



STRUCTURE
WHERE INNOVATION MEETS DESIGN

STRUCTURE

Premium Insulated Siding



ALCOA

HOME EXTERIORS

The Alcoa-Dow Partnership

- ▶ ***Combines the quality and reputation of Alcoa Home Exteriors' vinyl products***
 - ... with Dow's STYROFOAM brand in insulation products***
 - ... to produce the latest advancement in engineered siding products:***
- using extruded polypropylene (XPP) foam***
- developed exclusively for Alcoa.***
- ▶ ***If it's BLUE, it's the best!***

Material Science Synergy

▶ **Extruded polypropylene foam (XPP)**



- ▶ ***used for protecting tankers***
 - ▶ ***light weight, thermal insulation with very low water absorption***
- ▶ ***used for crash protection:***
 - ▶ ***automotive headliners***
- ▶ ***used for engine sound absorption in industrial machines***
 - ▶ ***QUASH© PP/PE foam***

▶ **Now ALCOA STRUCTURE**

- ▶ ***Styrofoam XPP Insulation – Vinyl Siding Panel***

Why Polypropylene?

- ▶ ***Other insulated vinyl siding offerings are based on expanded polystyrene (XPS) (beadboard)***

- ▶ ***disposable coffee cup***

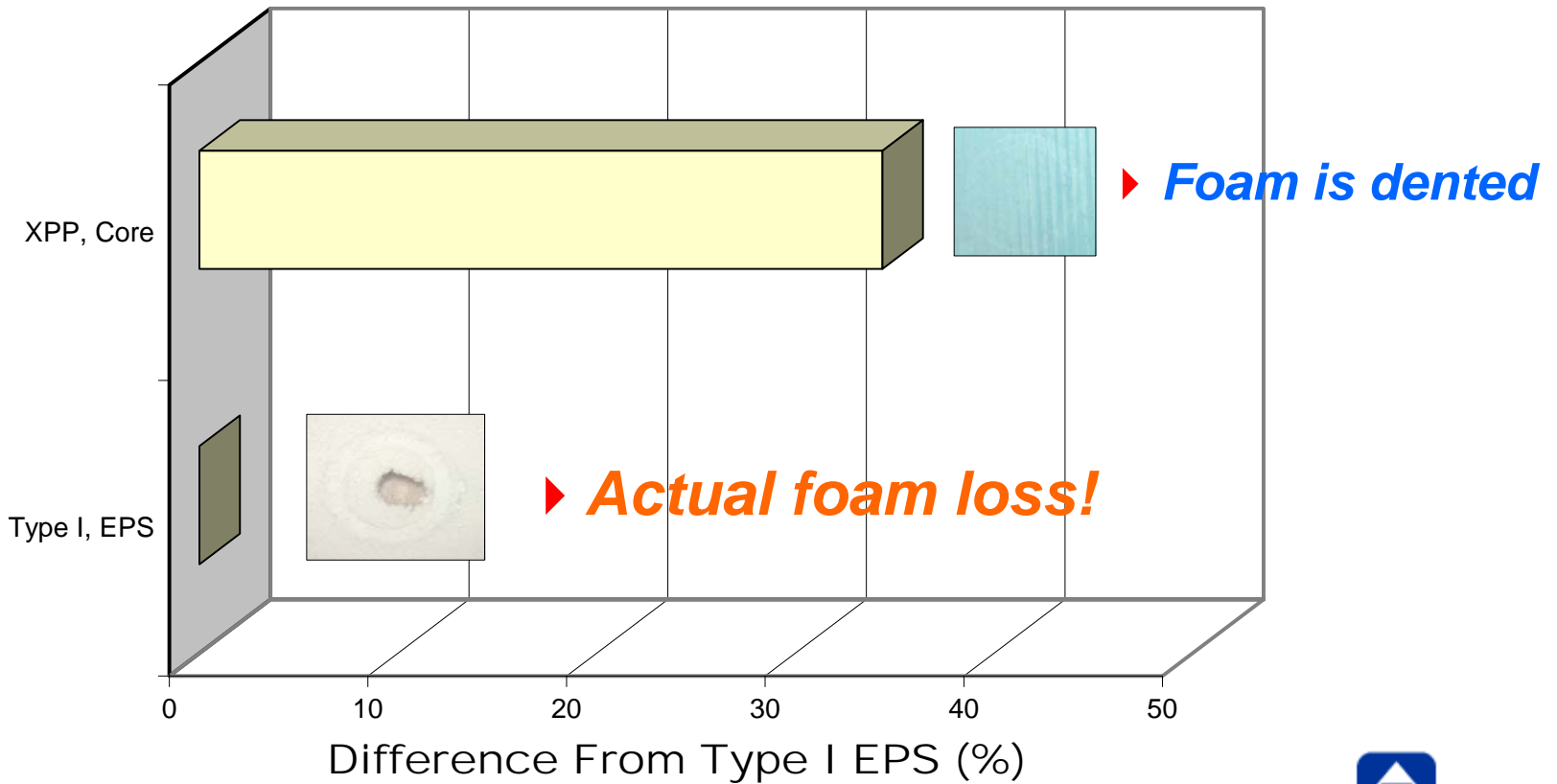


- ▶ ***Polypropylene is tougher***

- ▶ ***Withstands rough handling on the job site***
 - ▶ ***Measured in Laboratory Impact Testing***

Polypropylene is Tougher

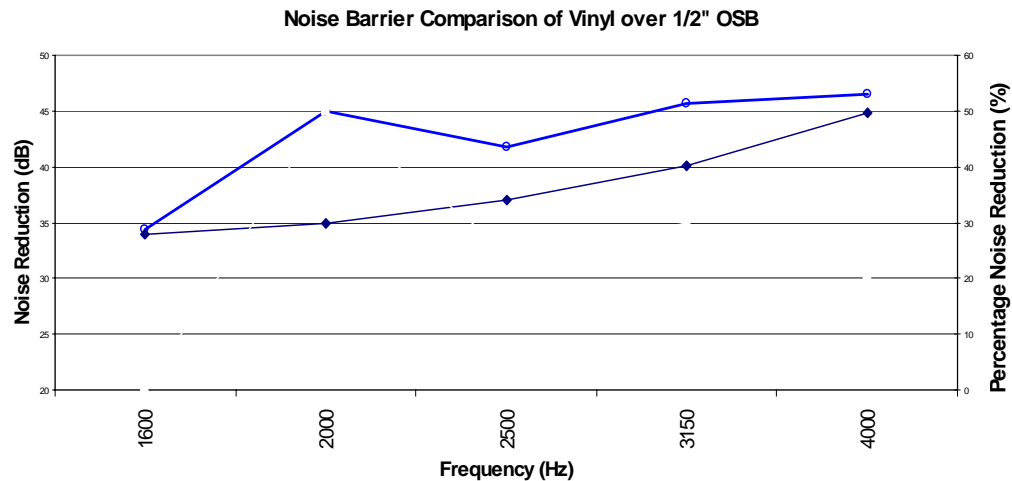
Impact Strength - ASTM D3763



Polypropylene Creates a Sound Barrier

▶ ***Polypropylene foam can offer noise reduction:***

- ▶ ***Provides improvement* in laboratory testing compared to siding with no foam***



Note *: Comparing exterior siding components mounted on OSB only in laboratory testing. Actual performance may vary depending on the full wall assembly and construction. ASHRAE Fundamentals Handbook (p 22.3) acknowledges that “some thermal insulation materials are used as acoustical control materials.”

Challenges to the Building Market

- Energy efficiency
- Effective insulation
- Improved Comfort and Feel



Cost of Energy

***The cost of energy continues to escalate.
Energy efficiency is of growing concern.***

Cost of Energy

- ▶ ***Energy bill for an average family in the U.S. has increased 25% since 1998.***
- ▶ ***Americans spend \$131 billion each year on household energy costs.***
- ▶ ***Home heating and cooling payments are the single largest payment for families after the mortgage.***
- ▶ ***Low-income families spend a quarter of their household income on winter heating bills.***

Over Time

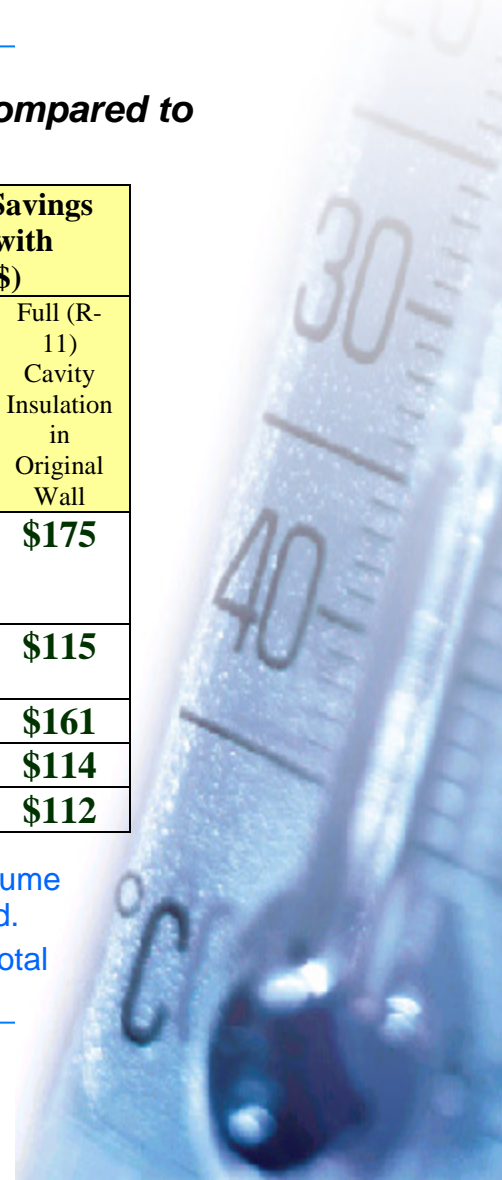


Cost of Energy

Relative savings of STRUCTURE in a hot humid climate compared to original wood sided wall:

Climate Region	City	State Residential Gas Cost ² (\$/Therm)	State Utility Cost ³ (\$/kWh)	Estimated Yearly Savings From Residing with Structure™ (\$)		
				No Cavity Insulation in Original Wall	Some (R5 to R8) Cavity Insulation in Original Wall	Full (R-11) Cavity Insulation in Original Wall
Cold Dry	Minneapolis, MN	0.88	0.072	\$306	\$214	\$175
Mixed Humid	Charleston, SC	1.31	0.085	\$176	\$133	\$115
Hot Dry	Phoenix, AZ	1.26	0.074	\$216	\$177	\$161
Hot Humid	Miami, FL	1.77	0.090	\$140	\$121	\$114
	Houston, TX	0.91	0.088	\$152	\$124	\$112

- ▶ Estimated savings are based on 1000 ft² of opaque wall area, an internal volume of 10000 ft³ and are based on heating and cooling savings over a year period.
- ▶ Projected savings include estimated air infiltration reduction of 0.25 ACPH. Total projected savings are average.



Understanding Insulation

What is Insulation? Is it...

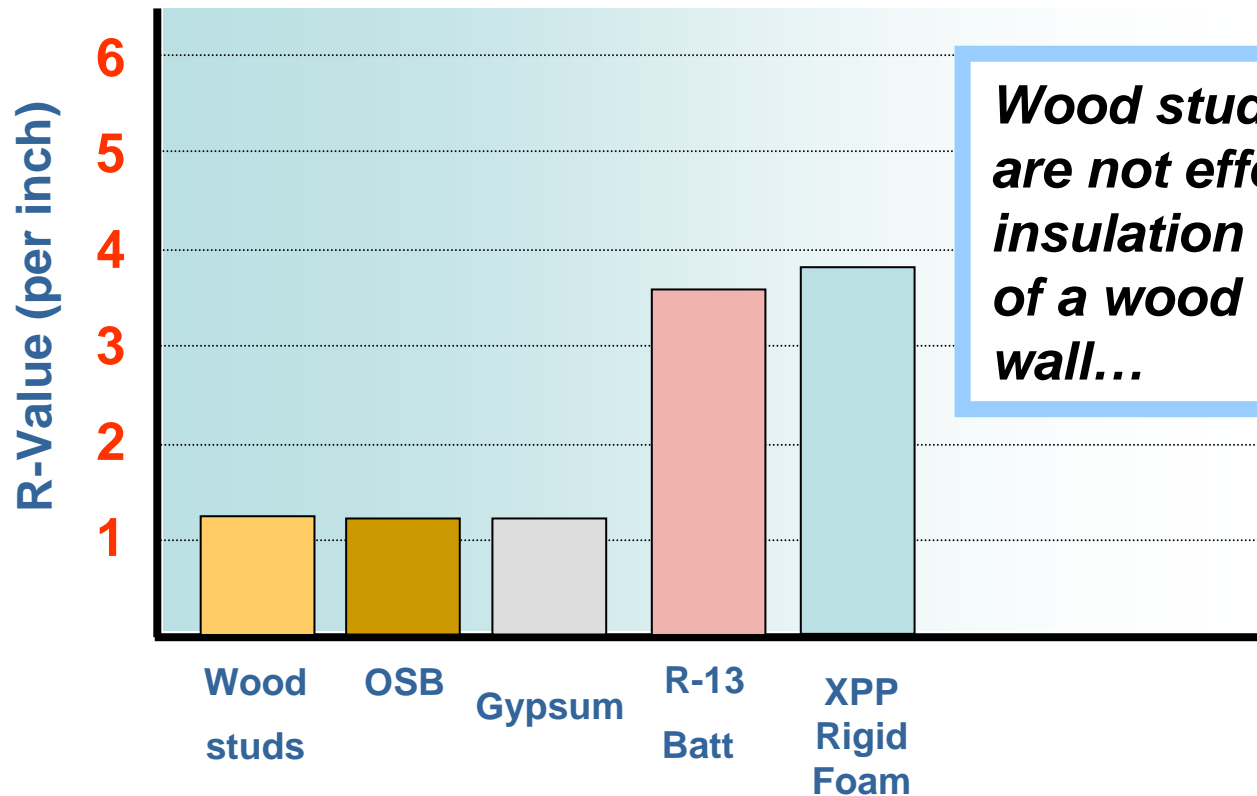
- A. The glass fibers in fiberglass insulation.***
- B. The paper fibers in cellulose insulation.***
- C. The plastic resin in rigid foam insulation.***
- D. All of the above.***
- E. The trapped air in any carrier material.***

Understanding Insulation

- ▶ *Insulation is basically trapped air.*
- ▶ *Carrier materials create compartments to trap air.*
- ▶ *Generally, the more compartments of air across the same span, the greater the thermal resistance.*
- ▶ *If insulation is compressed, its R-value is reduced.*
- ▶ *If moisture takes over the compartments of air, its R-value is reduced.*
- ▶ *If the air is forced to move from air infiltration or convection, then the insulation is less efficient.*

Understanding Insulation

R-values of various products:

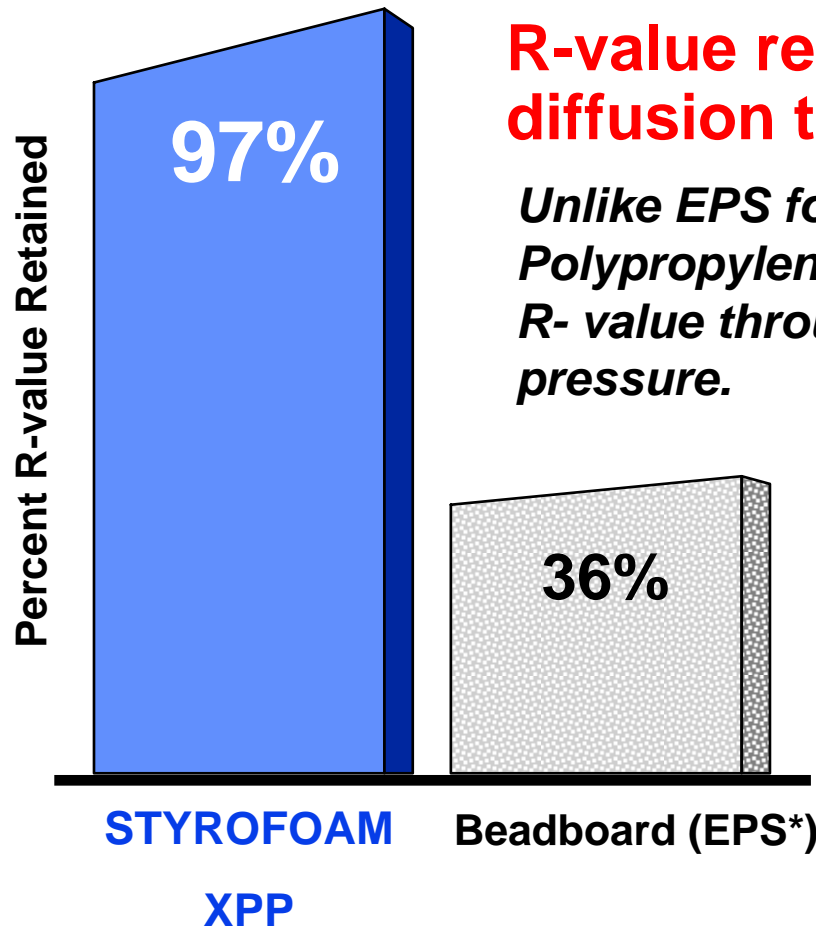


Wood stud or drywall are not effective insulation components of a wood framed wall...

Understanding R-Value

- ▶ ***R-Value = Measurement of Thermal Resistance.***
- ▶ ***The higher the R-Value the greater the resistance to heat transfer***
 - ▶ ***Example: R-30 resists heat transfer greater than R-15.***
- ▶ ***XPP foam:***
 - 1. Absorbs less water***
 - 2. Retains more R-value over time***

XPP Retains More R-Value Over Time



R-value retention in water vapor diffusion test (28 days).

Unlike EPS foams, STYROFOAM Extruded Polypropylene Insulation retains nearly all of its R-value through exposure to water vapor pressure.*

European Water Vapor Diffusion Test, EN 12088

Note*: Published value from Dechow and Epstein, "Laboratory and Field Investigations of Moisture Absorption and Its Effects on Thermal Performance of Various Insulations", ASTM STP 660, 1983.

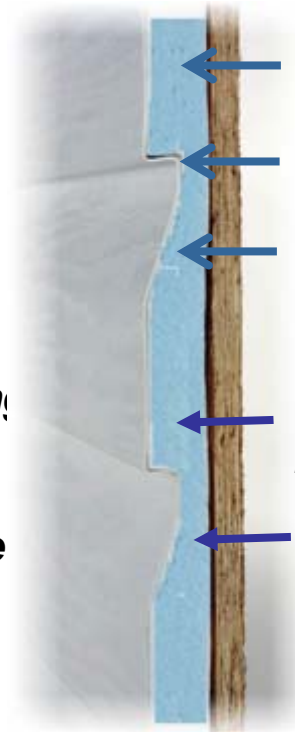
The XPP/Vinyl System Performs Better

Comparing the systems:



- ← *High vapor permeance.*
- ← *High water absorption.*
- ← *Less impact resistance*
- ← *Effective sound dampening properties.*
- ← *Lower performing R-Value*

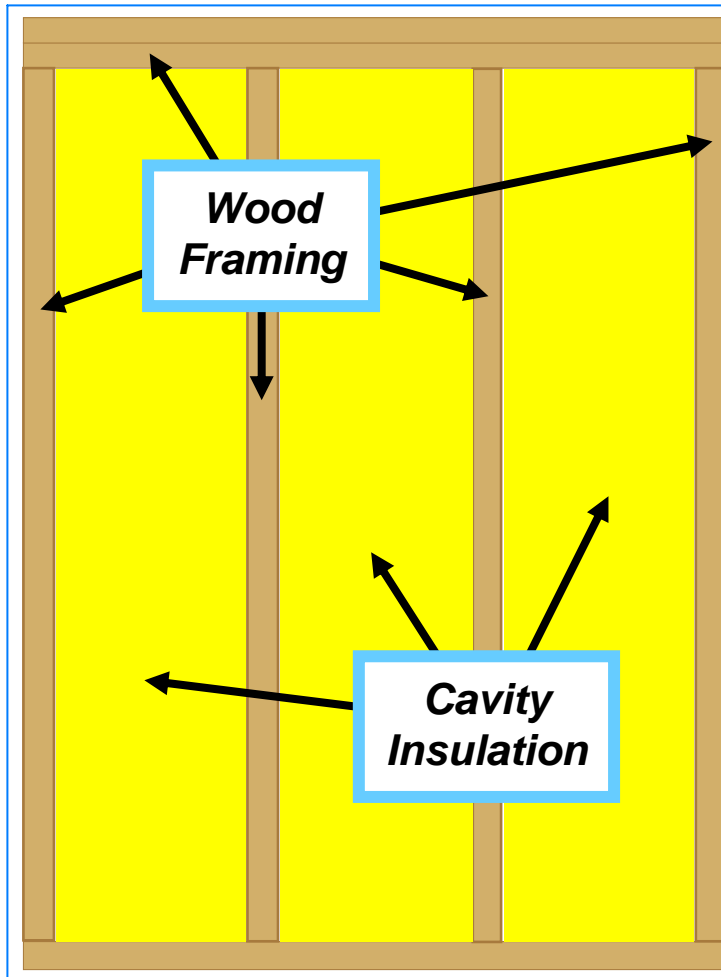
Contoured EPS



- ← *Low vapor permeance. (NOT a vapor barrier)*
- ← *Low water absorption.*
- ← *34% improvement in impact resistance*
- ← *Effective sound dampening properties.*
- ← *Higher performing R-Value*

Contoured XPP

Framing versus Cavities



The framing creates the structure of the house.

Cavities are a by-product of the structure.

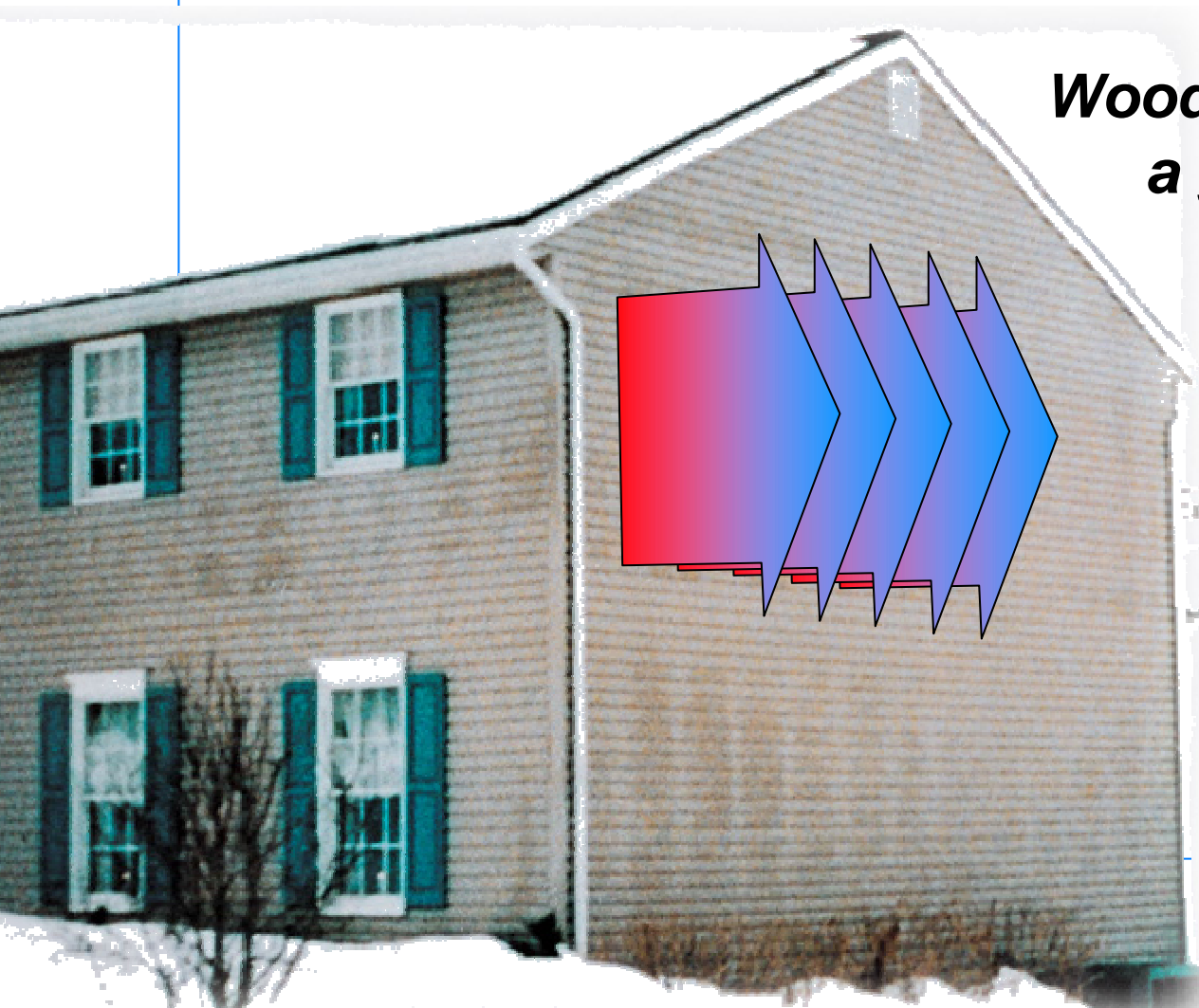
Thermal Bridging - Stud Loss



*What is
Thermal
Bridging?*

***Energy
loss
through
wood
framing.***

Thermal Bridging - Stud Loss



***Wood framing is not
a good insulator.***

***Heated and cooled
air is “bridged”
through uninsulated
wood framing.***

Thermal Bridging - Stud Loss



***Note the surface area
of the wood without
additional framing for
windows and doors.***

Thermal Bridging - Stud Loss



*Remove the wood
framing and ask...*

***Is this wall
insulated?***

Thermal Bridging - Stud Loss



Now it is!

A layer of insulated sheathing covers the entire opaque wall, including the framing.

This can be approximated with ALCOA Structure panels.

The Bottom Line



BUILDING BETTER.
**Residing
solutions.**

Better buildings begin with better materials ... and knowledge.

STRUCTURE meets the Energy Star requirement as a product which can save energy and protect the environment.