked="" type="checkbox"/> Other (Describe): <b>SIPS (See Comments)</b>		<input checked="" type="checkbox"/> Walls <b>R-25</b>
	<input checked="" type="checkbox"/> Basement Insulation (Describe): <b>(See Comments)</b>		<input checked="" type="checkbox"/> Ceiling <b>R-45</b>
<input checked="" type="checkbox"/> Floor Insulation (Describe): <b>(See Comments)</b>		<input checked="" type="checkbox"/> Floor <b>Basement Slab</b>	
<b>Water Efficiency</b>		<input type="checkbox"/> Reclaimed Water System (Explain): <input checked="" type="checkbox"/> Rain Barrels - #: <b>3 (min.)</b>	<input type="checkbox"/> Cistern - Size: Gallons <input checked="" type="checkbox"/> Rain Barrels Provide Irrigation Location: <b>Rear Downspouts</b>
<b>Windows</b>	<input checked="" type="checkbox"/> ENERGY STAR* <input checked="" type="checkbox"/> Low E <input checked="" type="checkbox"/> High Impact <input type="checkbox"/> Storm <input checked="" type="checkbox"/> Double Pane <input type="checkbox"/> Tinted <input type="checkbox"/> Solar Shades		
<b>Day Lighting</b>	<input checked="" type="checkbox"/> Skylights - #: <b>9</b> <input type="checkbox"/> Solar Tubes - #: <b>2</b>	<input checked="" type="checkbox"/> ENERGY STAR Light Fixtures <input type="checkbox"/> Other (Explain):	
<b>Appliances</b>	ENERGY STAR Appliances: <input checked="" type="checkbox"/> Range/Top <input checked="" type="checkbox"/> Dishwasher <input checked="" type="checkbox"/> Refrigerator <input type="checkbox"/> Other:	Water Heater: <input checked="" type="checkbox"/> Solar <input type="checkbox"/> Tankless (On Demand) Size: Gal.	Appliance Energy Source: <input type="checkbox"/> Propane <input checked="" type="checkbox"/> Electric <input checked="" type="checkbox"/> Natural Gas <input type="checkbox"/> Other (Describe):
<b>HVAC (Describe in Comments Area)</b>	<input checked="" type="checkbox"/> High Efficiency HVAC - SEER: <b>14</b> <input checked="" type="checkbox"/> Programmable Thermostat	<input type="checkbox"/> Heat Pump <input type="checkbox"/> Wind	<input checked="" type="checkbox"/> Thermostat/Controllers <input checked="" type="checkbox"/> Passive Solar <input type="checkbox"/> Radiant Floor Heat <input type="checkbox"/> Geothermal
<b>Energy Rating</b>	<input checked="" type="checkbox"/> ENERGY STAR Home <input type="checkbox"/> HPwES (Home Performance with ENERGY STAR) <input type="checkbox"/> Other (Describe):	<input checked="" type="checkbox"/> Indoor Air PLUS Package <input checked="" type="checkbox"/> Energy Recovery Ventilator Unit <input type="checkbox"/> Certification Attached	
<b>HERS Information</b>		Rating:	Date Rated:    Monthly Energy Savings on Rating: \$
<b>Utility Costs</b>		Average Utility Cost: \$ <b>-0- (net)</b> per month based on: <input checked="" type="checkbox"/> Energy modeling <input type="checkbox"/> Dashboards - #: <b>1</b>	
<b>Energy Audit</b>		Has an energy audit/rating been performed on the subject property? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If yes, comment on work completed as result of audit.	
<b>Comments</b>		This home will be Energy/Performance tested and a HERS rating applied prior to occupancy. The home will be constructed using Structural Insulated Panels with a wall R-value of 25 and a roof R-value of 45. Basement walls will be insulated using DOW Thermax panels to a minimum R-Value of 13. 2" foam insulation will be installed under basement slab.  This home will be built to comply with ANSI ICC-700 The National Green Building Standard, Energy Star v3 and D.O.E.'s revised Builders Challenge Program (Challenge Home), EPA's Water Sense and Indoor Air Programs. It is a prototype home for the European developed Active House Specification which focuses on energy efficiency and alternative energy sources, resource efficiency and occupant comfort and health.  The energy efficient lighting is being integrated in its design by The University of Missouri Center for Sustainable Energy to maximize efficiency and viewing comfort of the occupants.  In addition to independent third party certification under the auspices of those programs, the energy performance and indoor air quality will be verified and monitored for the period of at least one year after occupancy to assure equipment and home performance by the University of Missouri Center for Sustainable Energy.	

\*NOTICE: The Appraisal Institute publishes this form for use by appraisers where the appraiser deems use of the form appropriate. Depending on the assignment, the appraiser may need to provide additional data, analysis and work product not called for in this form. The Appraisal Institute plays no role in completing the form and disclaims any responsibility for the data, analysis or any other work product provided by the individual appraiser(s).  
 AI Reports® AI-620.03 Residential Green and Energy Efficient Addendum    © Appraisal Institute 2011, All Rights Reserved    June 2011



# The Smith's

- “Right Sized Home”  
Built entirely of SIPS!
- Competitively Priced
- Energy Savings
- Reduced Maintenance
- Reduced Operational Cost
- = Equity





# Key Takeaways

## **Improving your Building Performance *and* your Bottom Line with SIPS!**

- New High Performance homes have grown through the protracted downturn and are expected to continue to grow during the recovery
  - Total value expecting a five fold gain in five years.
- Builders are currently doing more EE/HP work than remodelers,  
**but remodelers are catching up!**
  - The number of remodeling firms doing largely EE/HP work is going to **triple** in the next 6 years.
- Experience in EE/HP carries strong business benefits.
  - Dedicated EE/HP firms have stronger business results across the board.
  - Trend since 2008 for all builders: High Performance is more affordable and easier to implement.
- Association with quality is the driver: most important trigger for builders and second for remodelers
- Codes continue to accelerate Envelope performance requirements.
- Liability Protection
- Investment performance and Equity!

## Conclusion:

**Improving your Building Performance *and* your Bottom Line using SIPS!**

**Still Not a linear process,  
*integrated systems*  
(Affordability = Sustainability!)**



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



**Structural Insulated  
Panel Association**

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

**Thank you! Questions?**

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