

# Insulated Sheathings

Not just for Energy Savings

Dan Tempas  
Sr. Research Engineer



# Insulated Sheathings

## Energy Savings

- Why they work
- What difference Does it Make?

## Moisture Performance

- Condensation
- Evaluation
- Reduction
- Execution

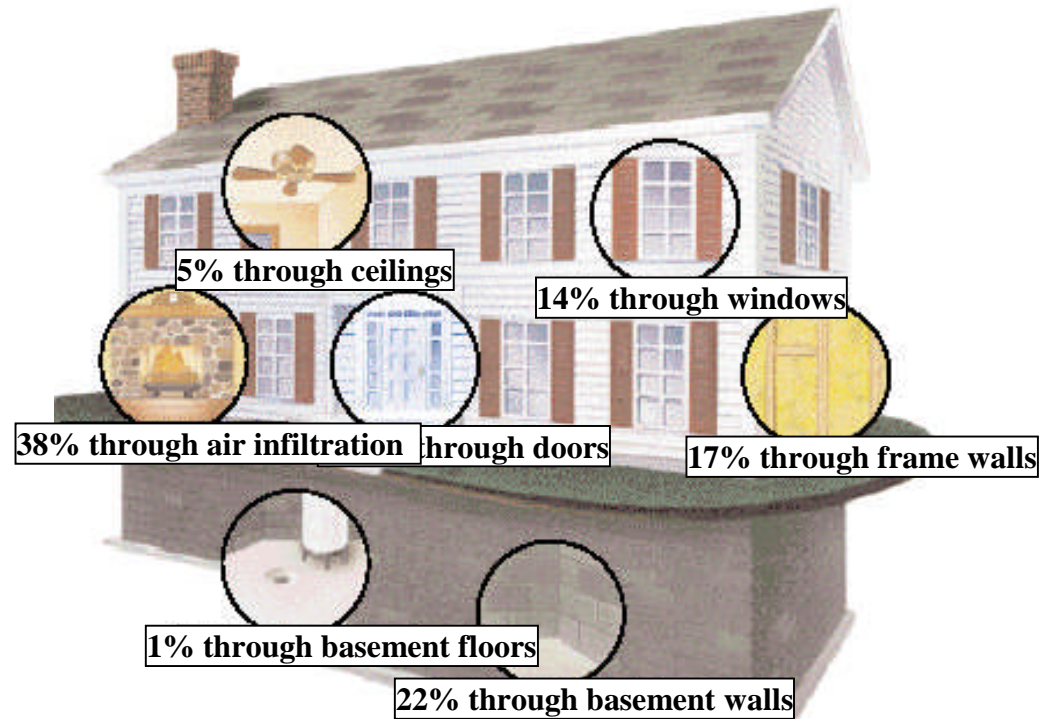
# Insulated Sheathings

## Energy Savings

- Why they work
- What difference Does it Make?

# Why They Work

Walls:  
Significant Loss



# Why They Work



Wood: ~1 R/inch

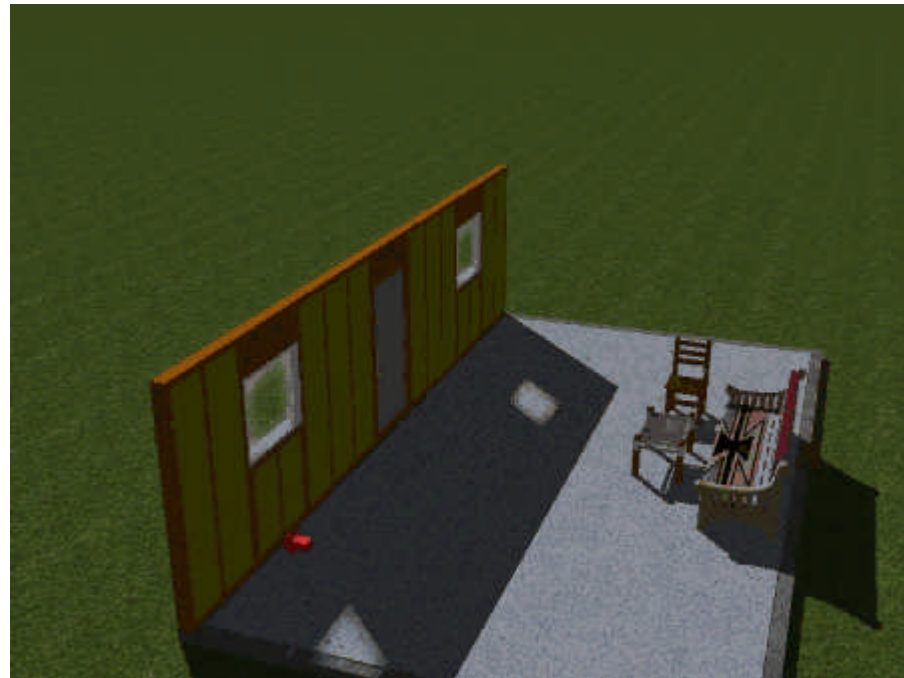


Batts: 3.1-4.3 R/inch

# Why They Work

## Thermal Shorts

Wood: 1/ inch  
Batts: 3.5/inch



# Why They Work



Wood: ~1 R/inch



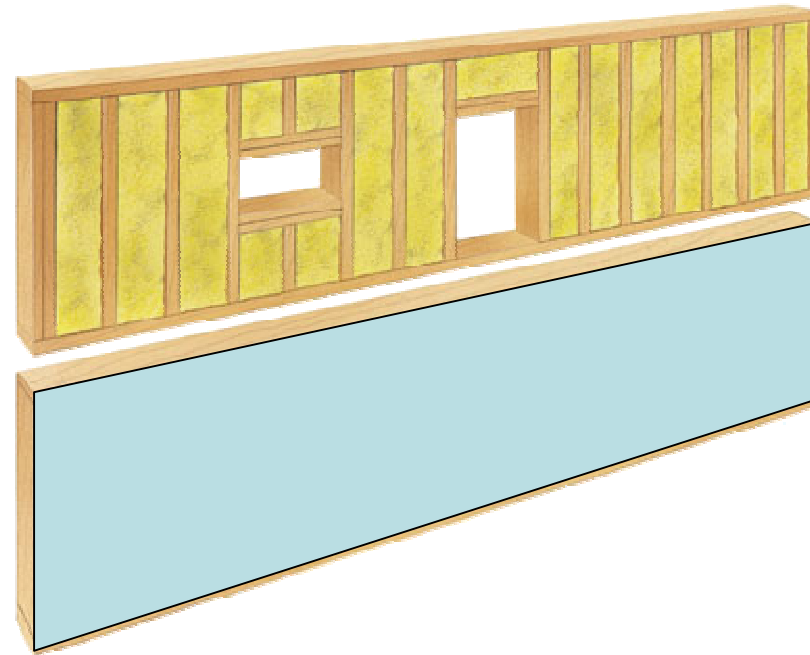
Foam: 5-6.5 R/inch

# Why They Work

## Thermal Shorts

Wood: 1/ inch

Foam: 5-6.5/inch



# Why They Work

R-11 Batts



$$U=0.0938 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=10.7$$

R-15 Batts



$$U=0.0808 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=12.4$$

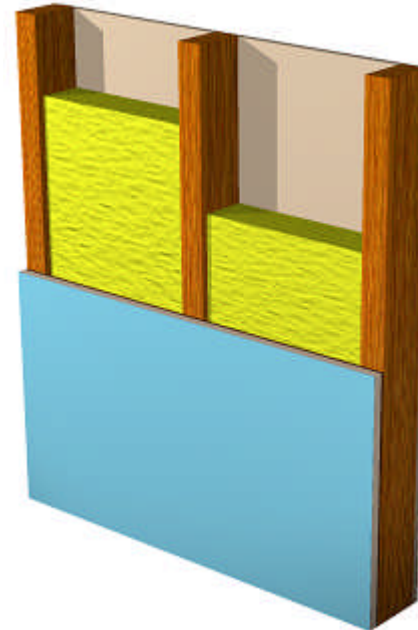
# Why They Work

R-11 Batts



$$U=0.0938 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=10.7$$

R-11 Batts + R5.5 ci



$$U=0.0624 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=16.0$$

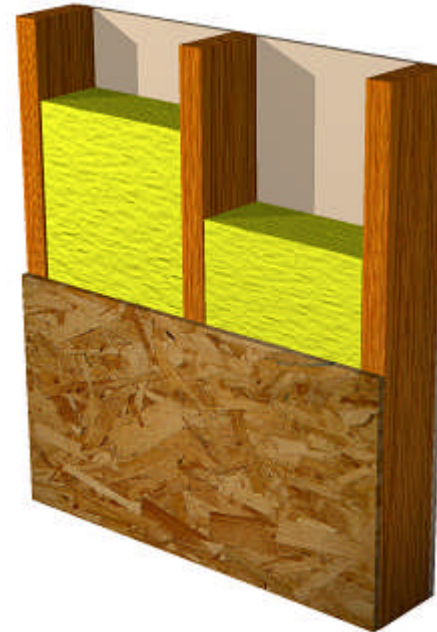
# Why They Work

R-15 Batts



$$U=0.0808 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=12.4$$

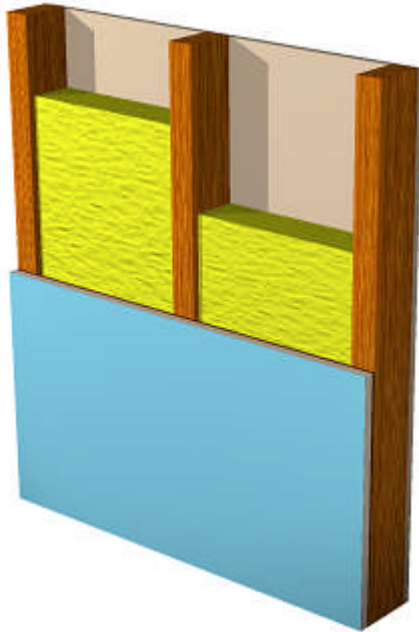
R-19 Batts



$$U=0.0624 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=16.0$$

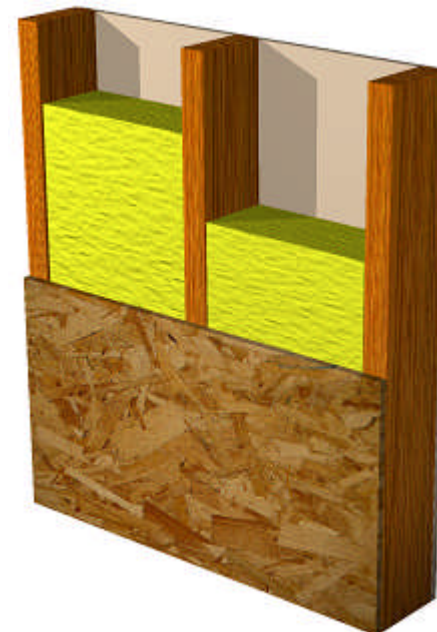
# Why They Work

R-15 Batts + R5.5ci



$$U=0.055 \text{ BTU/hr ft}^2 \text{ } ^\circ\text{F}$$
$$R_T=18.2$$

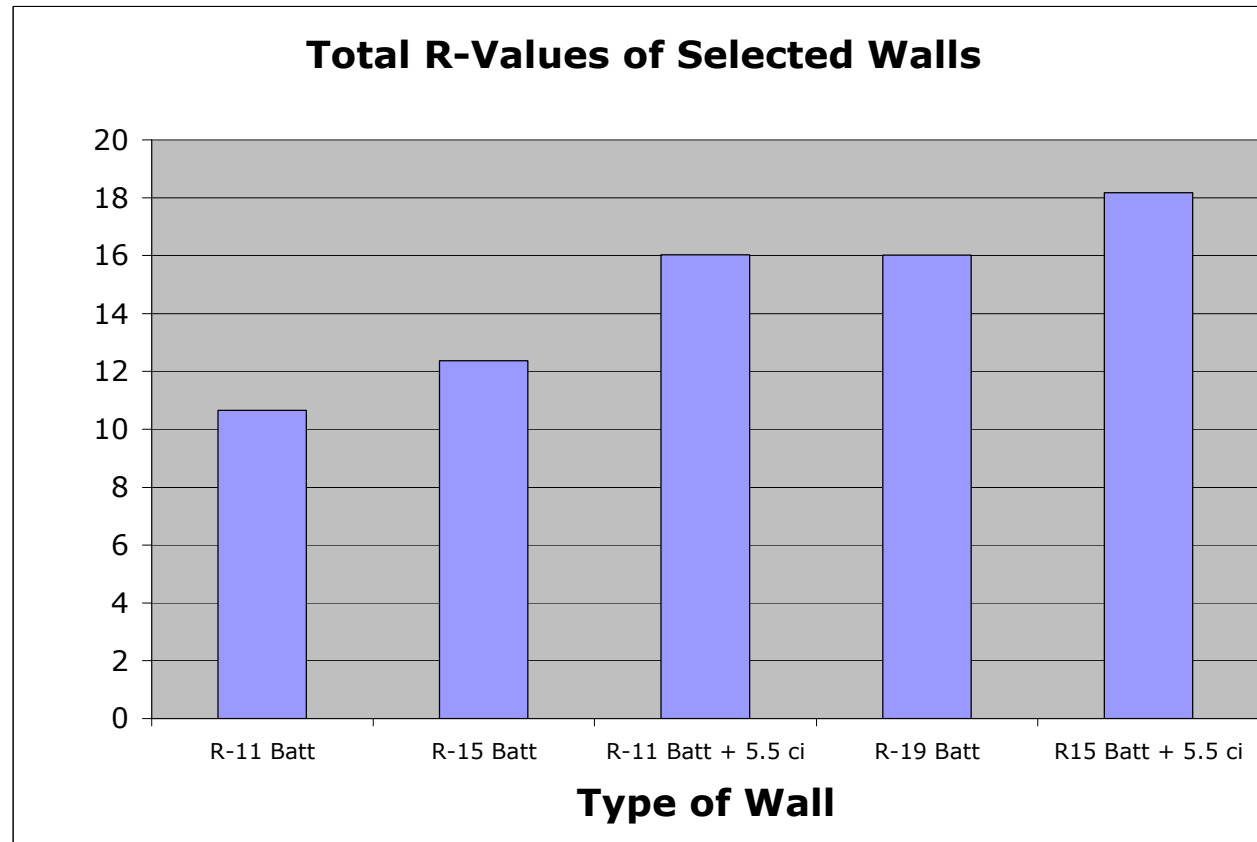
R-19 Batts



$$U=0.0624 \text{ BTU/hr ft}^2 \text{ } ^\circ\text{F}$$
$$R_T=16.0$$

# Why They Work

## Summary



# Why They Work

## What difference does that make?

R-11 Batts



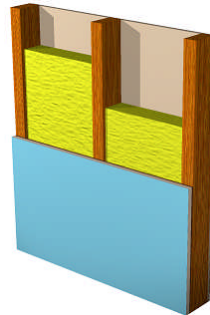
$U=0.0938$   
 $R_T=10.7$

R-15 Batts



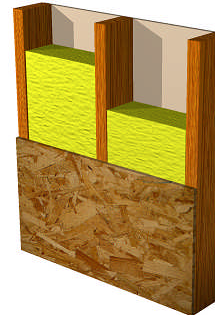
$U=0.0808$   
 $R_T=12.4$

R-11 Batts + 5.5ci



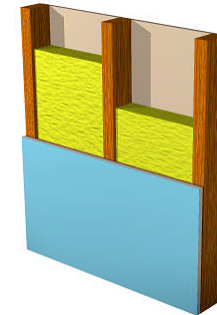
$U=0.0624$   
 $R_T=16.0$

R-19 Batts



$U=0.0624$   
 $R_T=16.0$

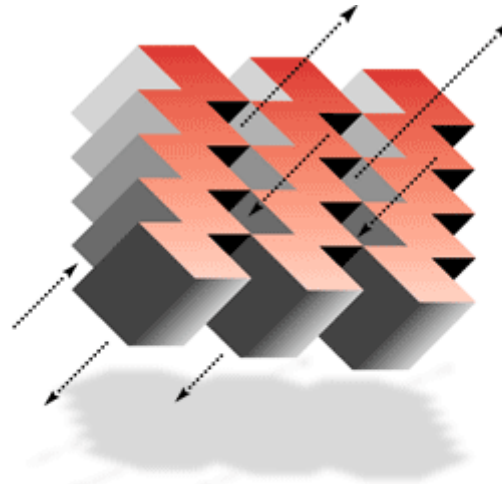
R-15 Batts + 5.5ci



$U=0.055$   
 $R_T=18.2$

# Why They Work

## What difference does that make?



**ARCHITECTURAL ENERGY**  
C O R P O R A T I O N

*Integrated Engineered Solutions*

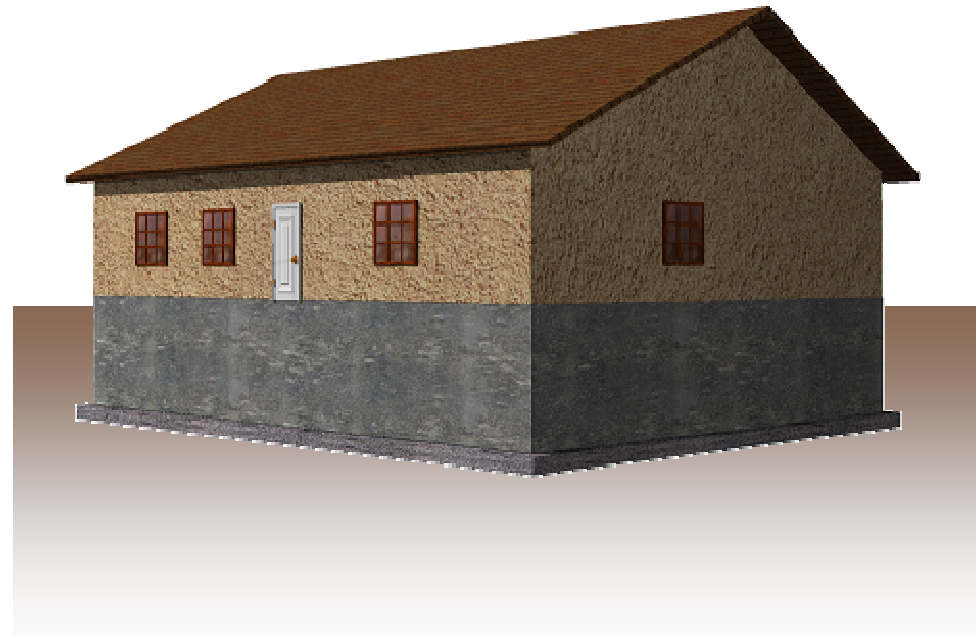


# Why They Work

## What difference does that make?

### Specifics

- 40x50 footprint
- Single Storey (9')
- 2000 square feet
- Full basement (9')
- 200 ft<sup>2</sup> low E windows
- In Chicago
- No attached garage
- 13 SEER
- 92 AFUE
- 0.25 ACH



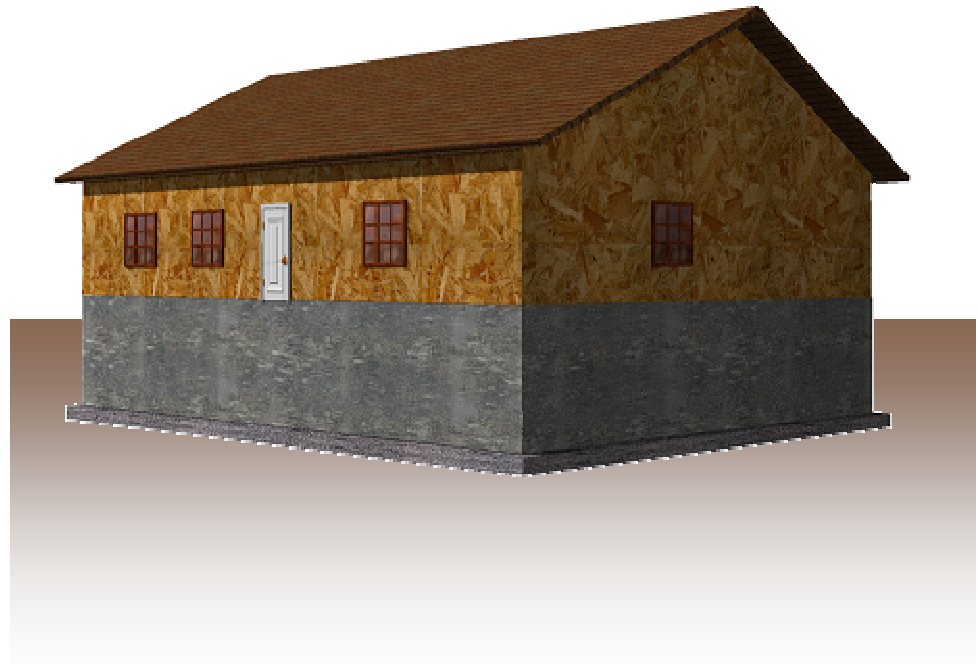
# Why They Work

## What difference does that make?

### Results

- Rating: 96

(no insulated sheathing)

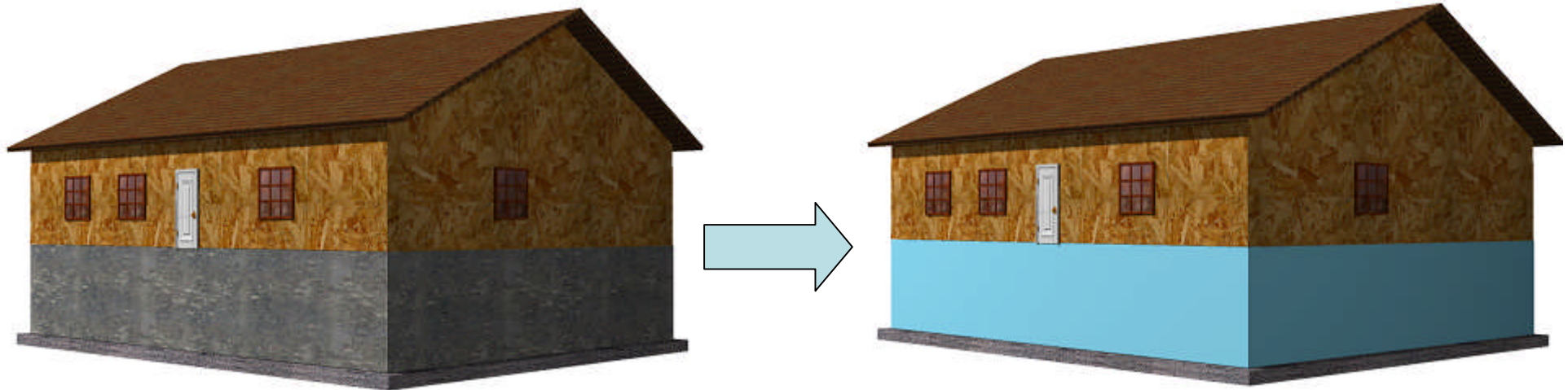


# Why They Work

## What difference does that make?

### Results

- Rating: 96 → 88
- (+R-5 Foundation Insulation)

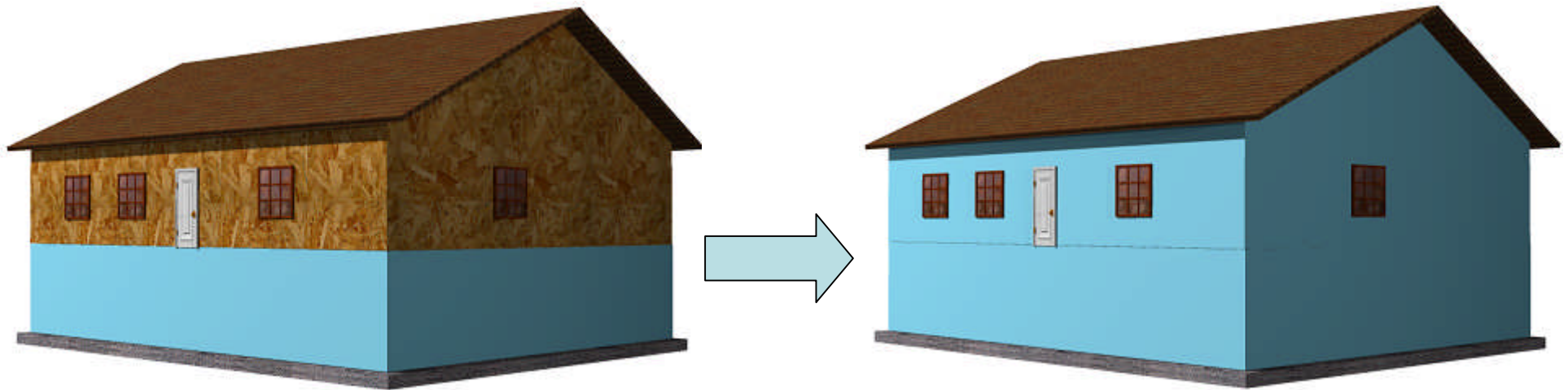


# Why They Work

## What difference does that make?

### Results

- Rating: 88 → 84
- + R-5.5 Sheathing



# Why They Work

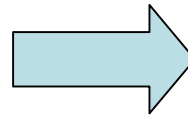
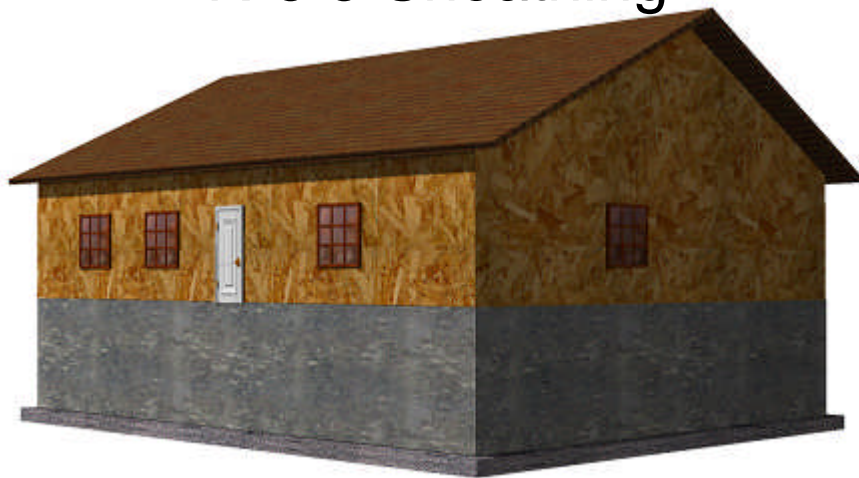
## What difference does that make?

### Results

•Rating: 96 → 84

+R-5 Foundation Insulation

+ R-5.5 Sheathing



# Insulated Sheathings

## Energy Savings

- Why they work
- What difference Does it Make?

## Moisture Performance

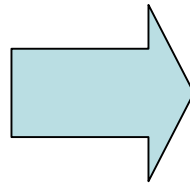
- Condensation
- Evaluation
- Reduction
- Execution

# Condensation

## What is Condensation?



**Vapor  
(fog)**



**Liquid  
(water)**

# Condensation

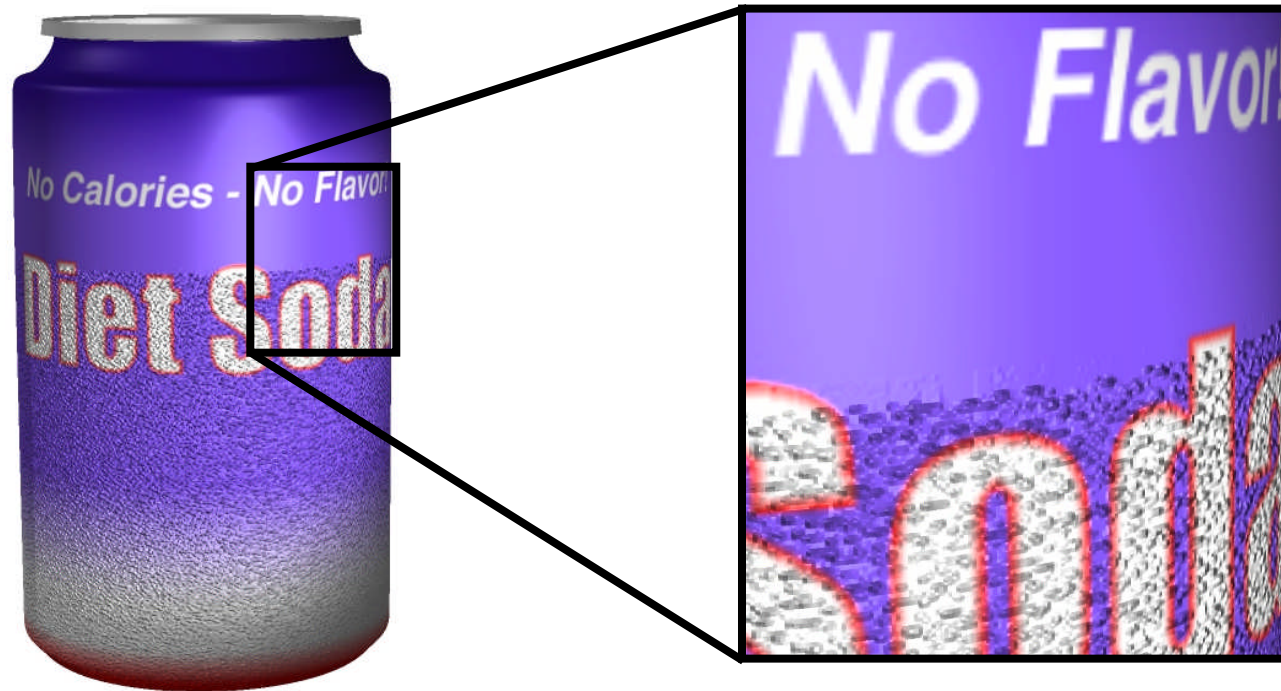


Warm

Cold

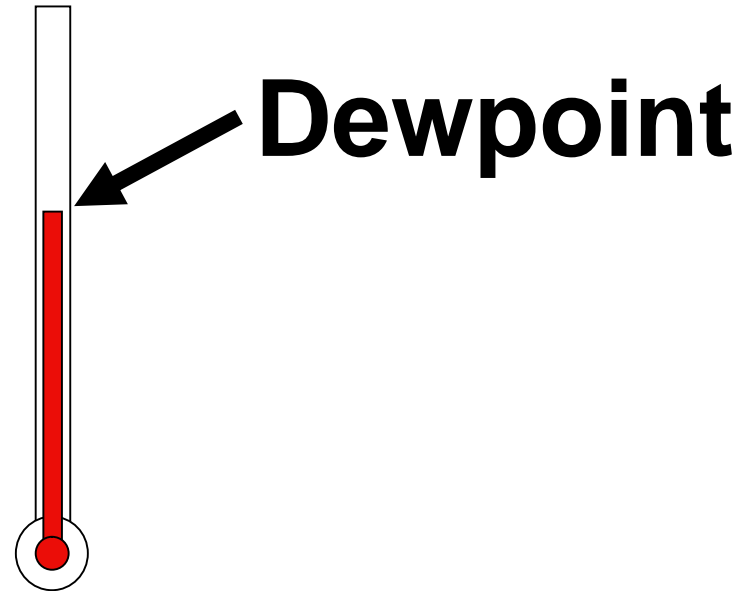
## Temperature!

# Cold Causes Condensation

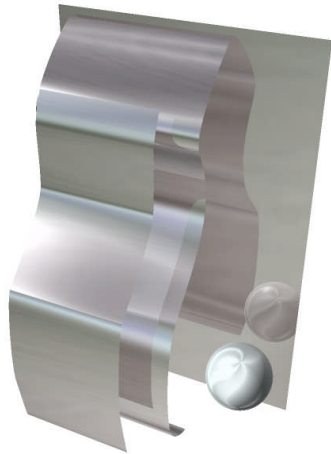


Temperature -> Condensation

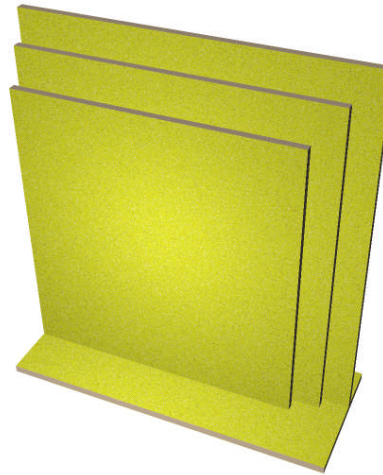
# Cold Causes Condensation



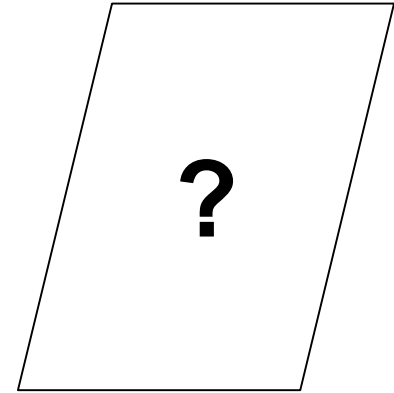
# Cold Causes Condensation



**Aluminum**



**Gypsum**

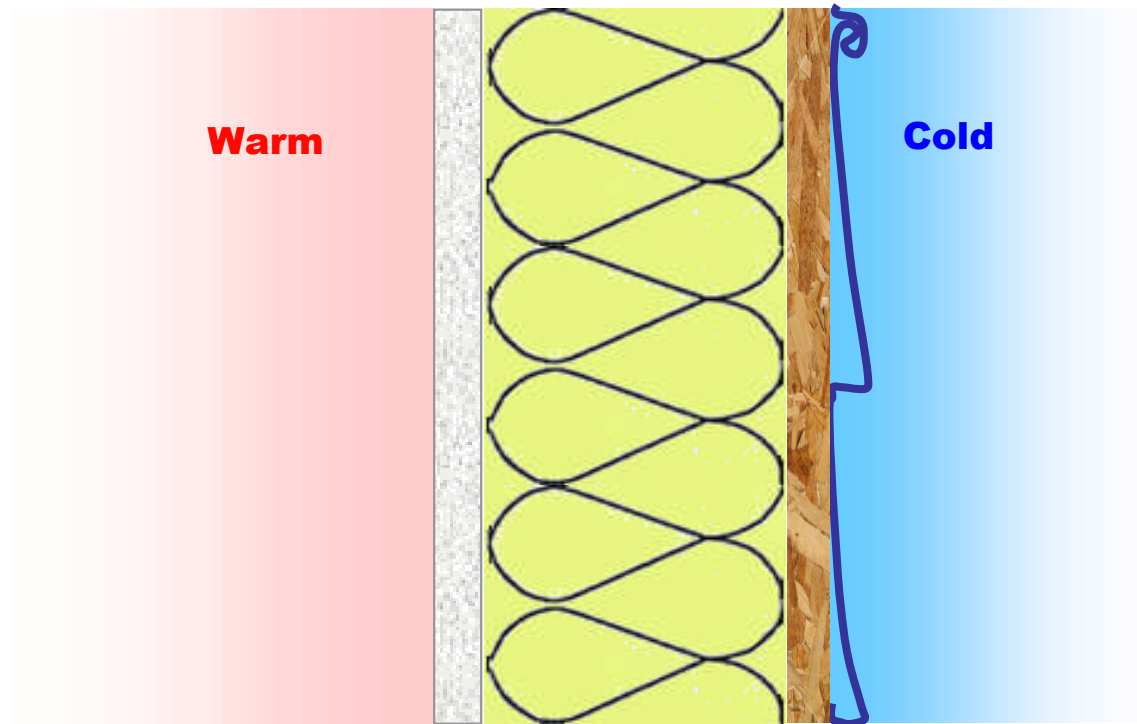


**Other**

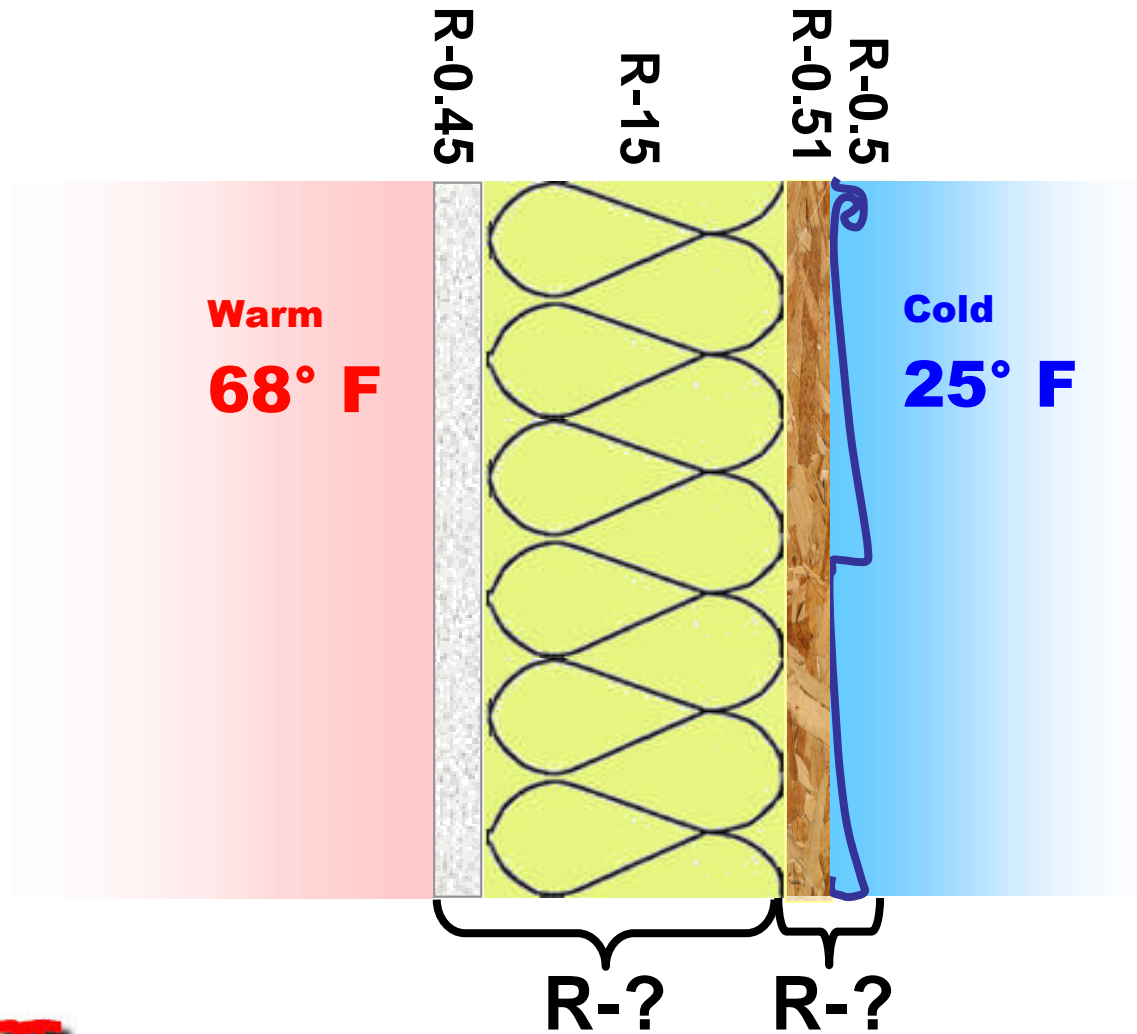
**Material doesn't matter,  
only Temperature**

# Evaluation

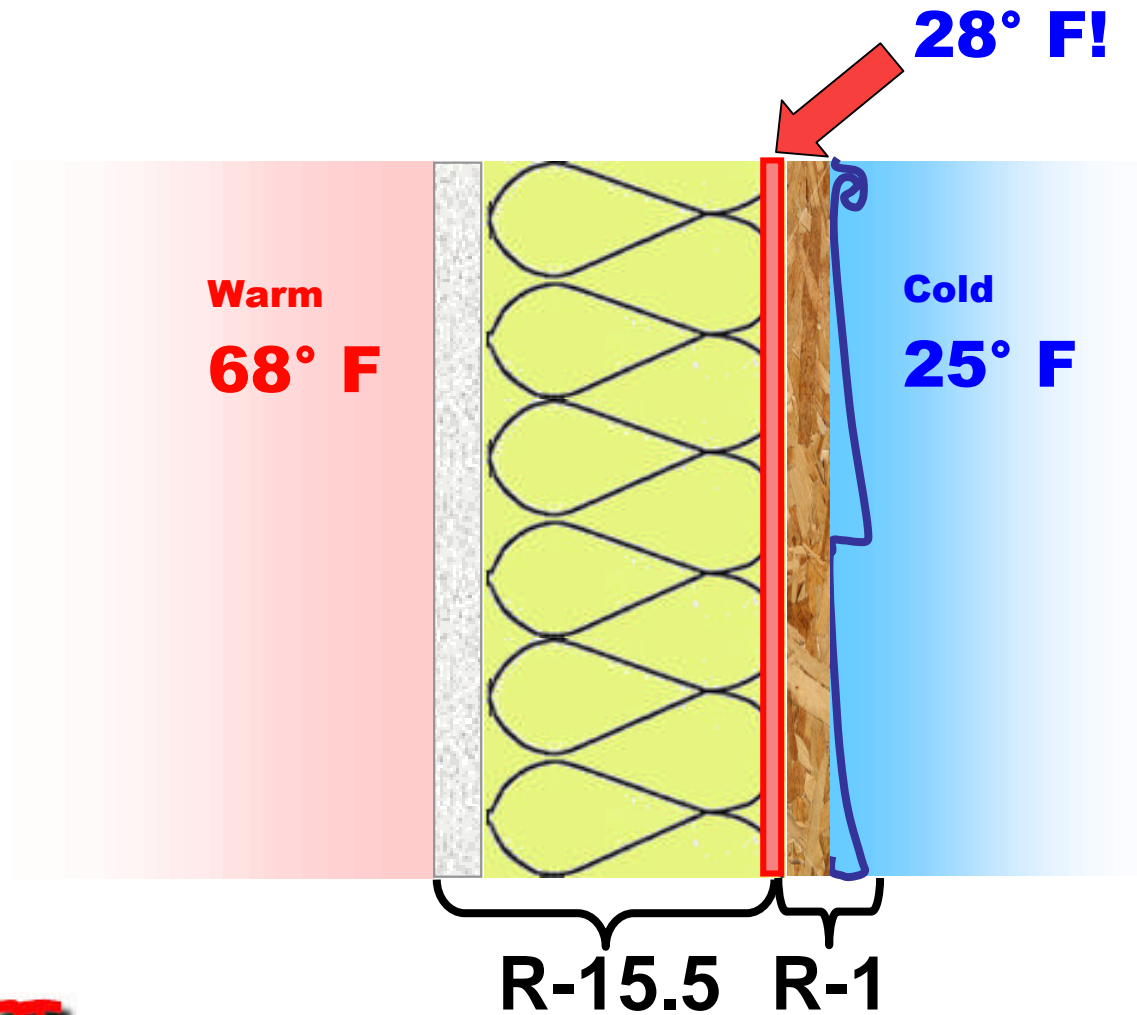
So...



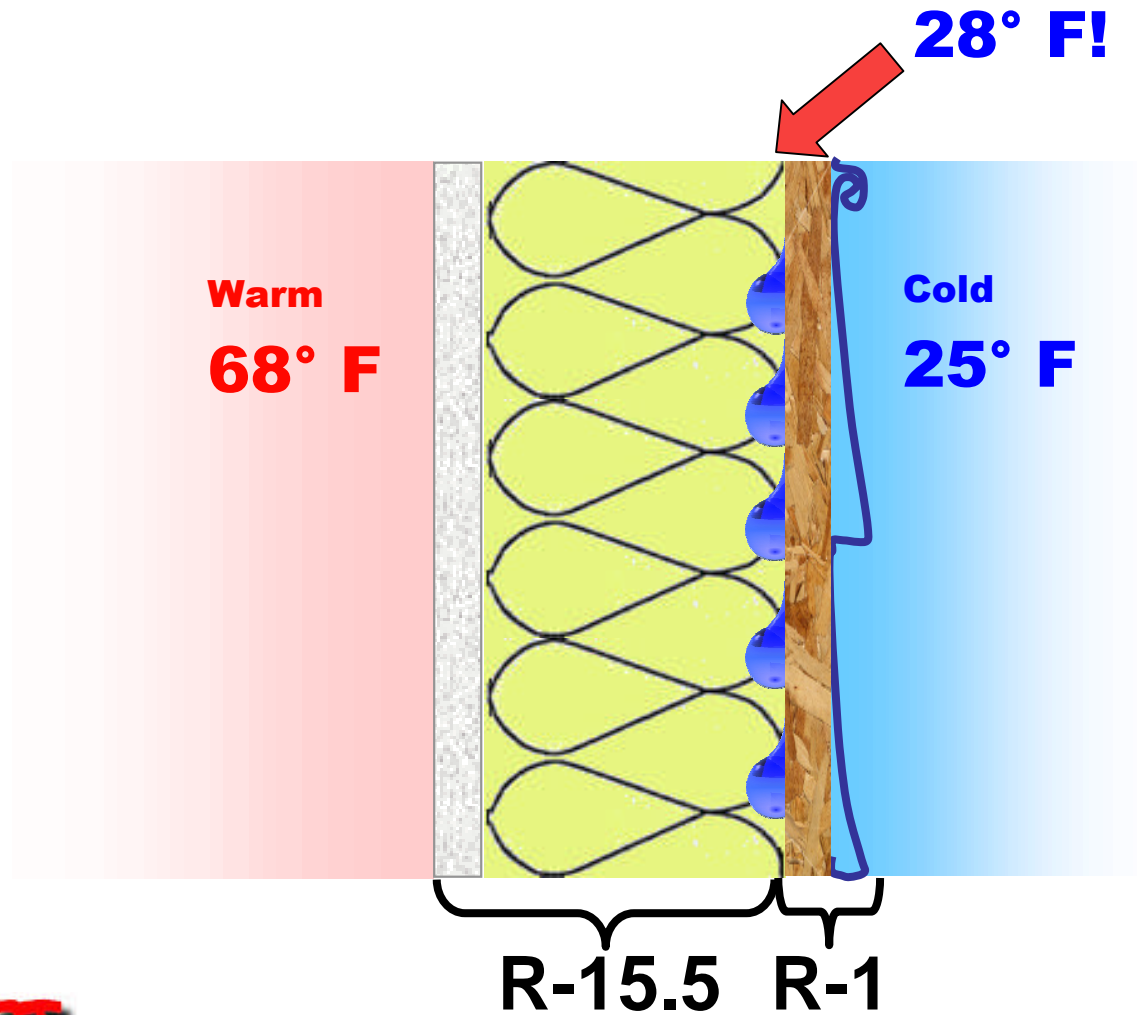
# Evaluation



# Evaluation



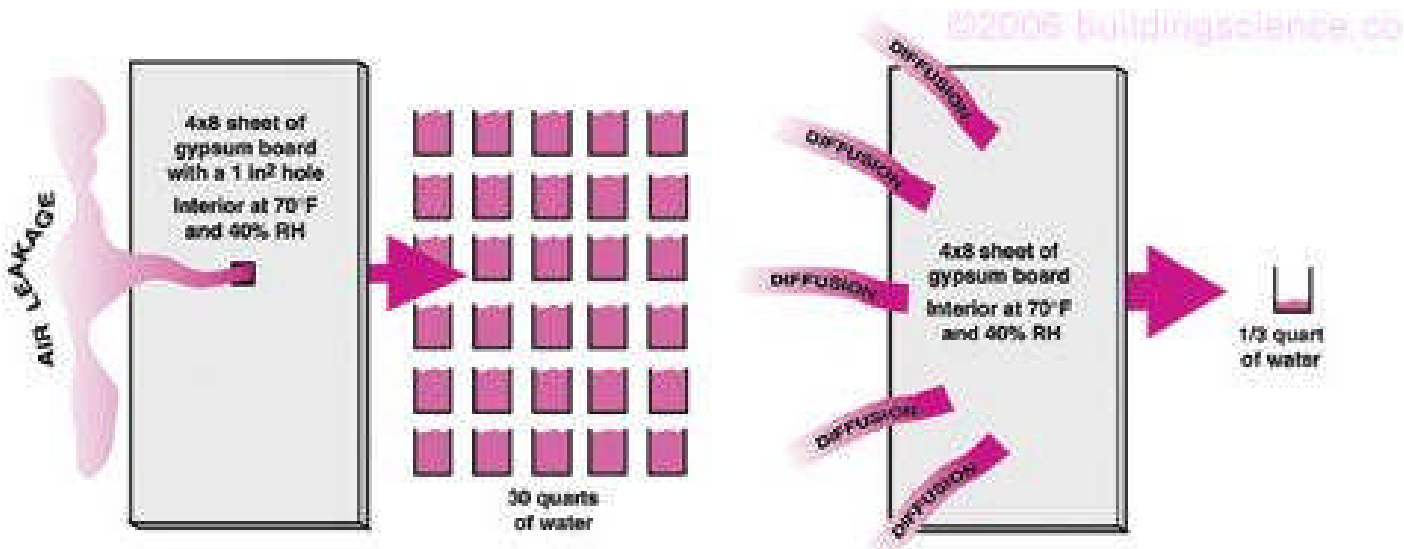
# Evaluation



# Evaluation



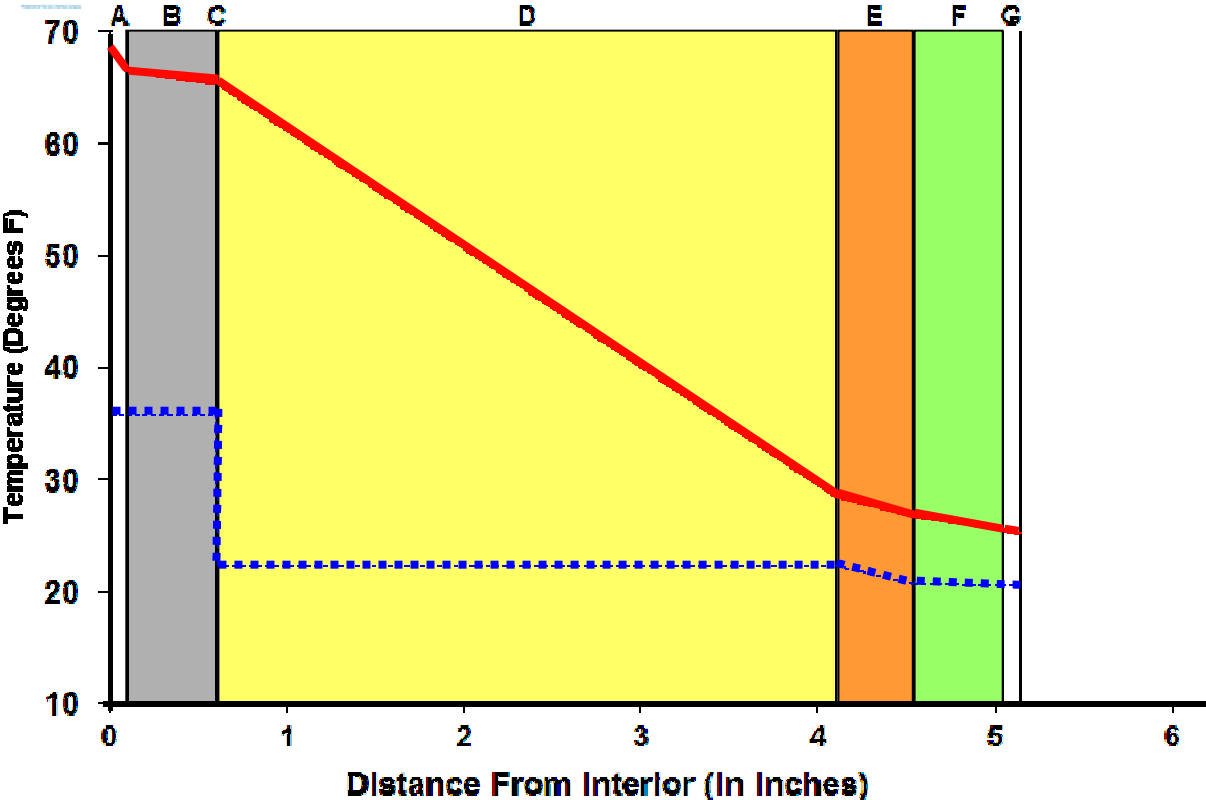
# Evaluation



# Evaluation

## Dewpoint Analysis - Dow Chemical

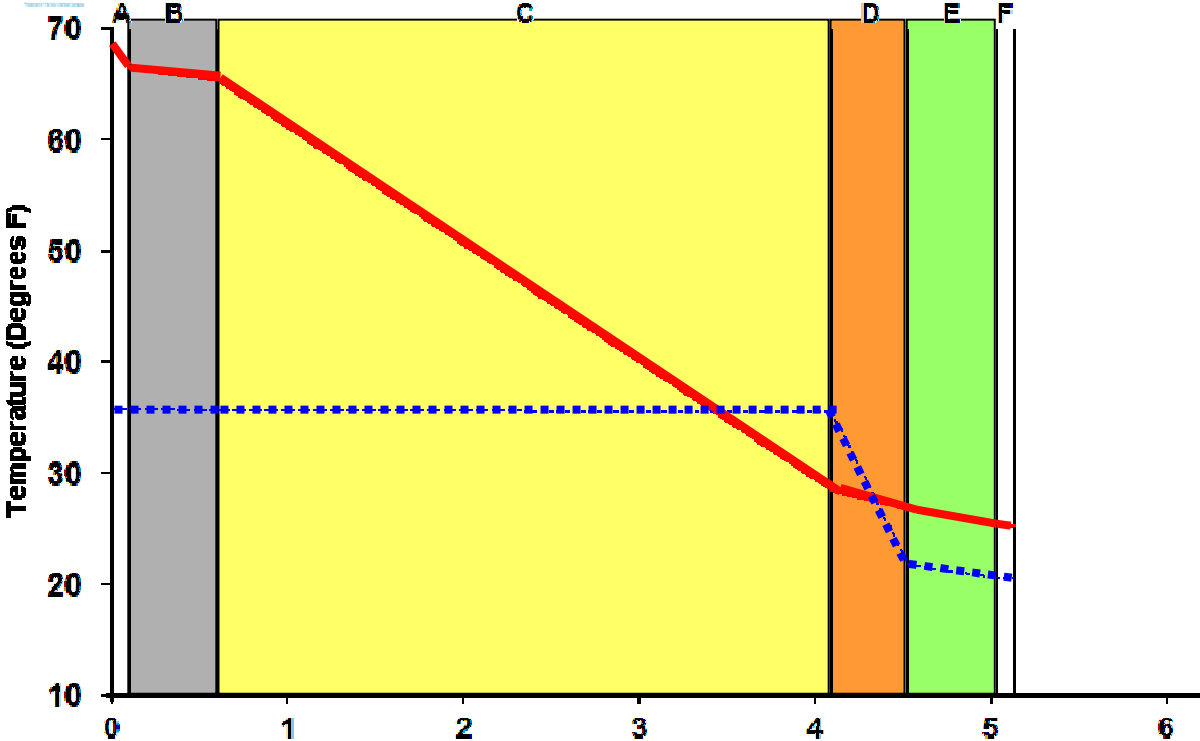
Wood Stud Wall and OSB Sheathing with Vapor Barrier



# Evaluation

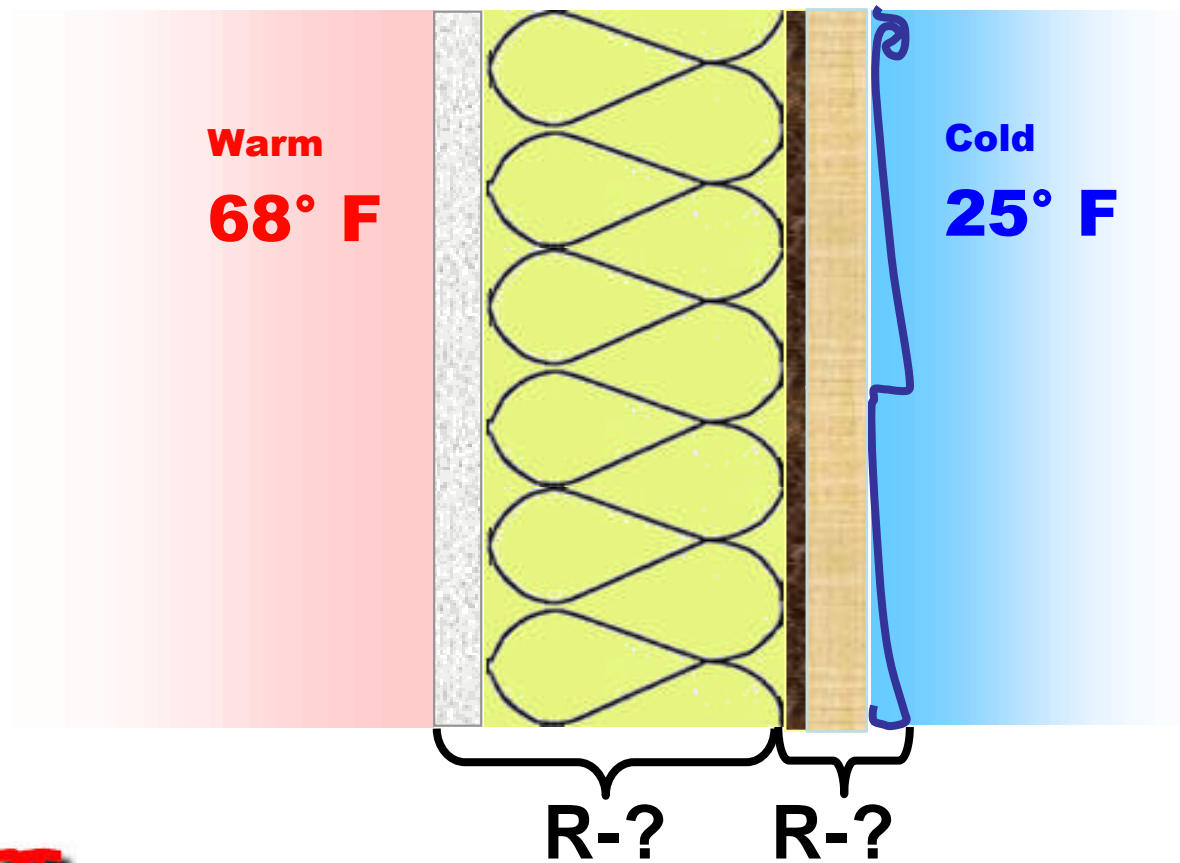
## Dewpoint Analysis - Dow Chemical

Wood Stud Wall and OSB Sheathing



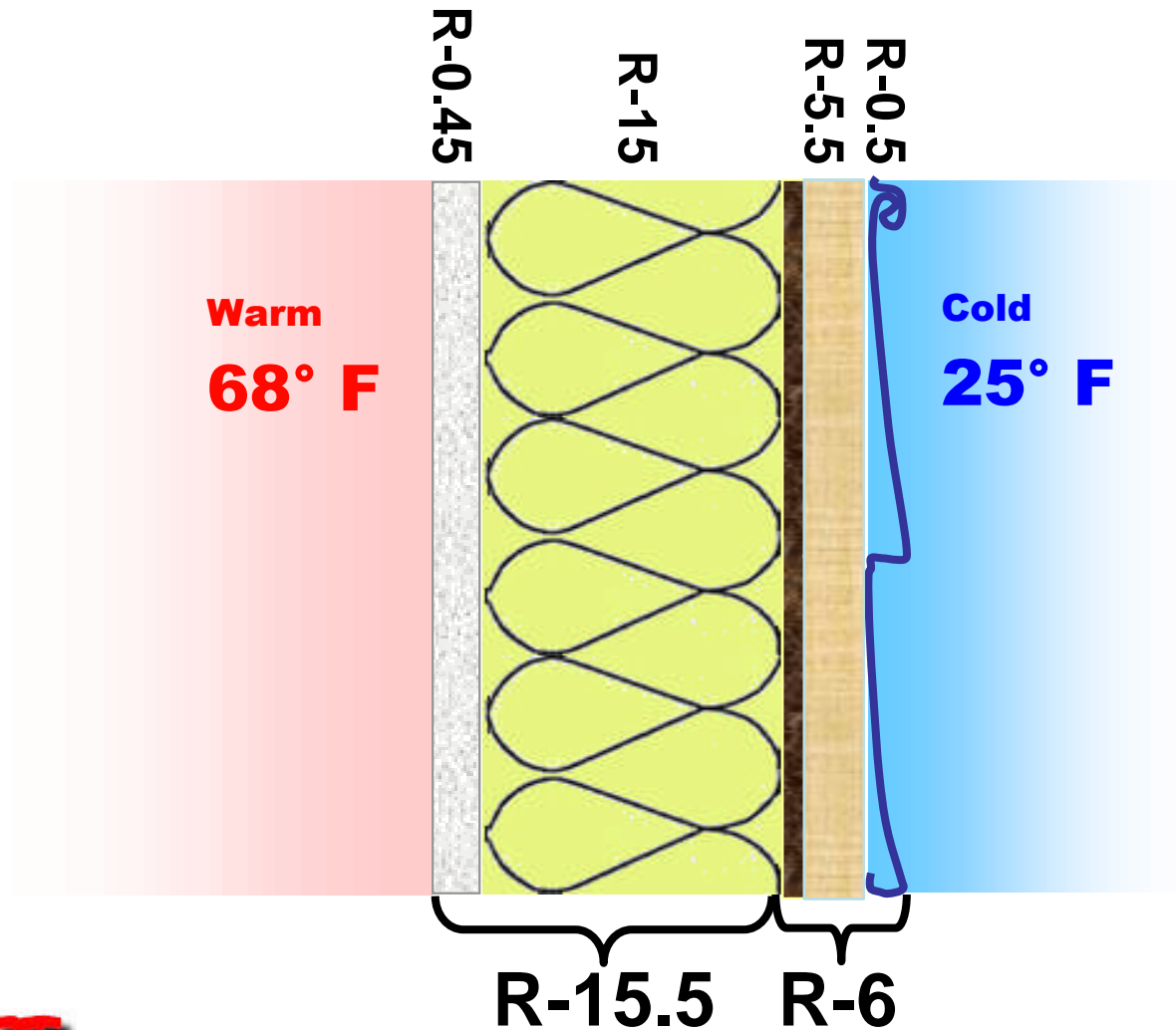
# Reduction

## Insulating Sheathing



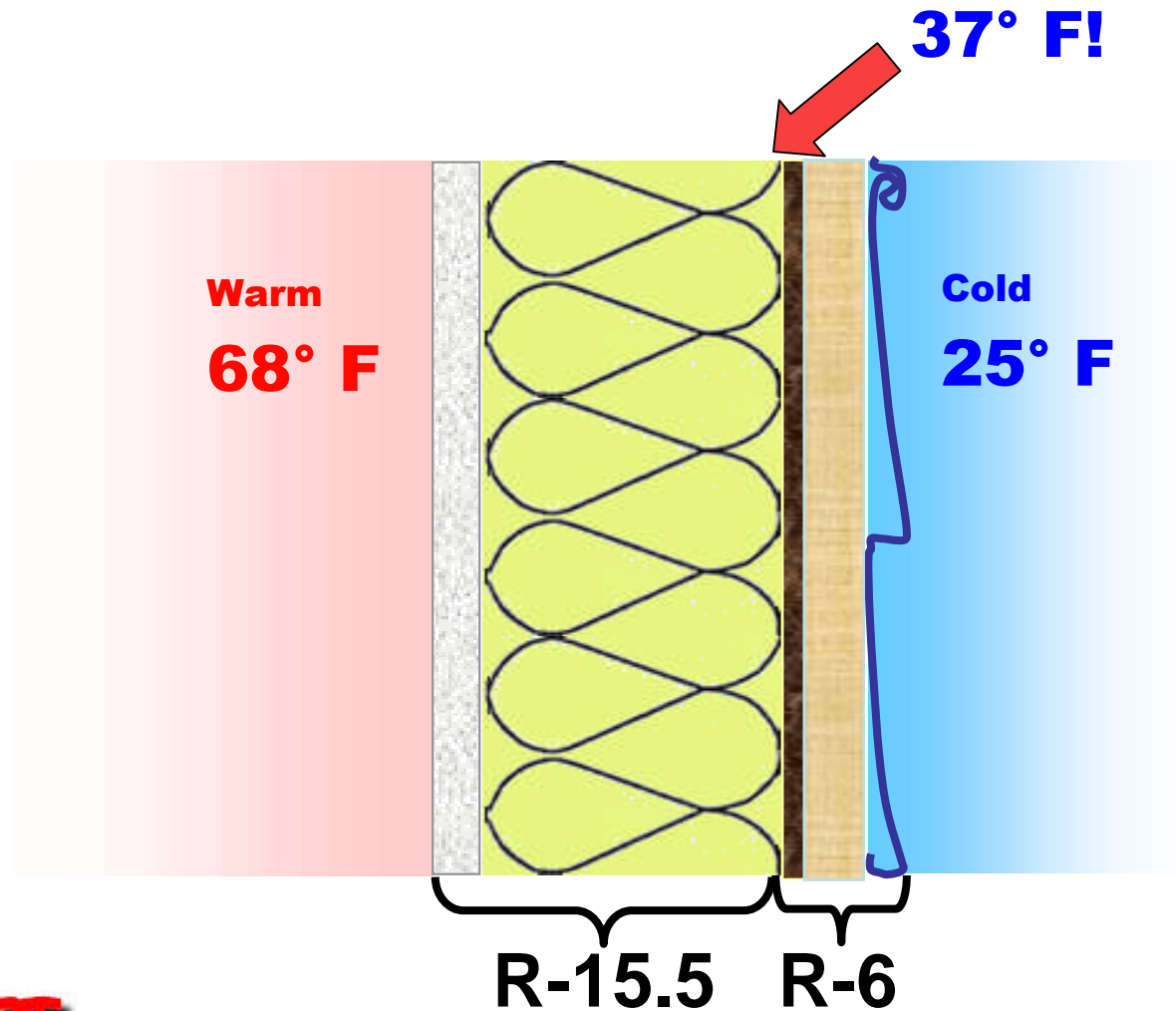
# Reduction

## Insulating Sheathing



# Reduction

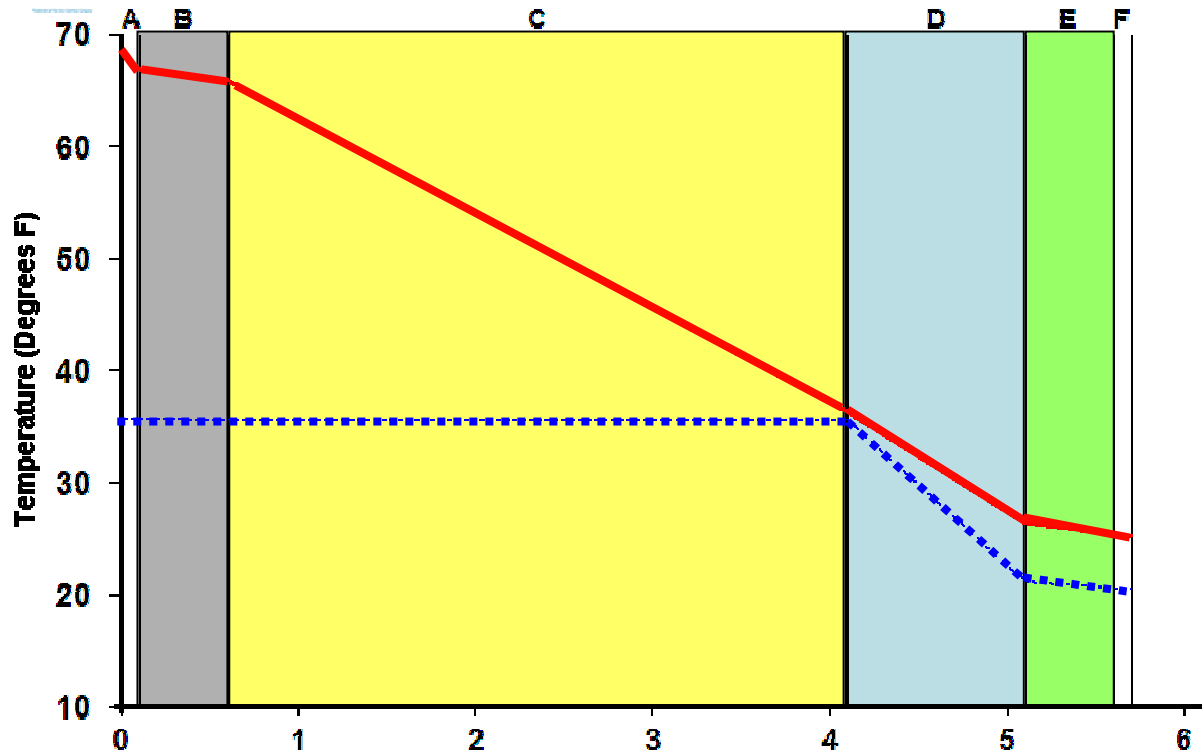
## Insulating Sheathing



# Reduction

## Dewpoint Analysis - Dow Chemical

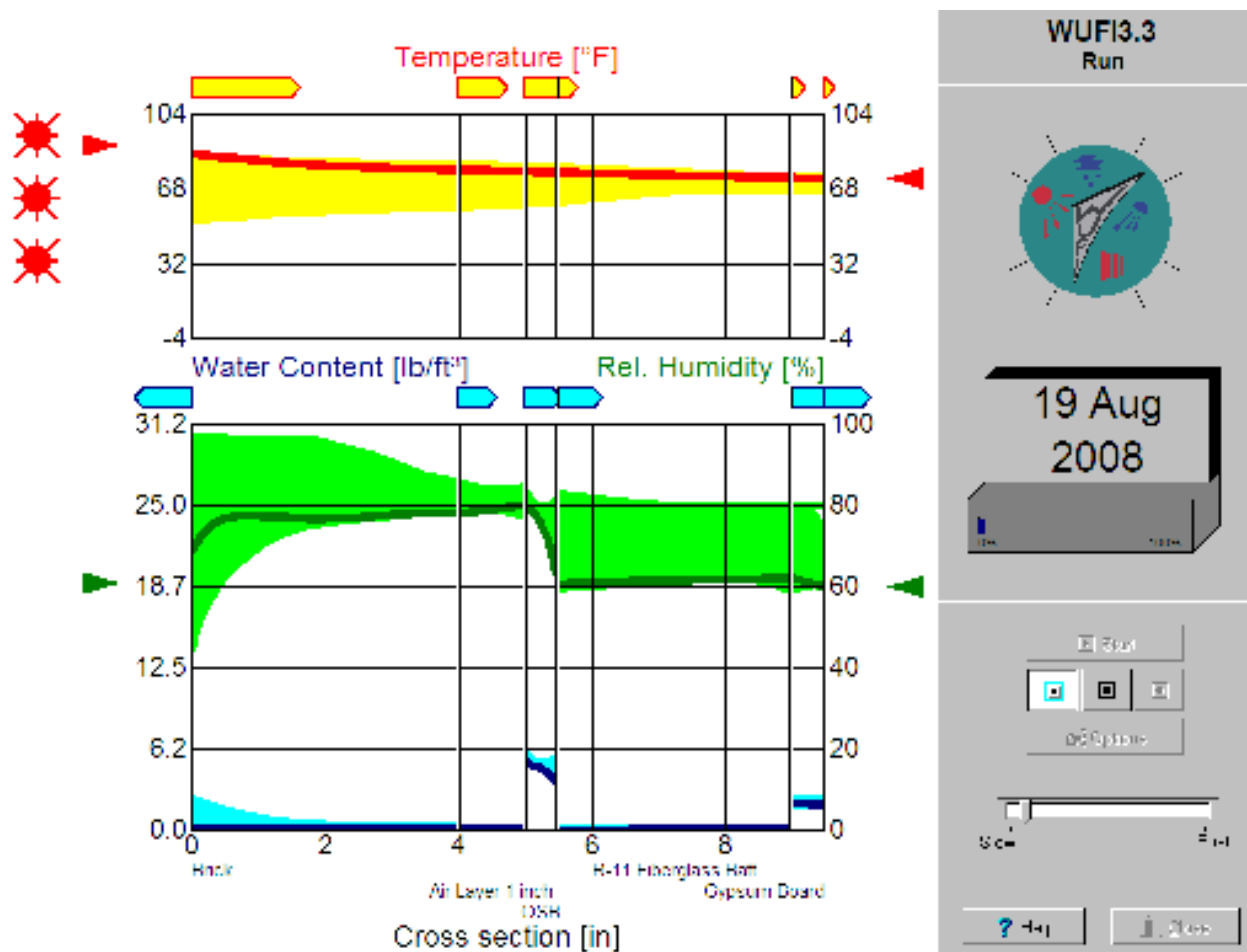
Wood Stud Wall and R5 Sheathing



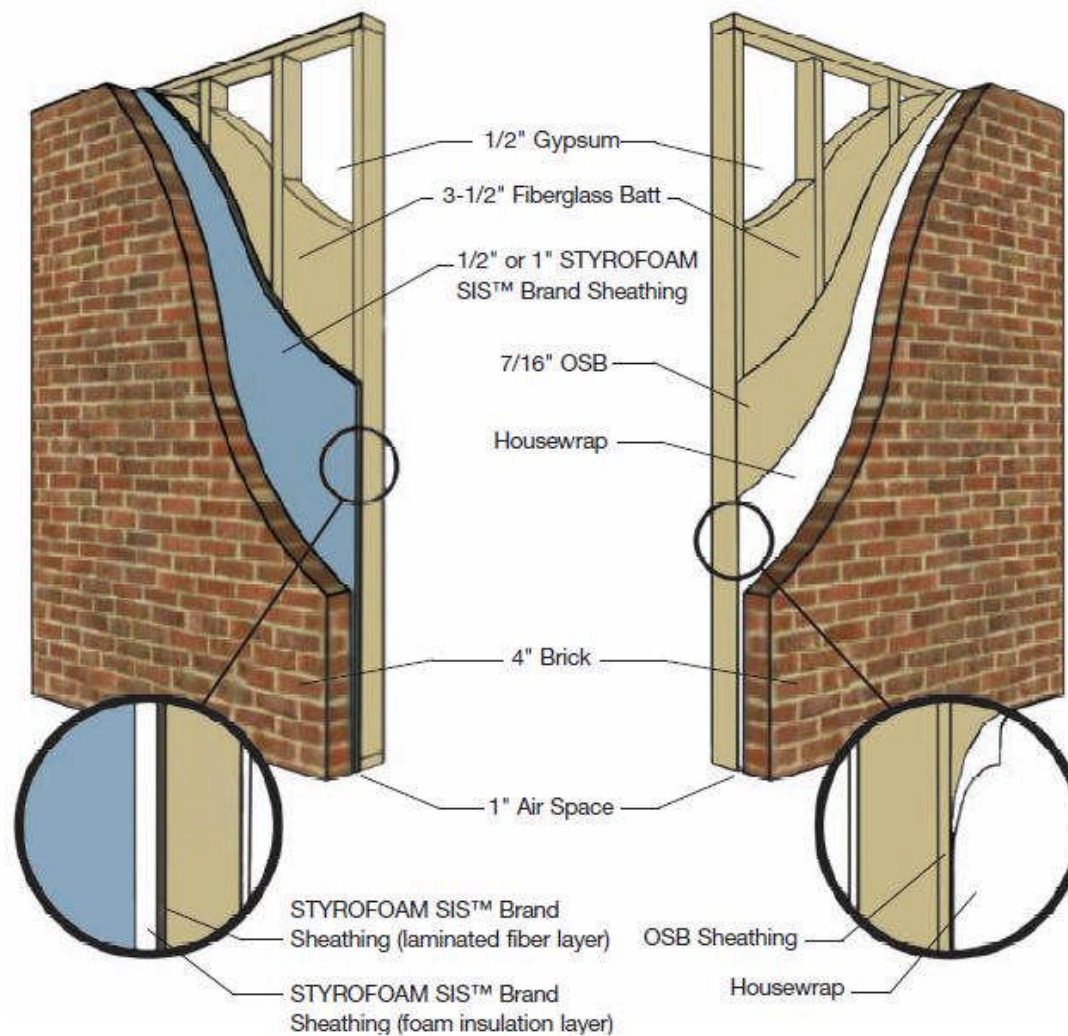
# Reduction

The image shows a screenshot of the WUFI 3.3 - Pro. software interface. It features a central circular logo with a stylized 'WUFI' and a sailboat. The background is a technical graph with multiple data series. The top graph shows 'Temperatur [°C]' (Temperature) on the y-axis, ranging from -20 to 40. The bottom graph shows 'Wasserdampfdruck [Pa]' (Vapor pressure) on the left y-axis (0 to 12) and 'Feuchte [%]' (Humidity) on the right y-axis (0 to 100). The x-axis for both graphs represents time, with markers at 0, 5, 10, 15, 20, 25, and 30. The text 'WUFI® 3.3 - Pro.' is prominently displayed in the center, followed by 'moisture design tool for architects and engineers' and 'License: Dan Tempas, DCC'. The Fraunhofer IBP logo and 'Fraunhofer Institut Bauphysik' are located in the bottom right corner of the screenshot.

# Reduction

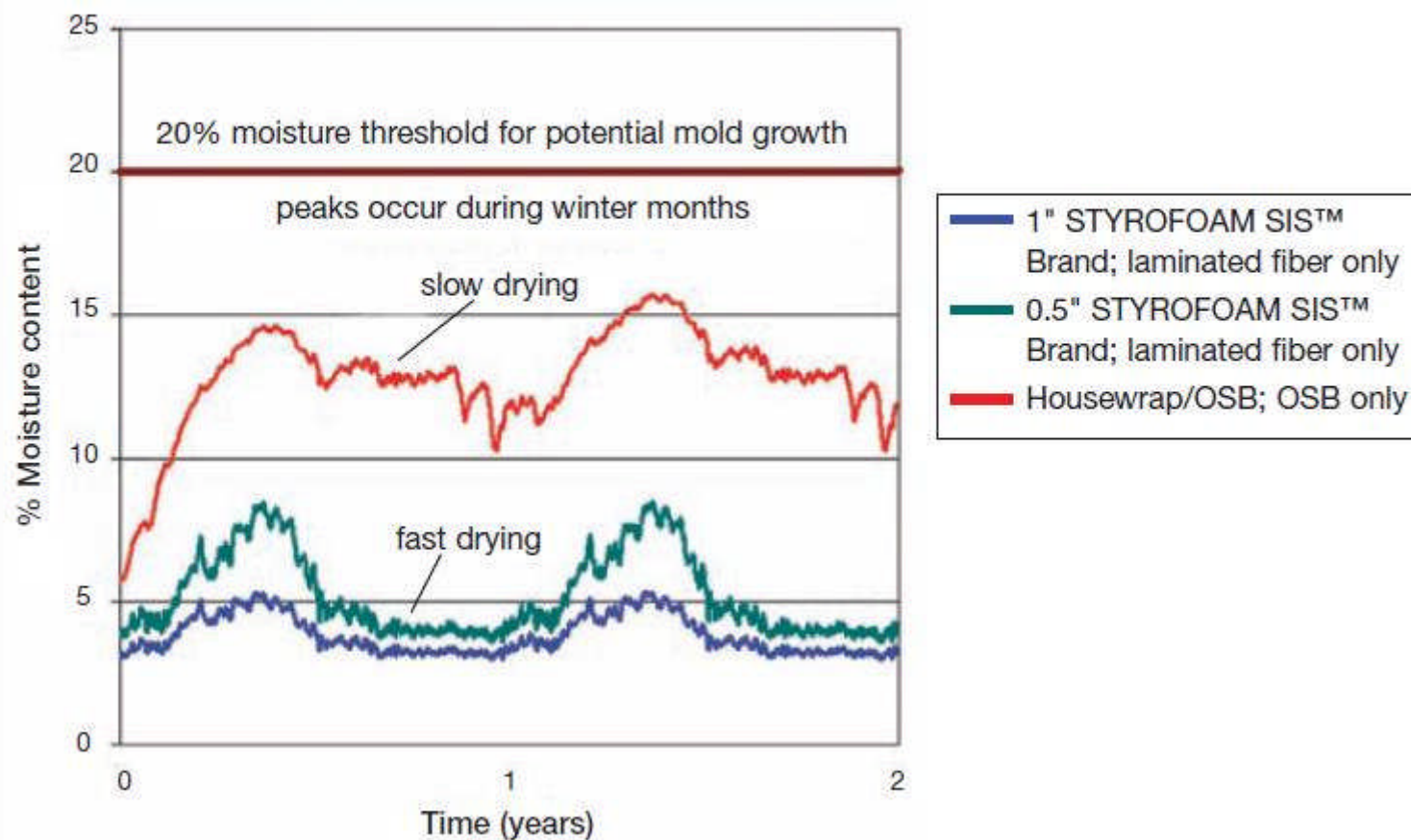


# Reduction



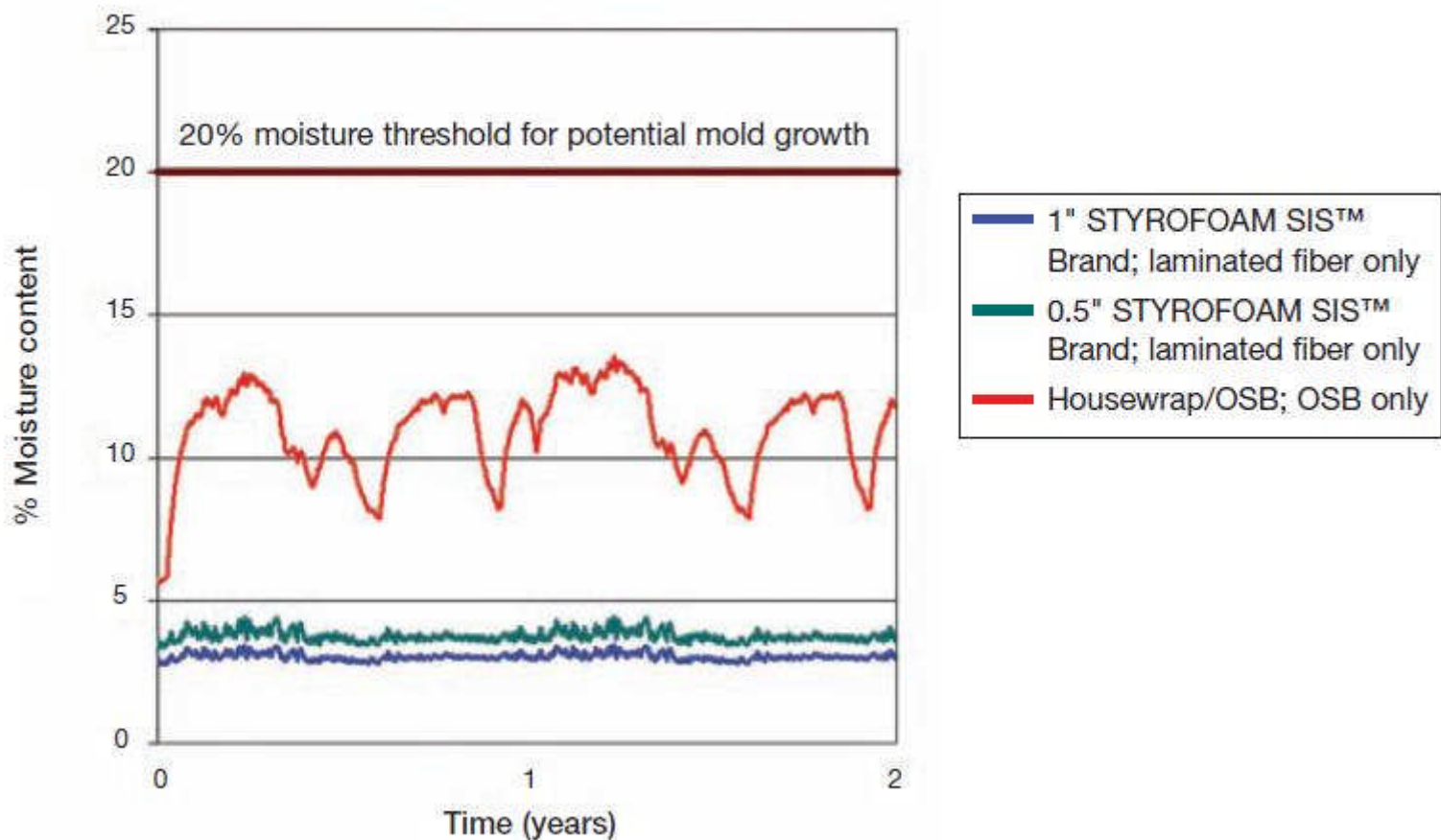
# Reduction

Figure 3: STYROFOAM SIS™ Brand Structural Insulated Sheathing vs. Housewrap/OSB; % Moisture Content of Sheathing; Chicago



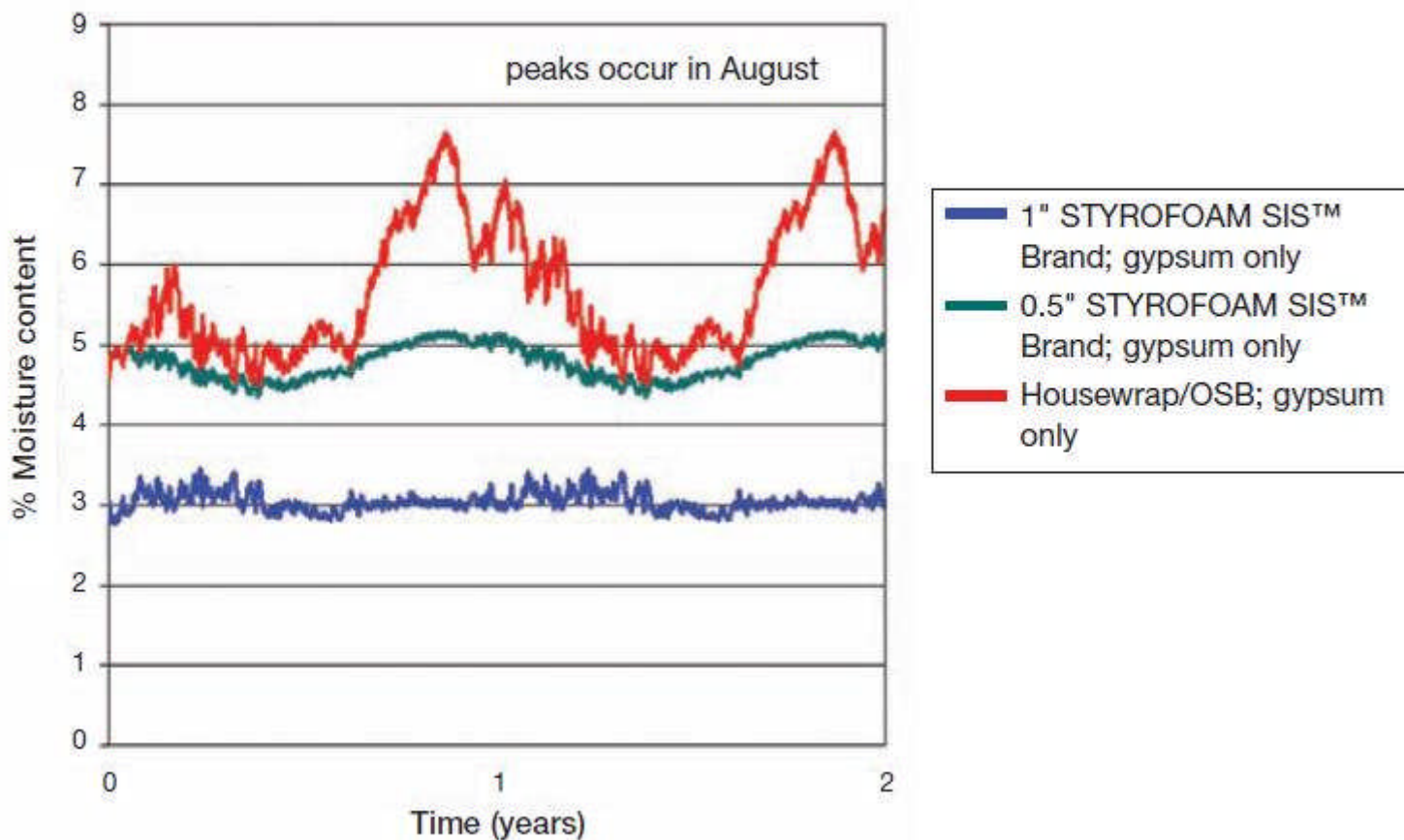
# Reduction

Figure 5: STYROFOAM SIS™ Brand Structural Insulated Sheathing vs. Housewrap/OSB; % Moisture Content of Sheathing; Houston

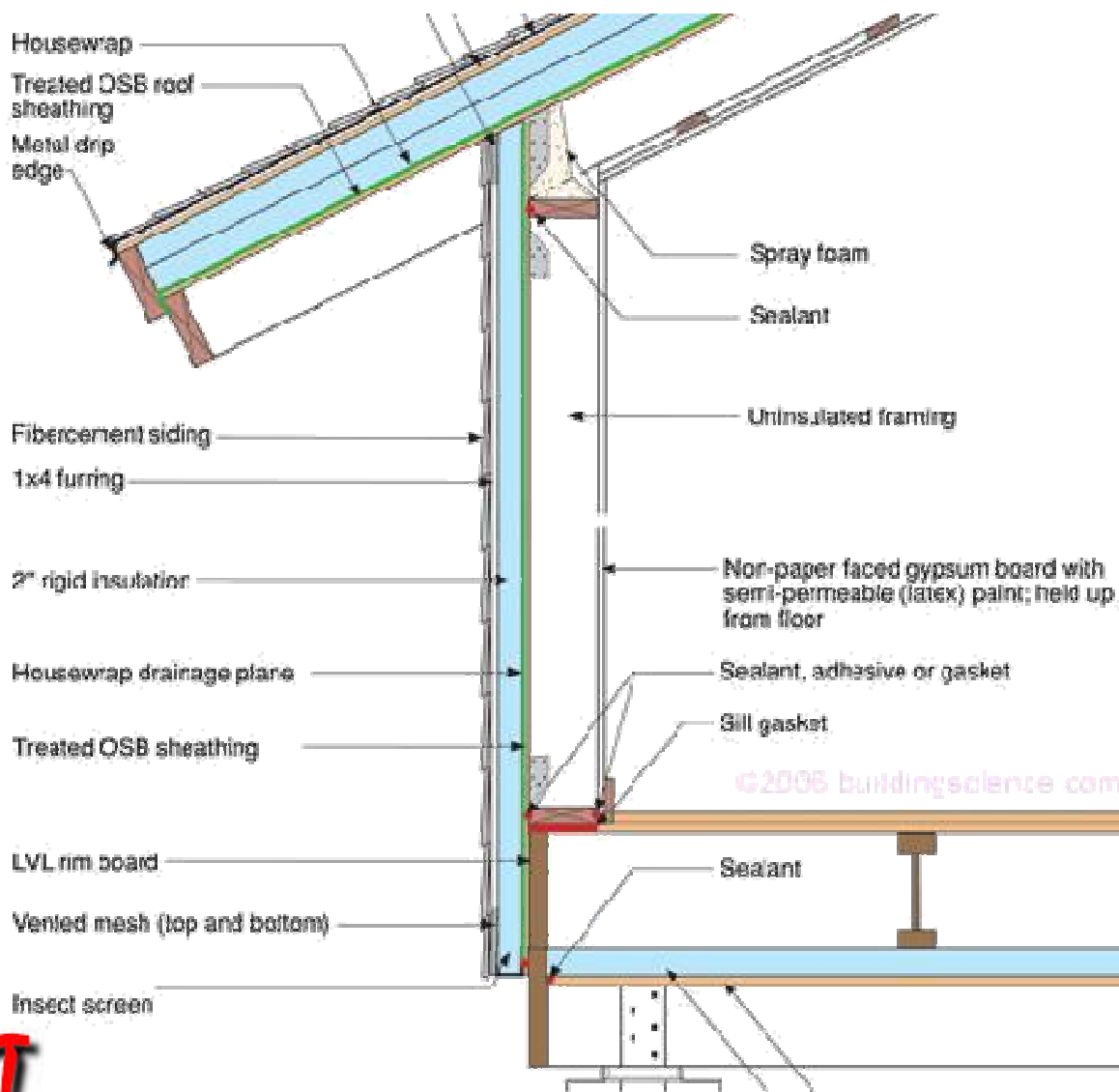


# Reduction

Figure 6: STYROFOAM SIS™ Brand Structural Insulated Sheathing vs. Housewrap/OSB; % Moisture Content of Gypsum Board; Houston



# Reduction



# Execution

## Options:

- Oversheathing



# Execution

## Options:

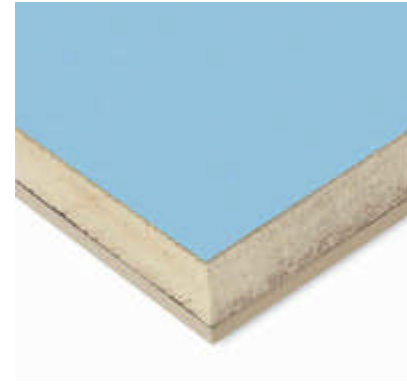
- Oversheathing
- Insulation Only



# Execution

## Options:

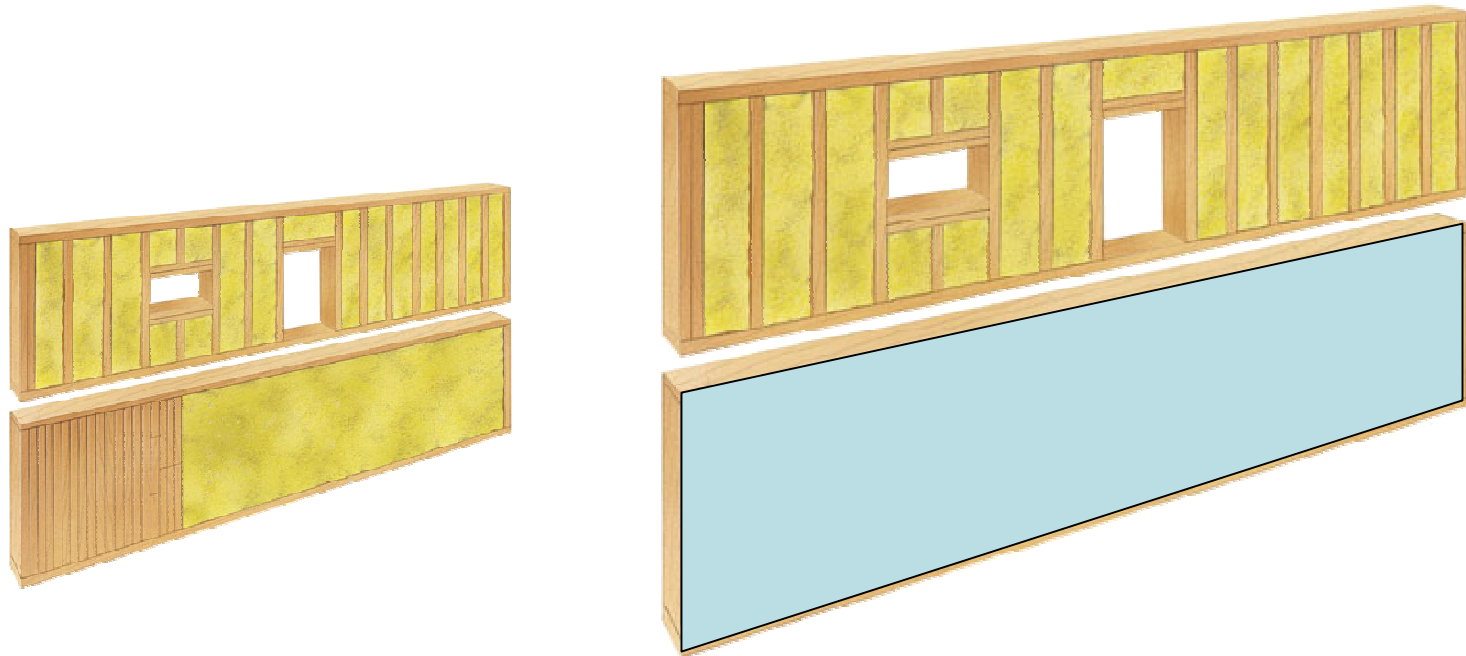
- Oversheathing
- Insulation Only
- Structural Insulated Sheathing**



# Insulated Sheathings

## Energy Savings

- Why they work



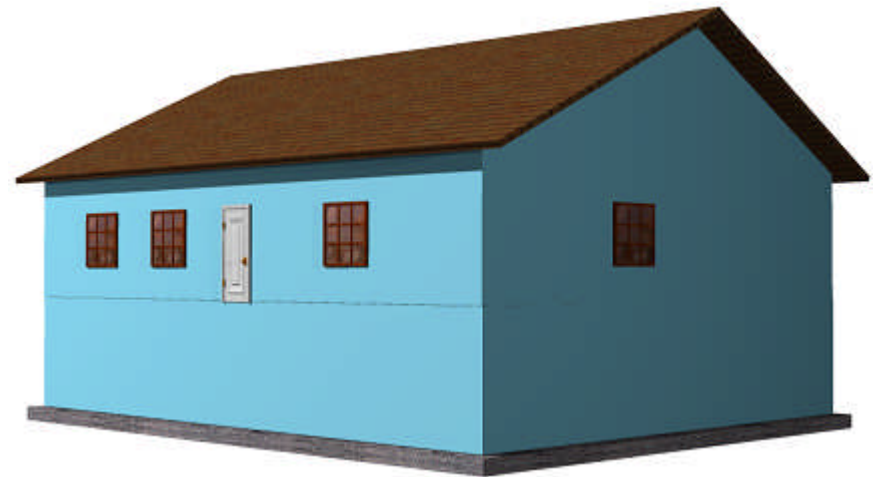
# Insulated Sheathings

## Energy Savings

- Why they work
- What difference Does it Make?

### Results

- Rating: 96 → 84
- +R-5 Foundation Insulation
- + R-5.5 Sheathing



# Insulated Sheathings

## Energy Savings

- Why they work
- What difference Does it Make?

## Moisture Performance

- Condensation



Warm Cold

**Temperature!**

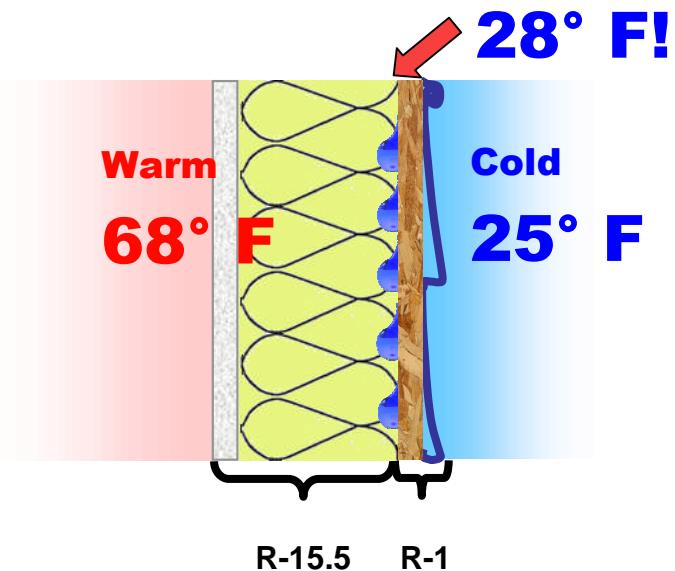
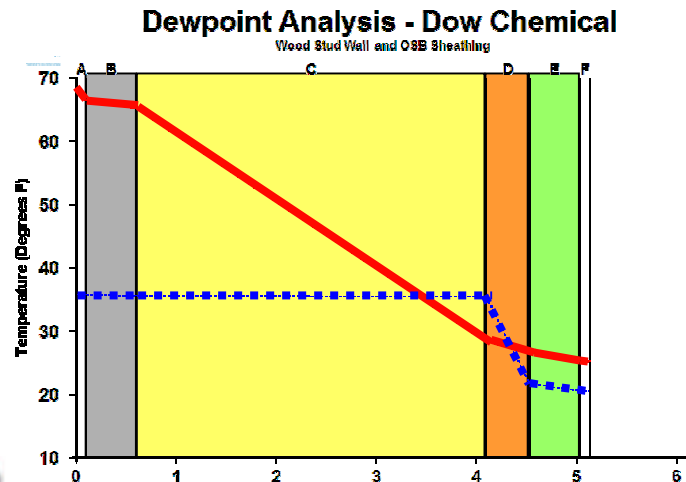
# Insulated Sheathings

Energy Savings

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# Insulated Sheathings

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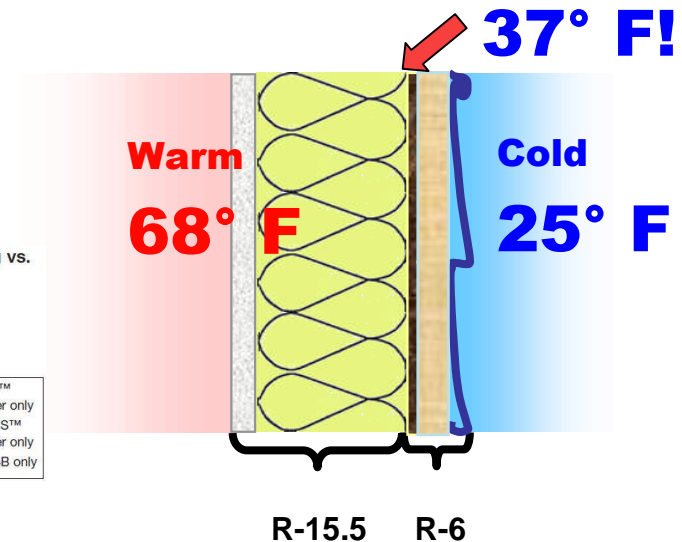
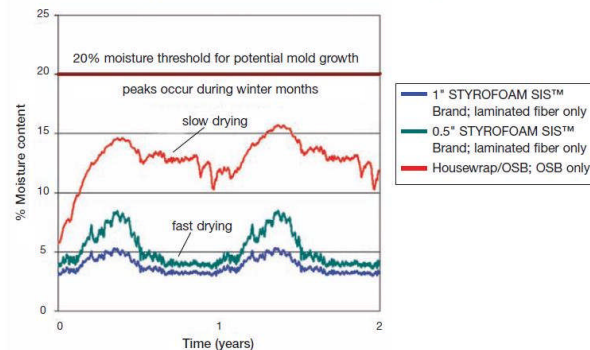


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# Insulated Sheathings

Not just for Energy Savings

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Sr. Research Engineer



## Questions?

