

The Value of Foamed Plastic

As a Residential Sheathing

Dan Tempas
Sr. Scientist



Insulated Sheathing Value

Energy Savings

- Why they work
- What difference Does it Make?

Moisture Performance

- Condensation
- Evaluation
- Reduction
- Execution

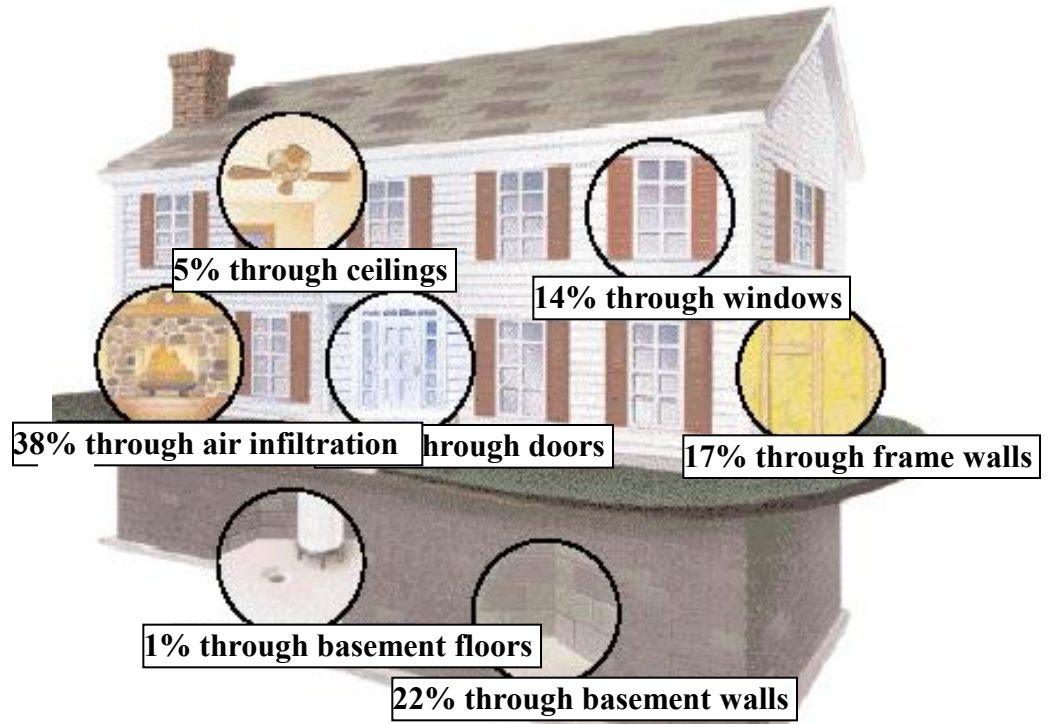
Insulated Sheathing Value

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



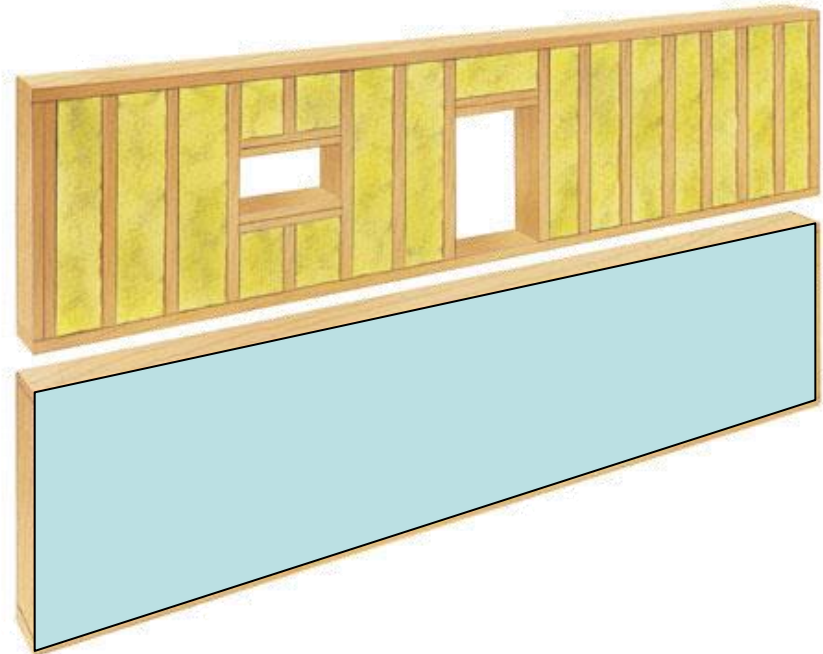
Foam: 5-6.5 R/inch

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



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

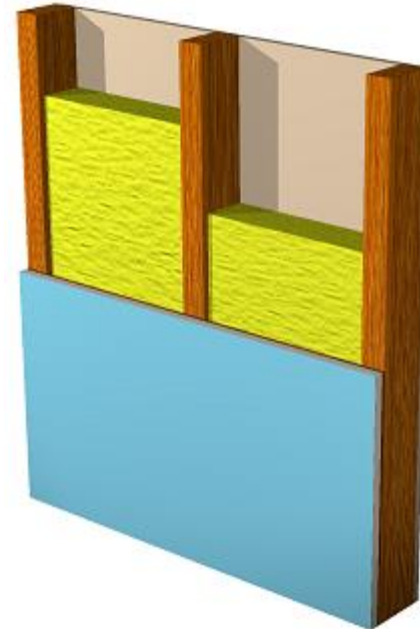
Why They Work

R-11 Batts



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

R-11 Batts + R5 ci



$$U=0.0645 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=15.5$$

Why They Work

R-15 Batts



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

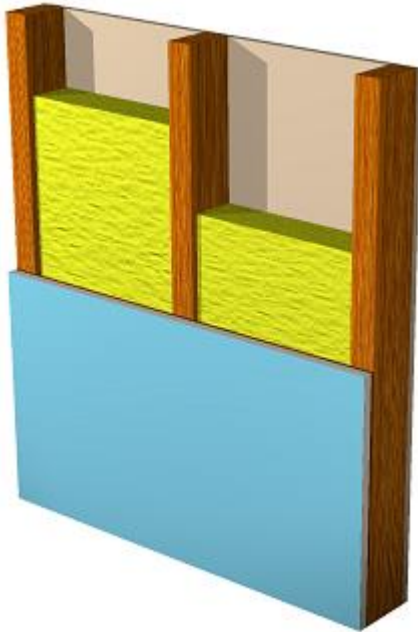
R-19 Batts



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

Why They Work

R-15 Batts + R5 ci



$$U=0.0563 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=17.8$$

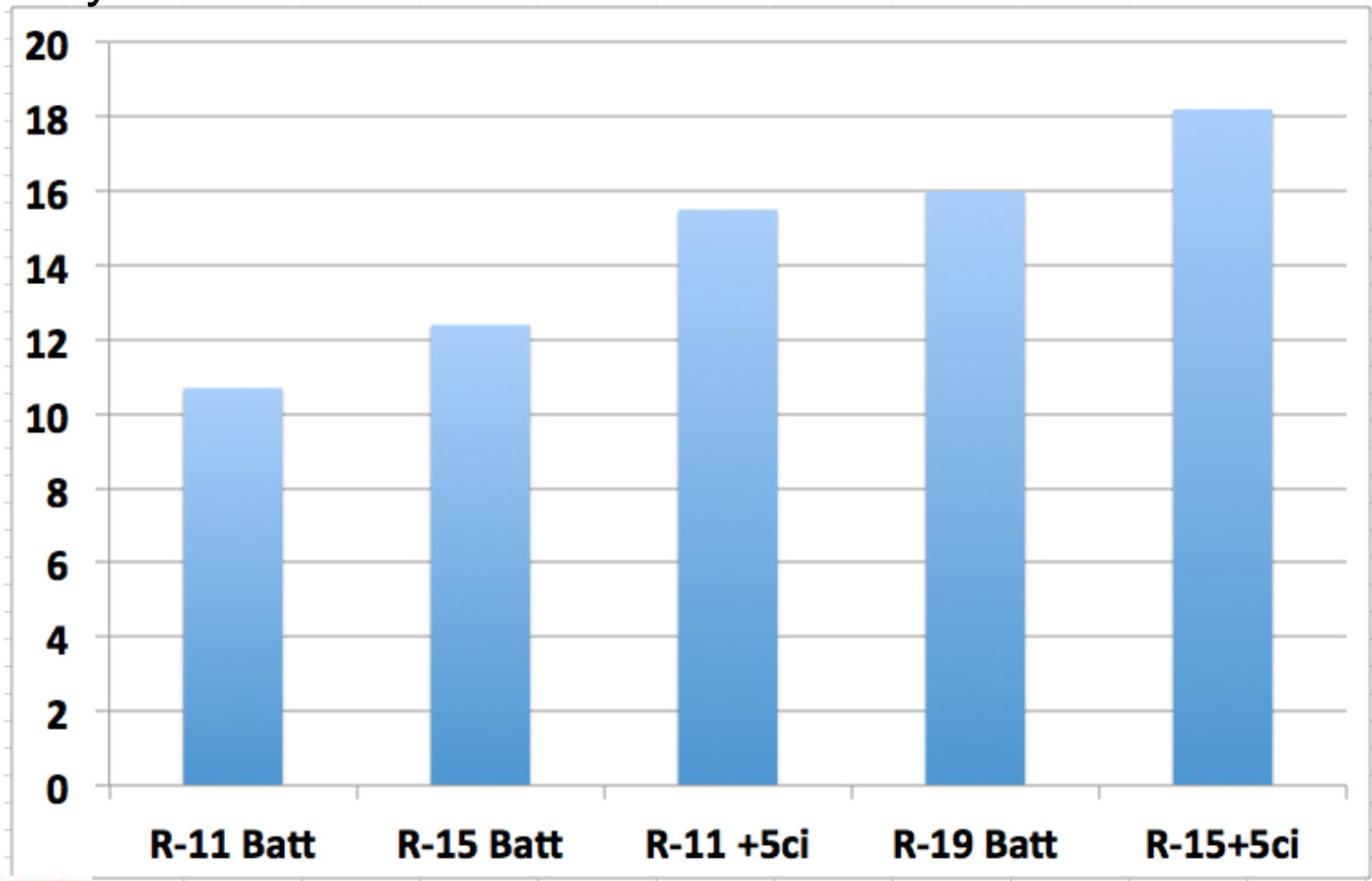
R-19 Batts



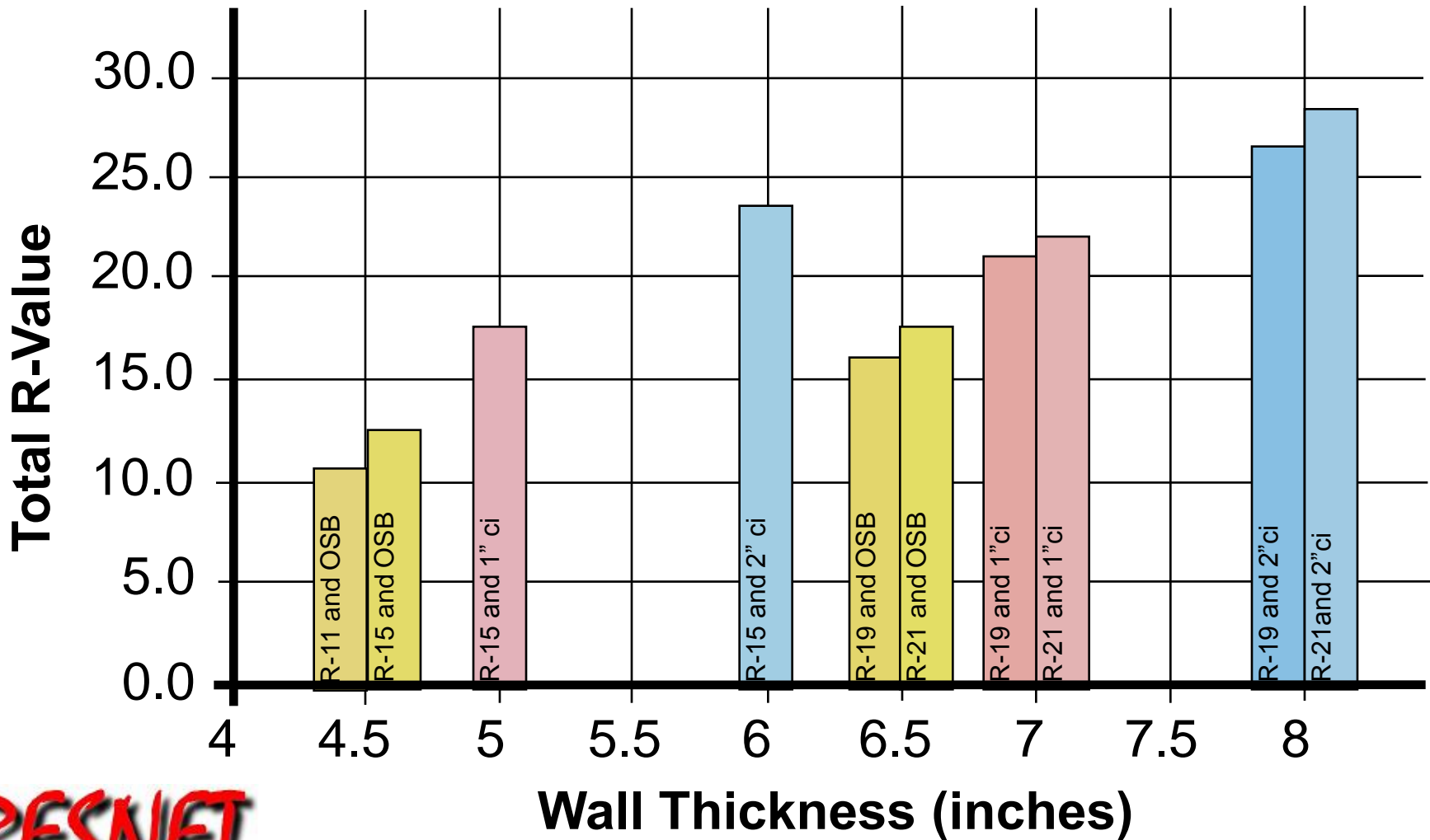
$$U=0.0624 \text{ BTU/hr ft}^2 \text{ }^\circ\text{F}$$
$$R_T=16.0$$

Why They Work

Summary



Why They Work



Why They Work

What difference does that make?

R-11 Batts



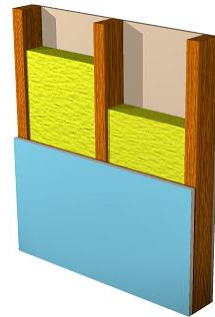
$U=0.0938$
 $R_T=10.7$

R-15 Batts



$U=0.0808$
 $R_T=12.4$

R-11 Batts + 5ci



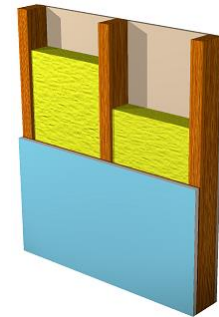
$U=0.0645$
 $R_T=15.5$

R-19 Batts



$U=0.0624$
 $R_T=16.0$

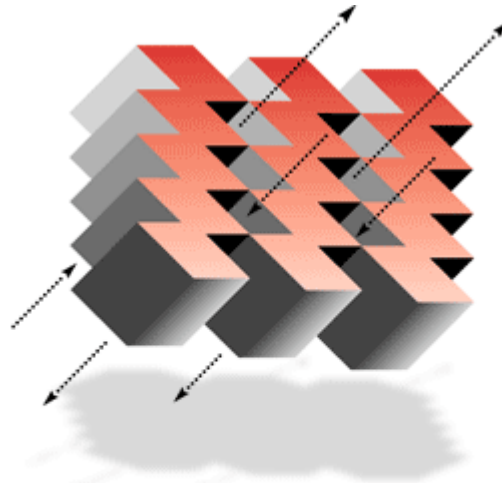
R-15 Batts + 5ci



$U=0.0563$
 $R_T=17.8$

Why They Work

What difference does that make?



ARCHITECTURAL ENERGY
C O R P O R A T I O N
Integrated Engineered Solutions

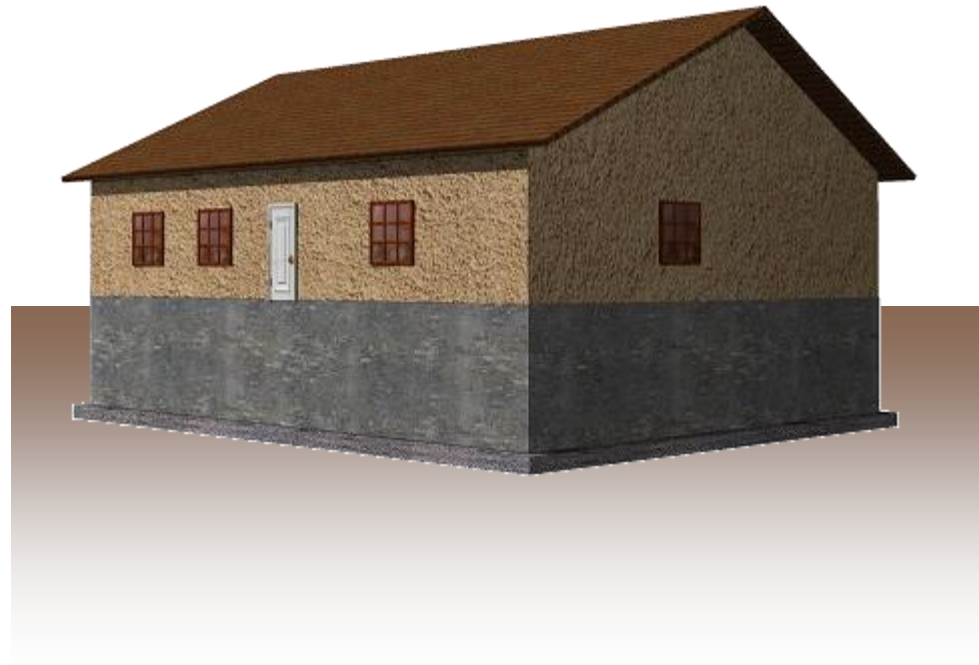


Why They Work

What difference does that make?

Specifics

- 40x50 footprint
- Single Storey (9')
- 2000 square feet
- Full basement (9')
- 200 ft² low E windows
- In Chicago
- No attached garage
- 13 SEER
- 92 AFUE
- 0.25 ACH



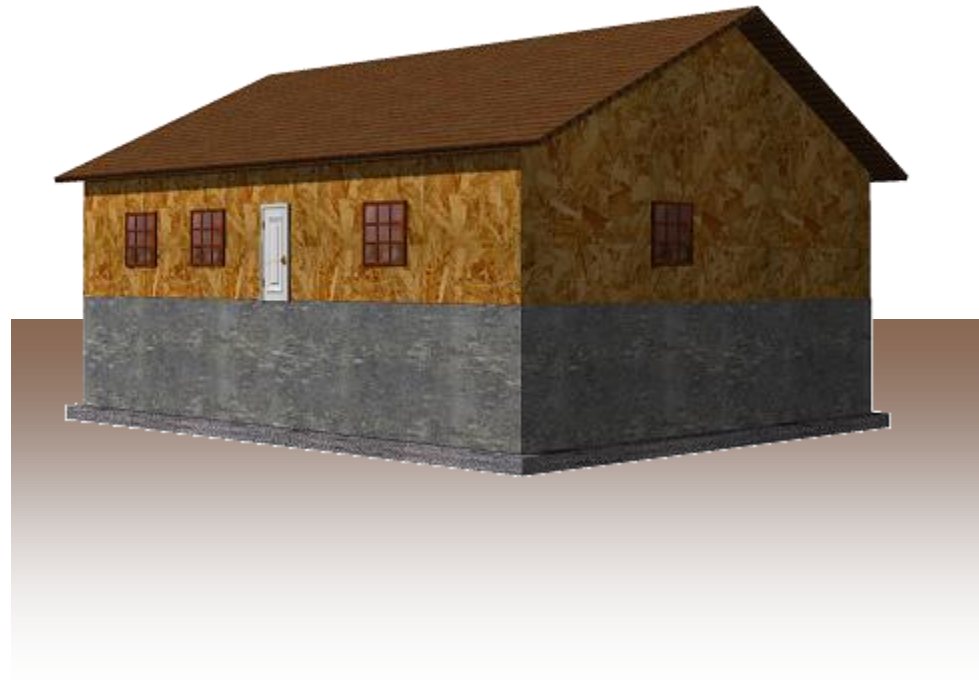
Why They Work

What difference does that make?

Results

- Rating: 96

(no insulated sheathing)

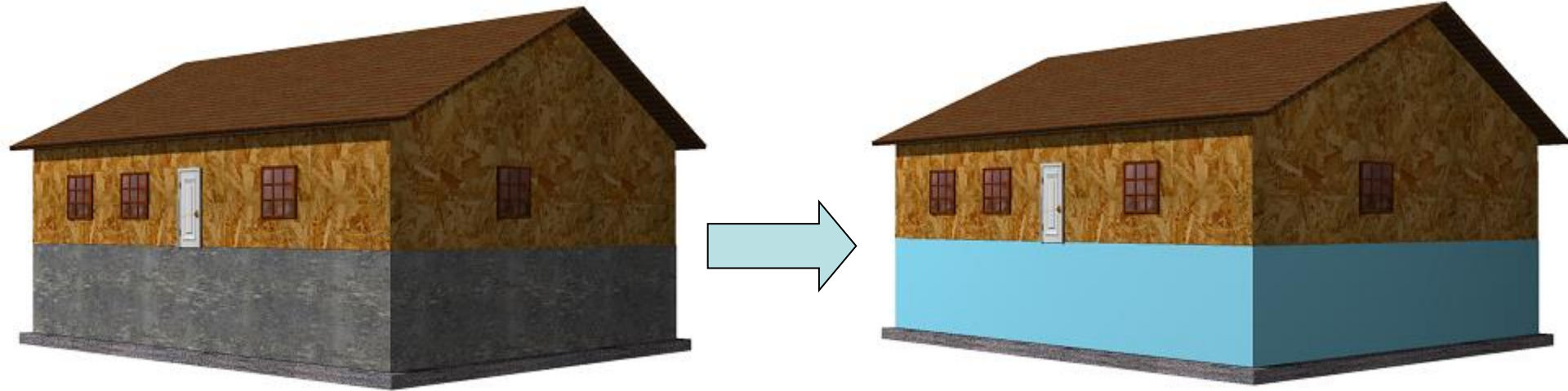


Why They Work

What difference does that make?

Results

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

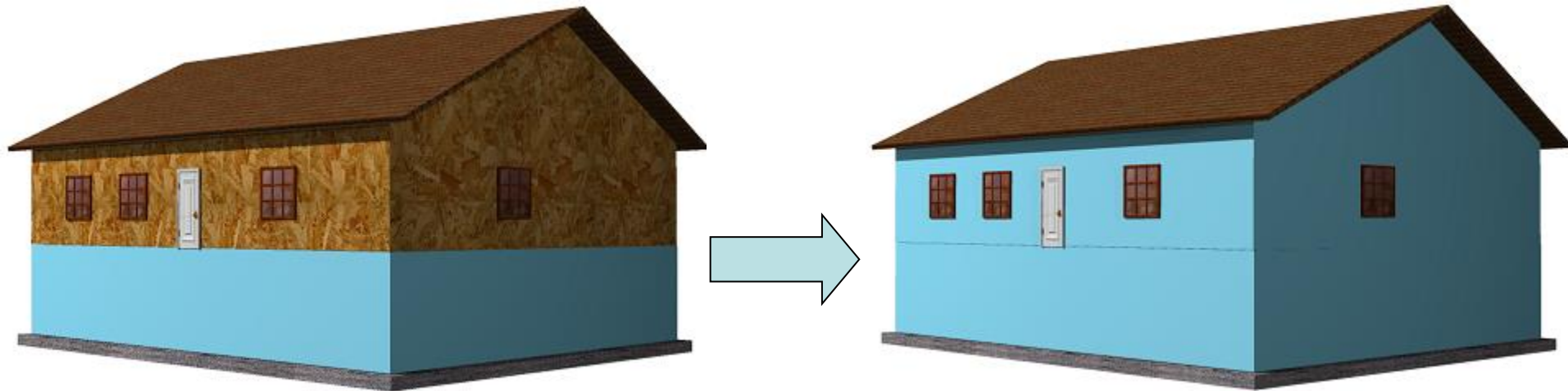


Why They Work

What difference does that make?

Results

- Rating: 88 → 84
- + R-5 Sheathing



Why They Work

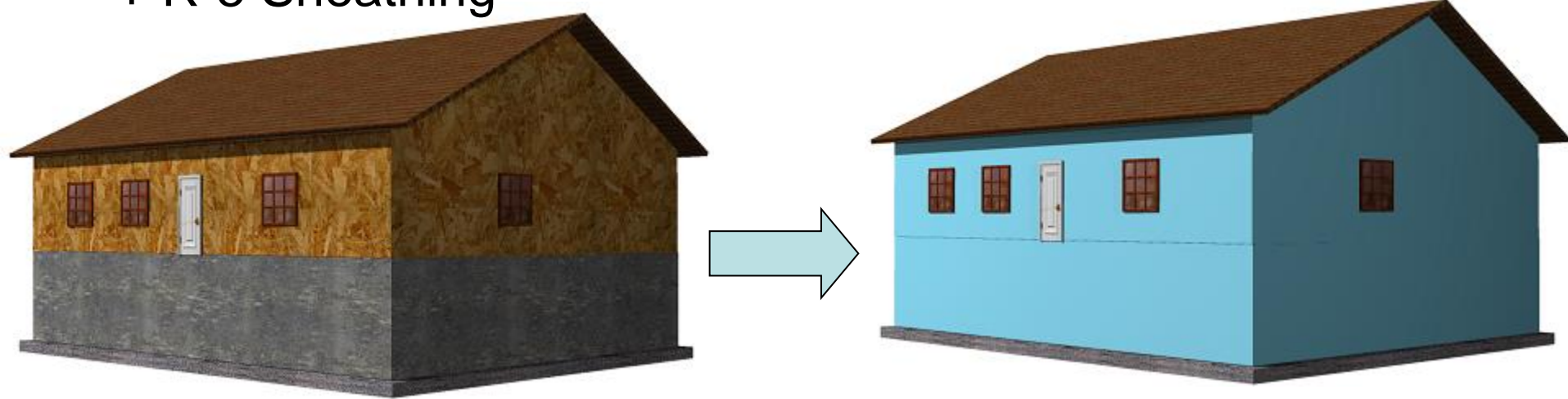
What difference does that make?

Results

•Rating: 96 → 84

+R-5 Foundation Insulation

+ R-5 Sheathing



Insulated Sheathings

Energy Savings

- Why they work
- What difference Does it Make?

Moisture Performance

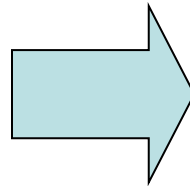
- Condensation
- Evaluation
- Reduction
- Execution

Condensation

What is Condensation?



**Vapor
(fog)**



**Liquid
(water)**

Condensation

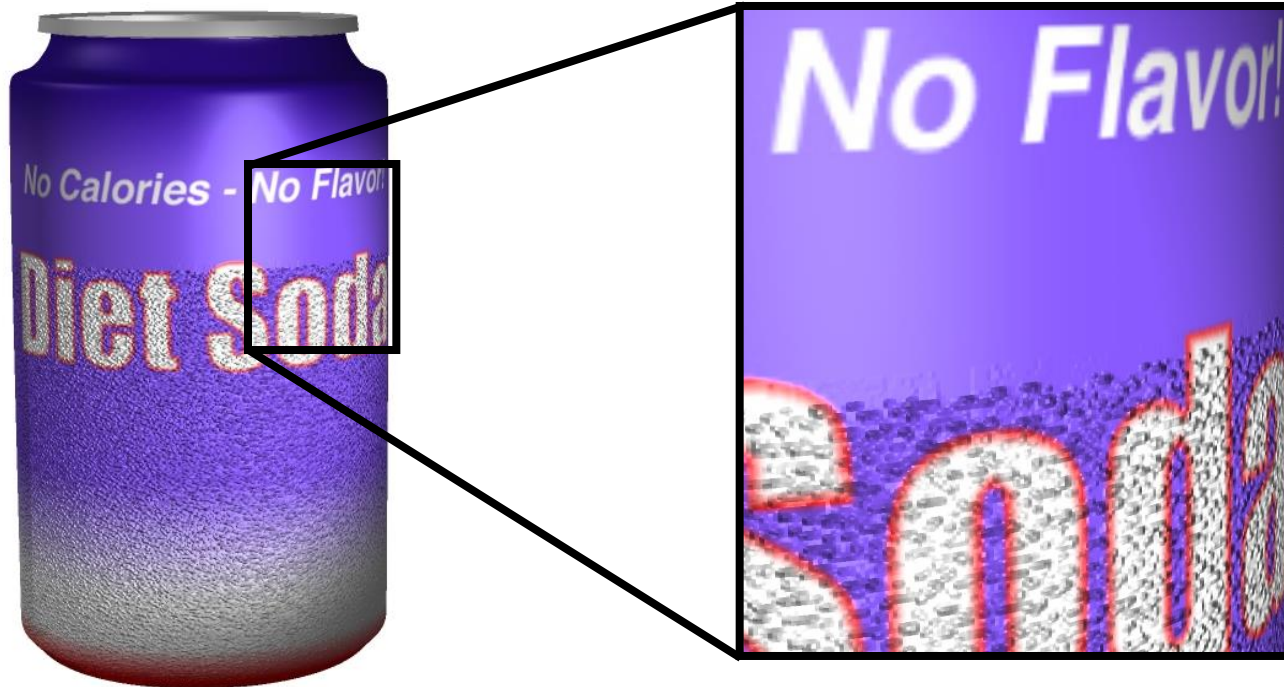


Warm

Cold

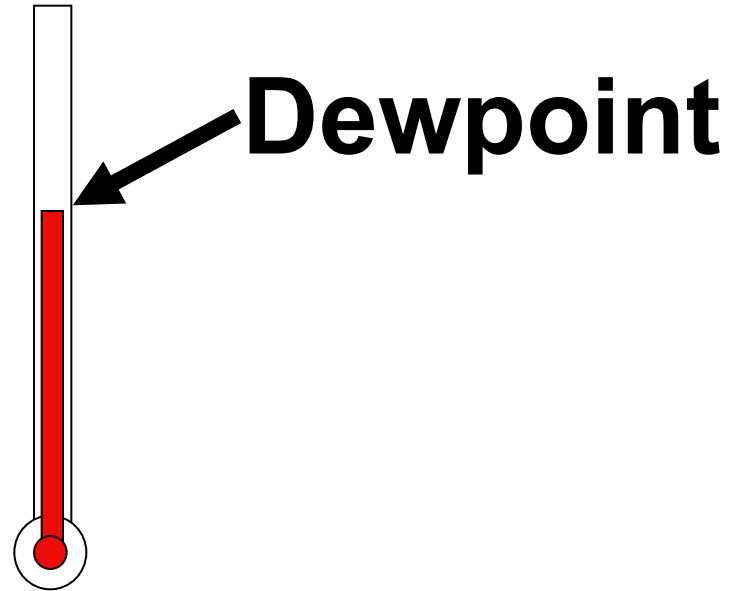
Temperature!

Cold Causes Condensation

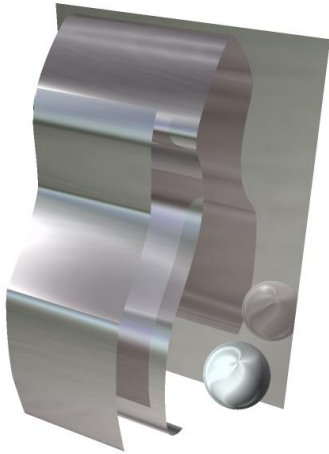


Temperature -> Condensation

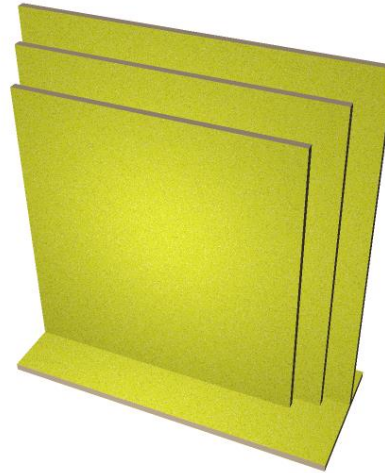
Cold Causes Condensation



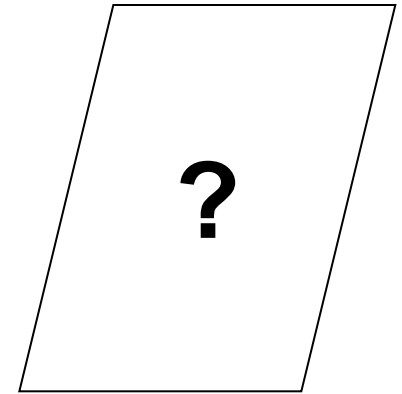
Cold Causes Condensation



Aluminum



Gypsum

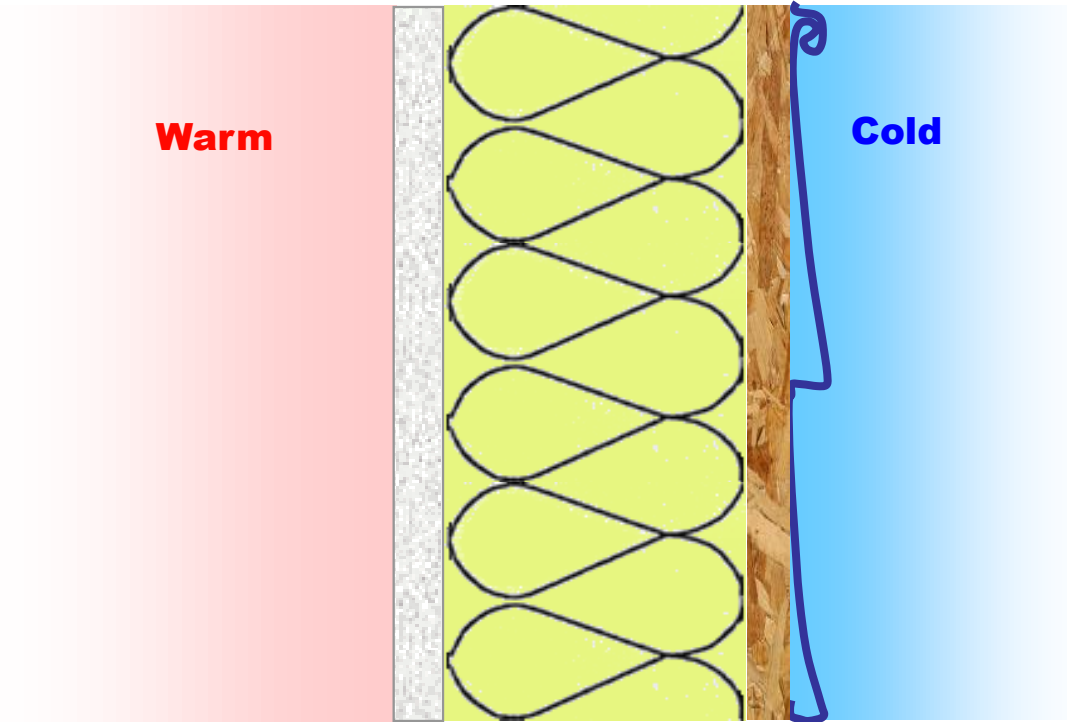


Other

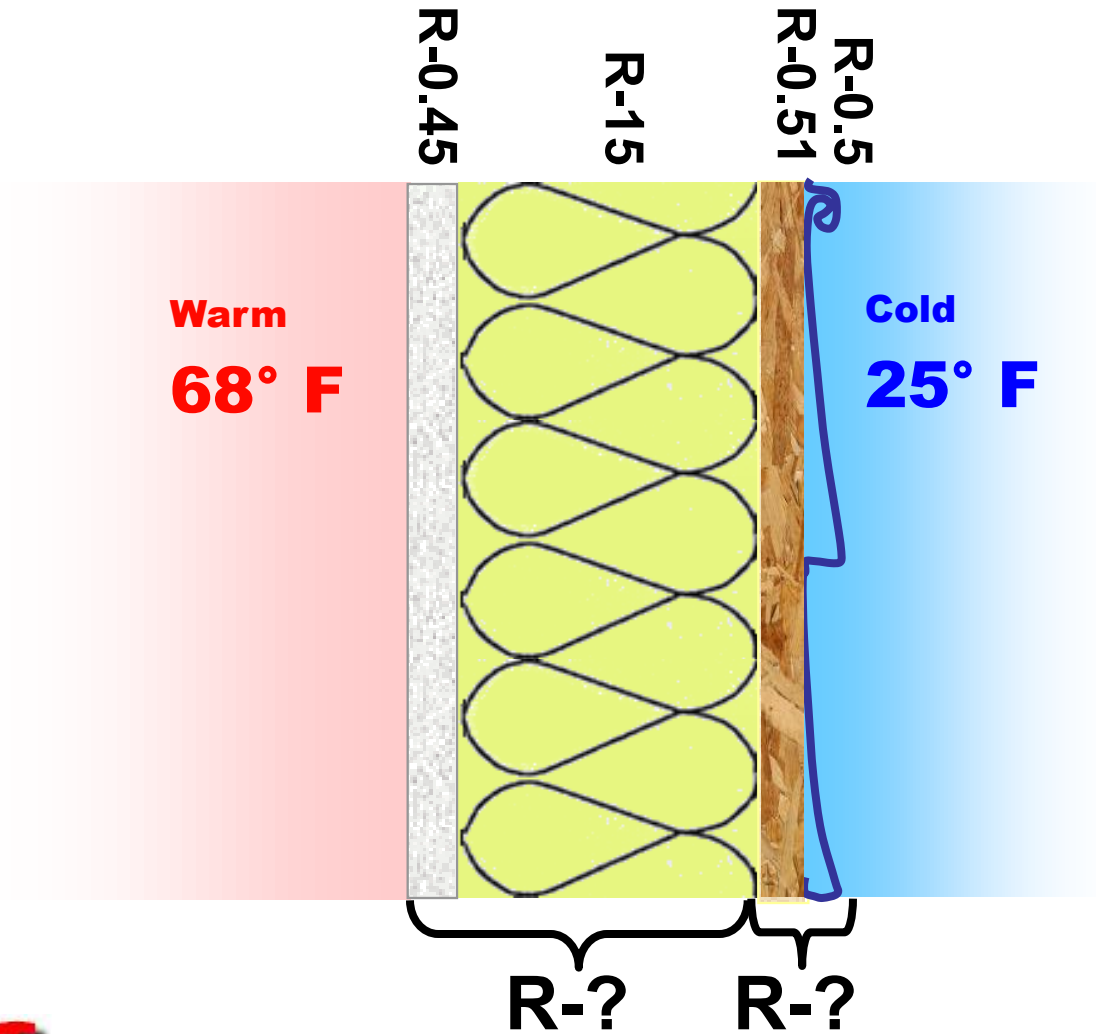
**Material doesn't matter,
only Temperature**

Evaluation

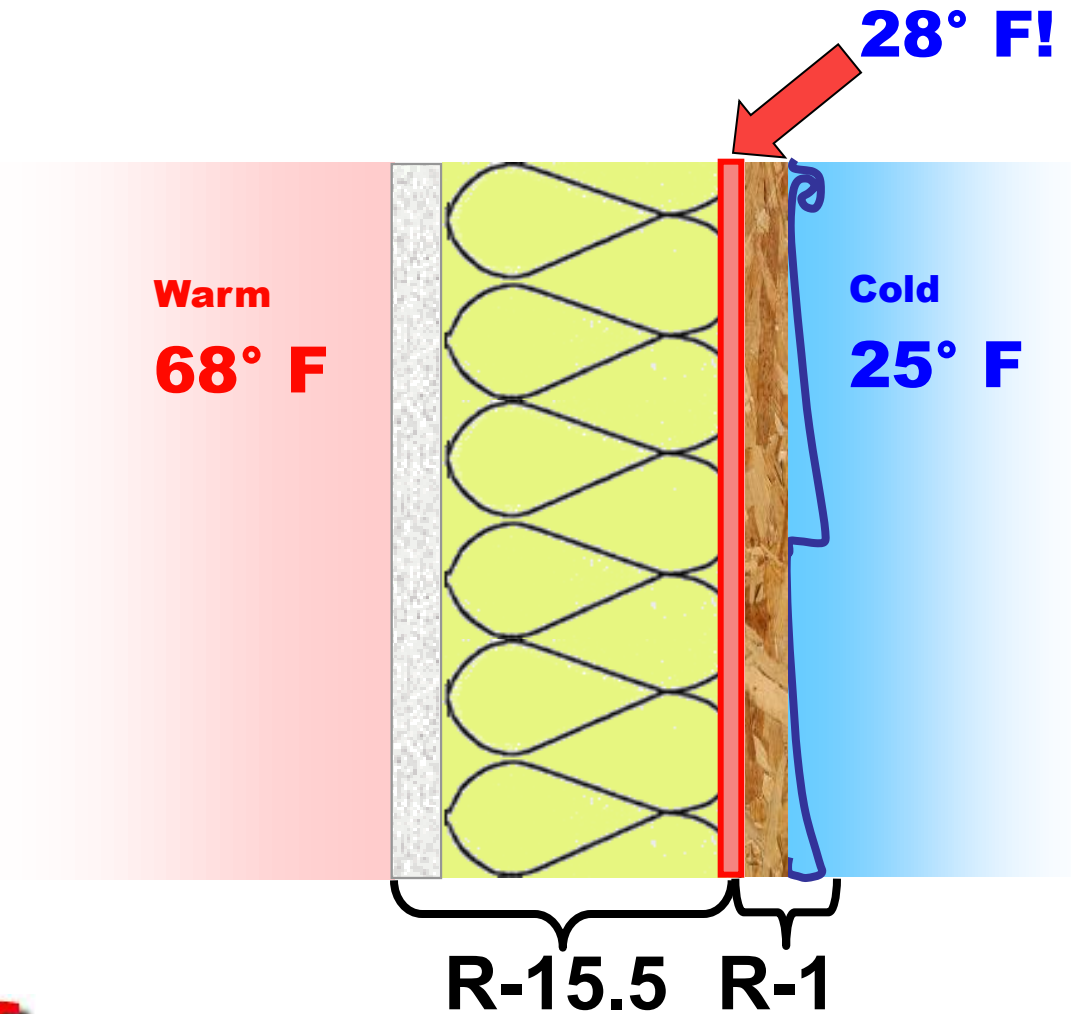
So...



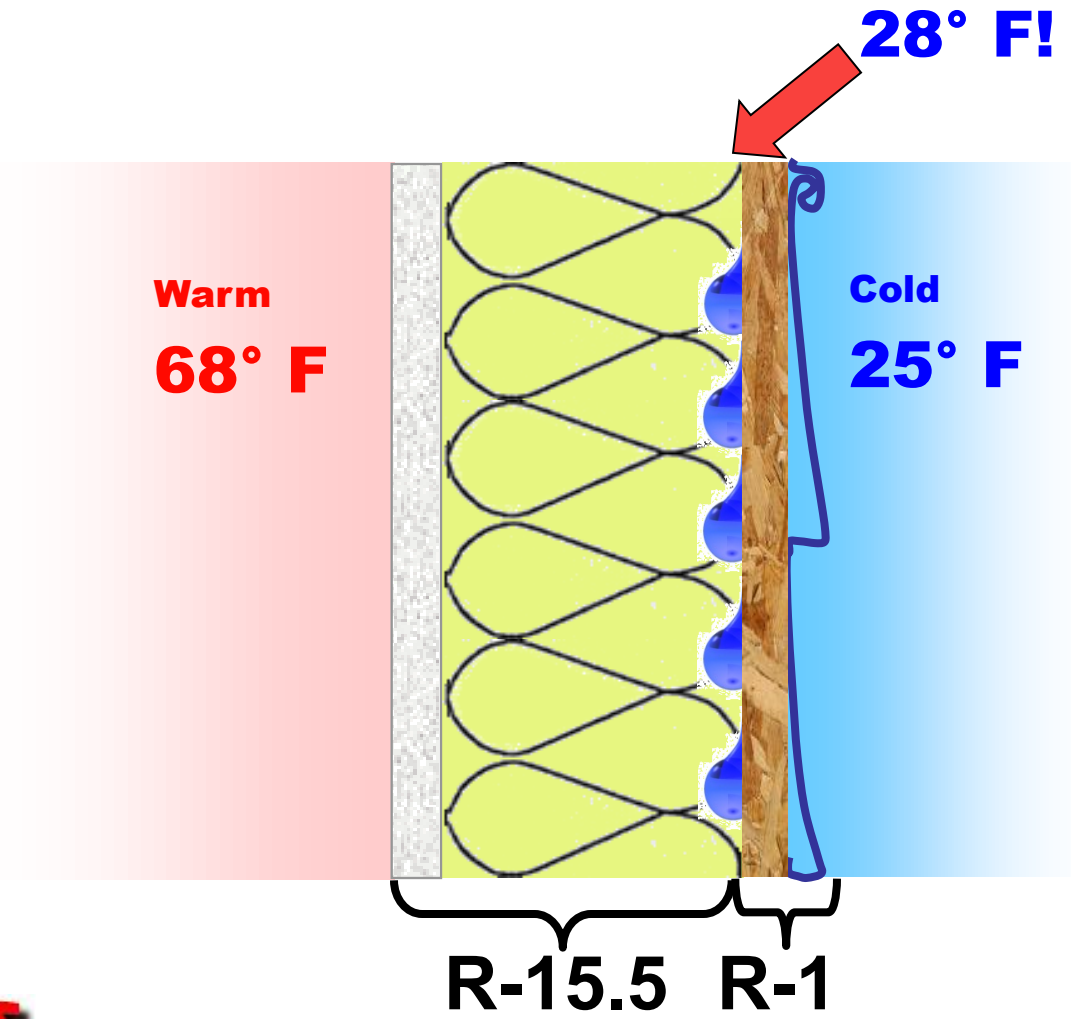
Evaluation



Evaluation



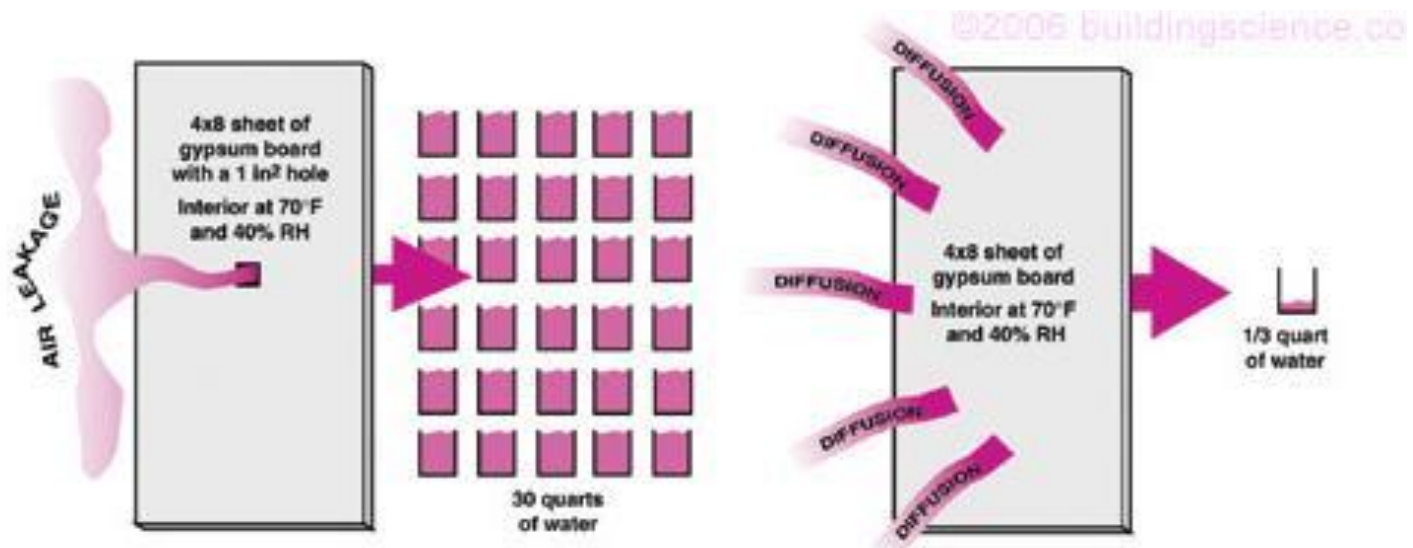
Evaluation



Evaluation



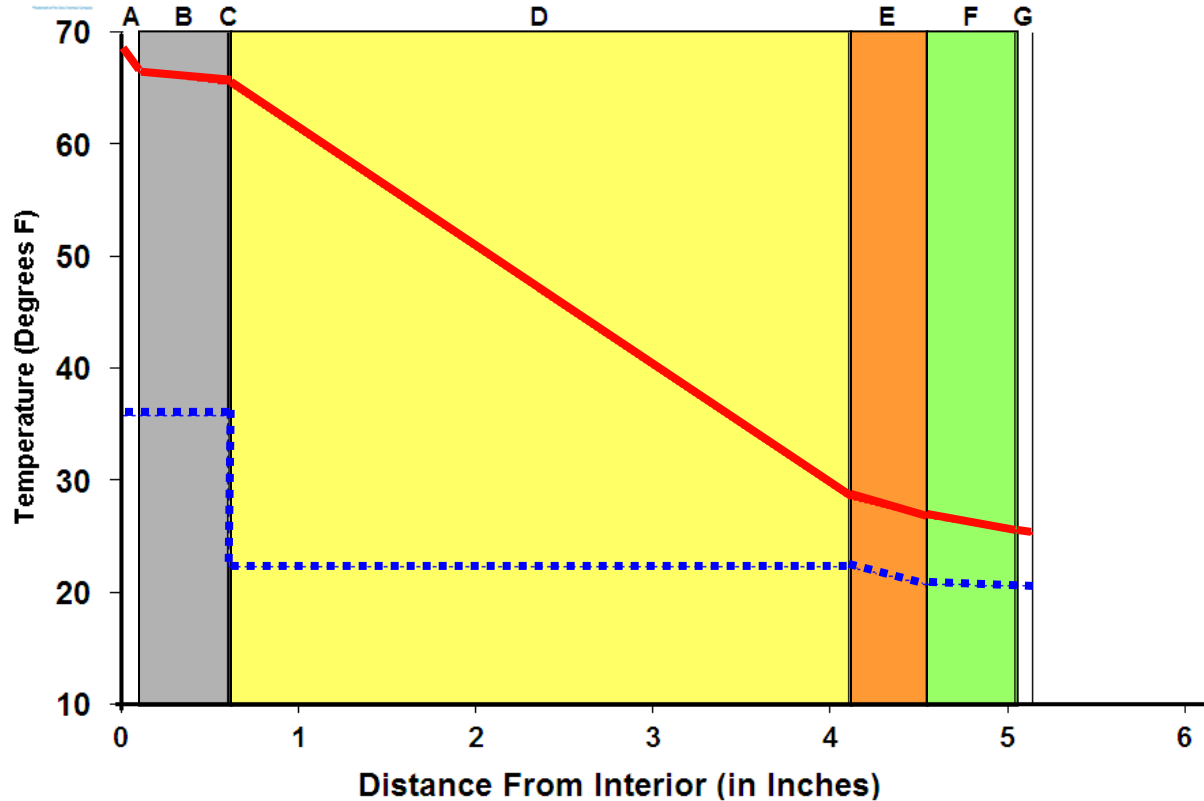
Evaluation



Evaluation

Dewpoint Analysis - Dow Chemical

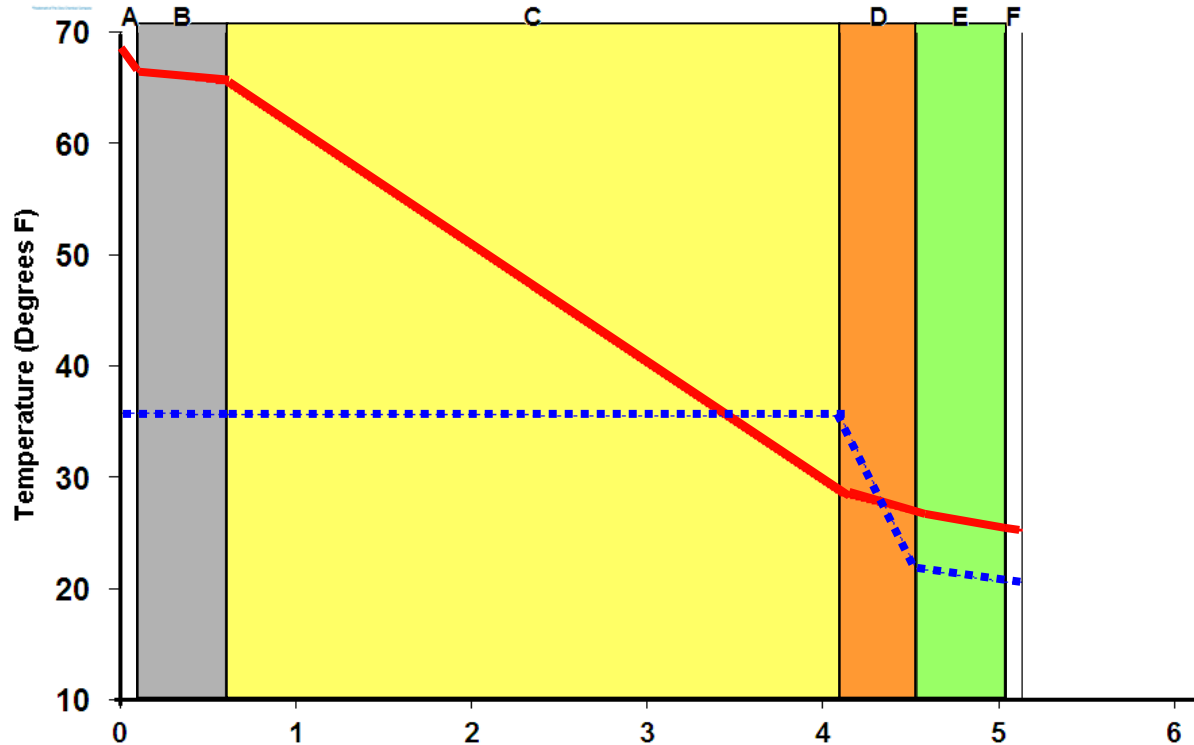
Wood Stud Wall and OSB Sheathing with Vapor Barrier



Evaluation

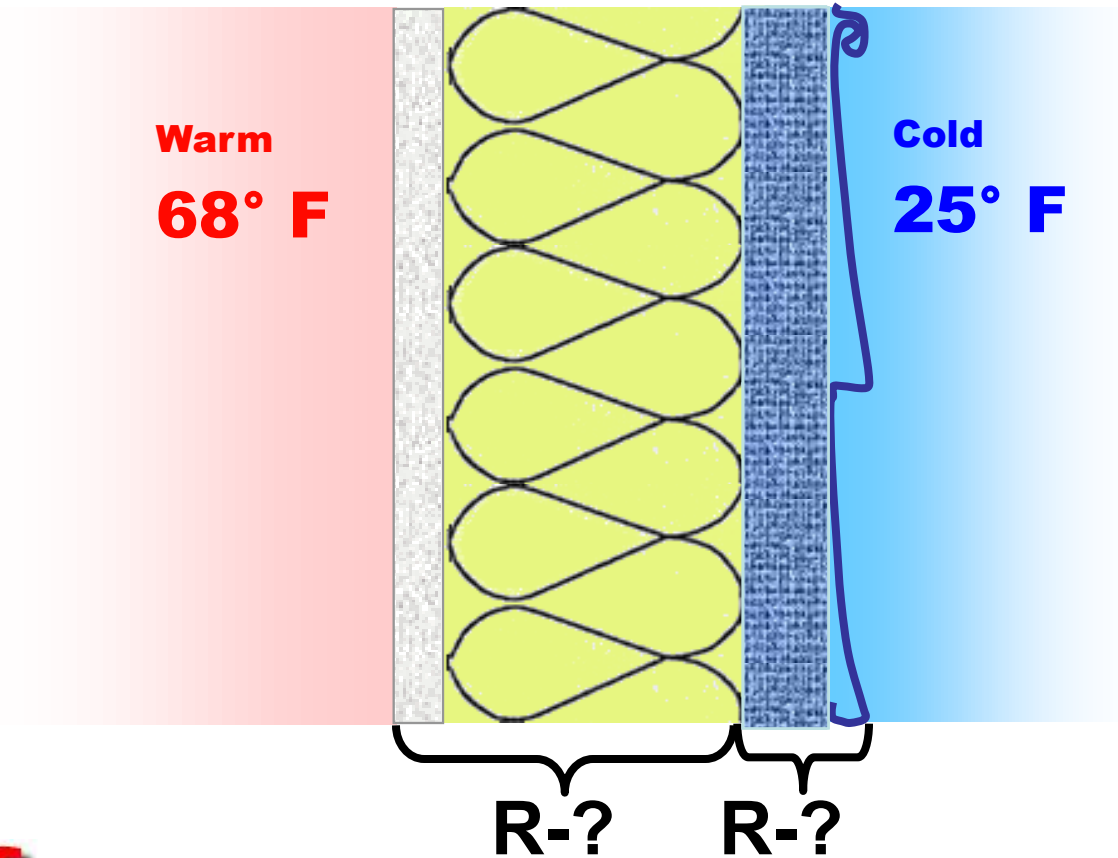
Dewpoint Analysis - Dow Chemical

Wood Stud Wall and OSB Sheathing



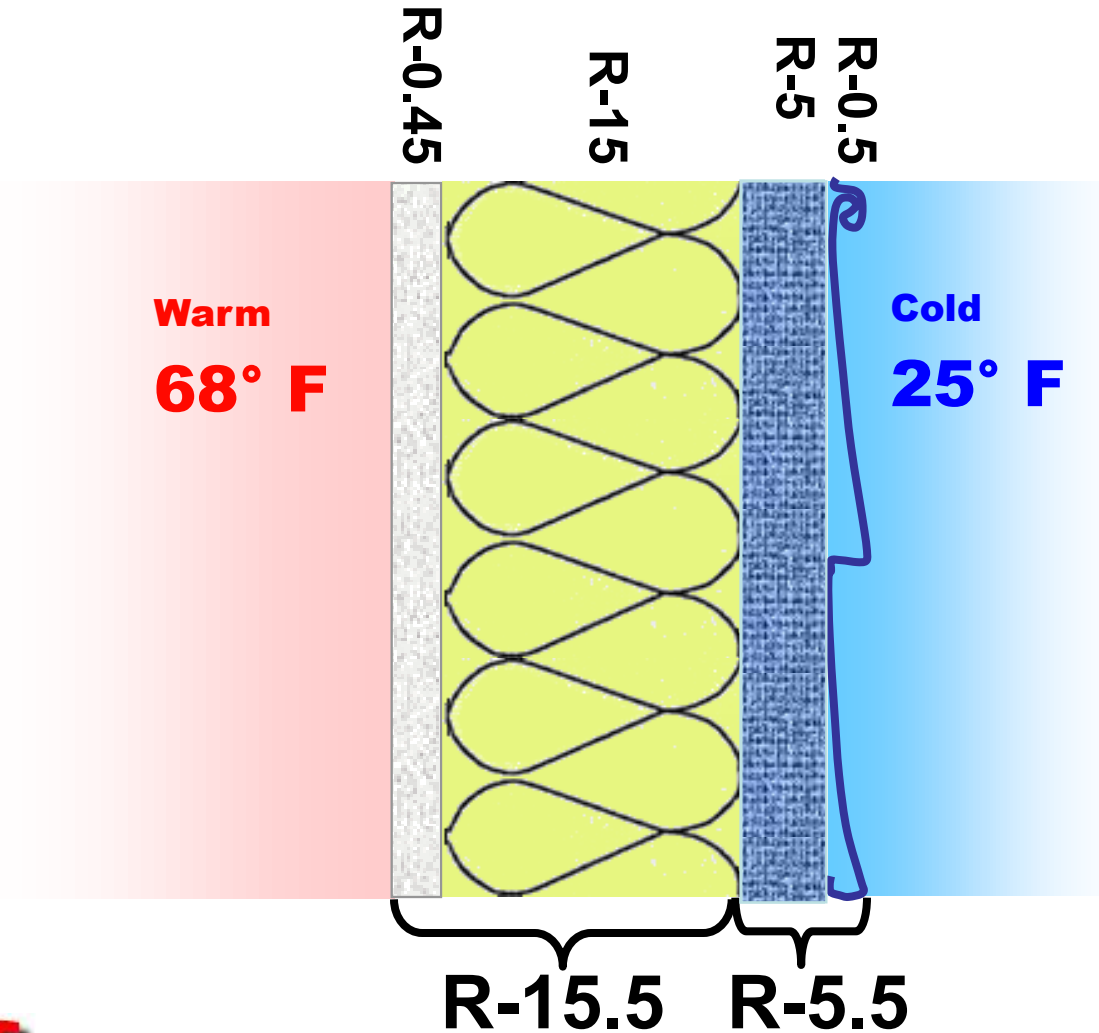
Reduction

Insulating Sheathing



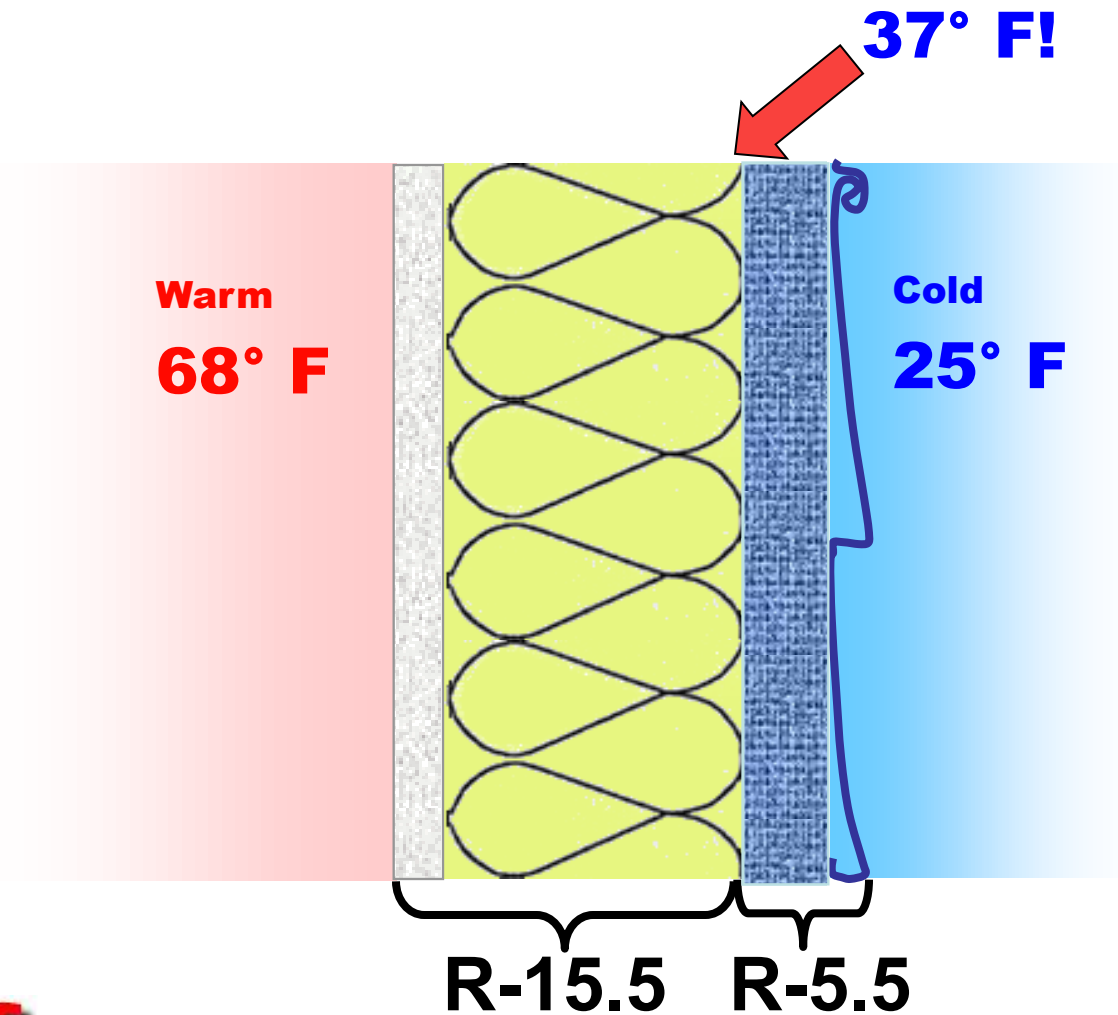
Reduction

Insulating Sheathing



Reduction

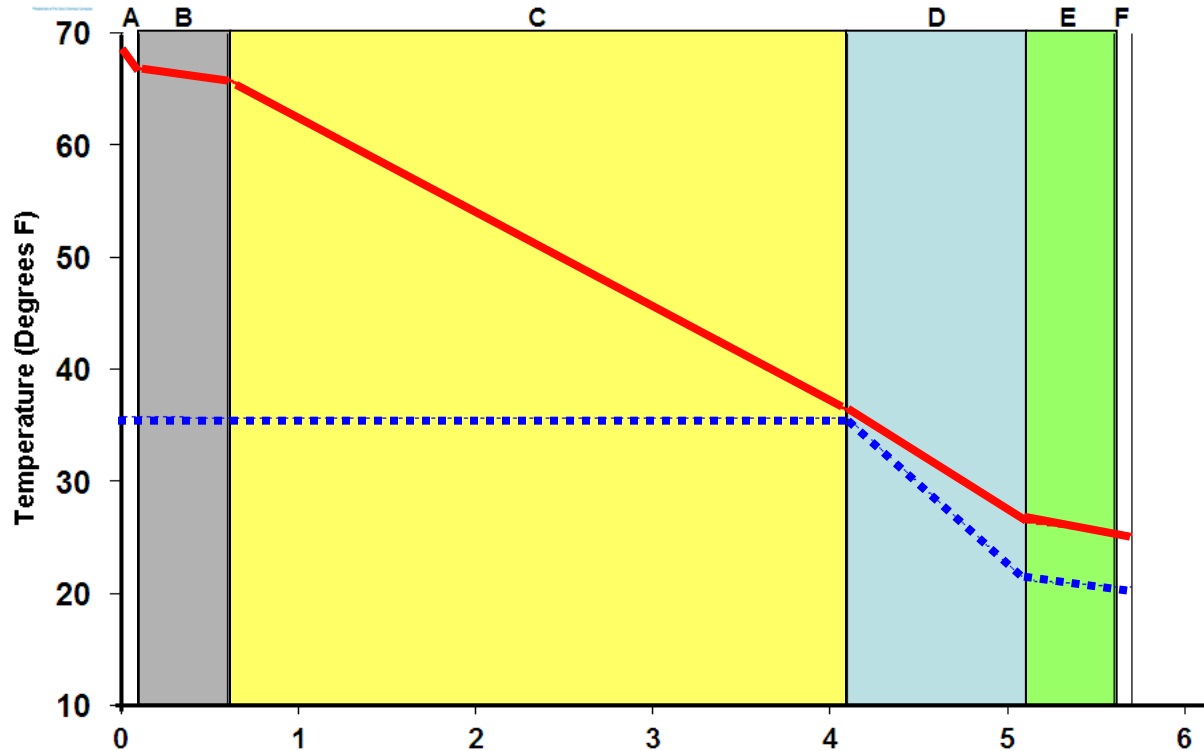
Insulating Sheathing



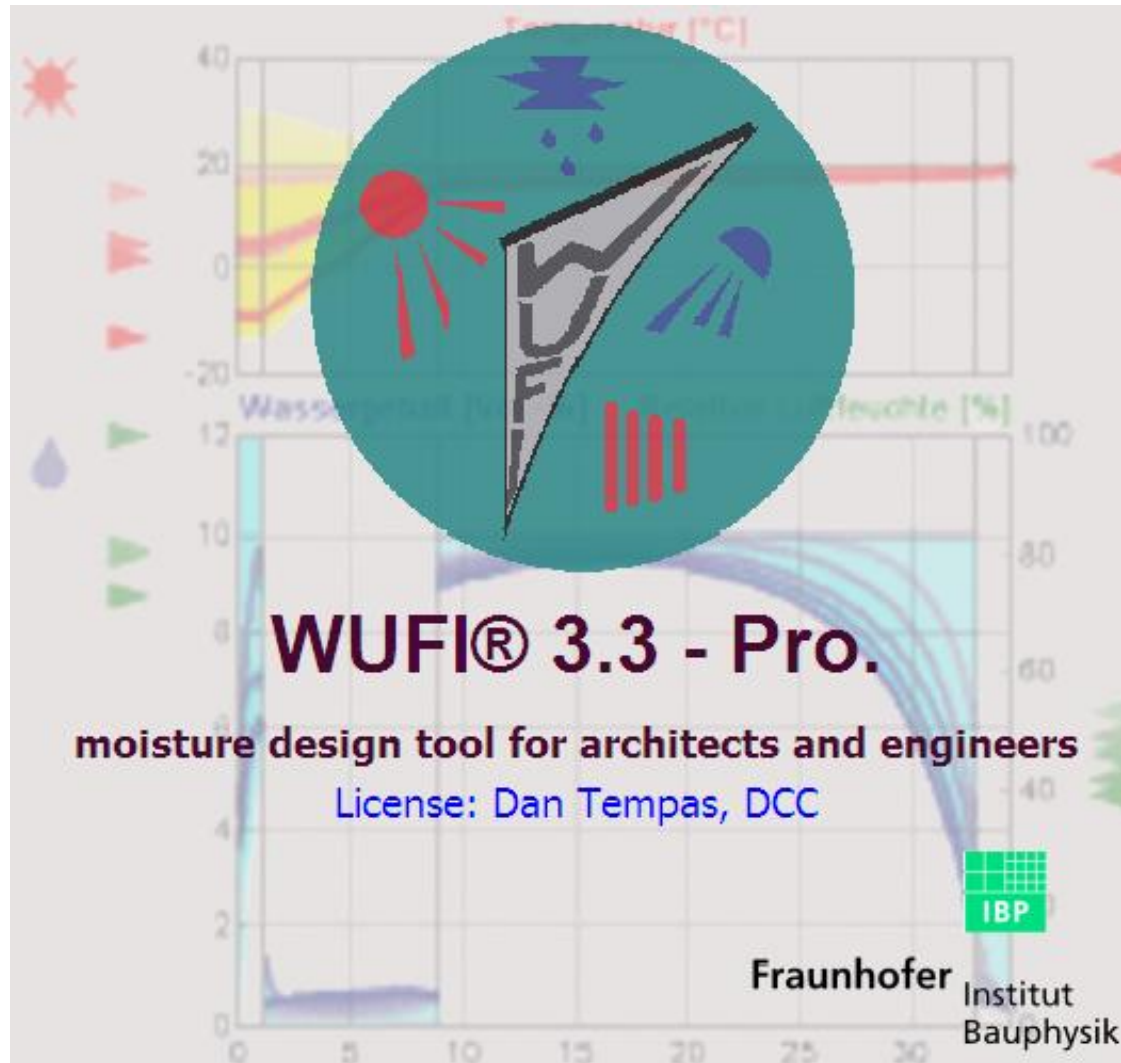
Reduction

Dewpoint Analysis - Dow Chemical

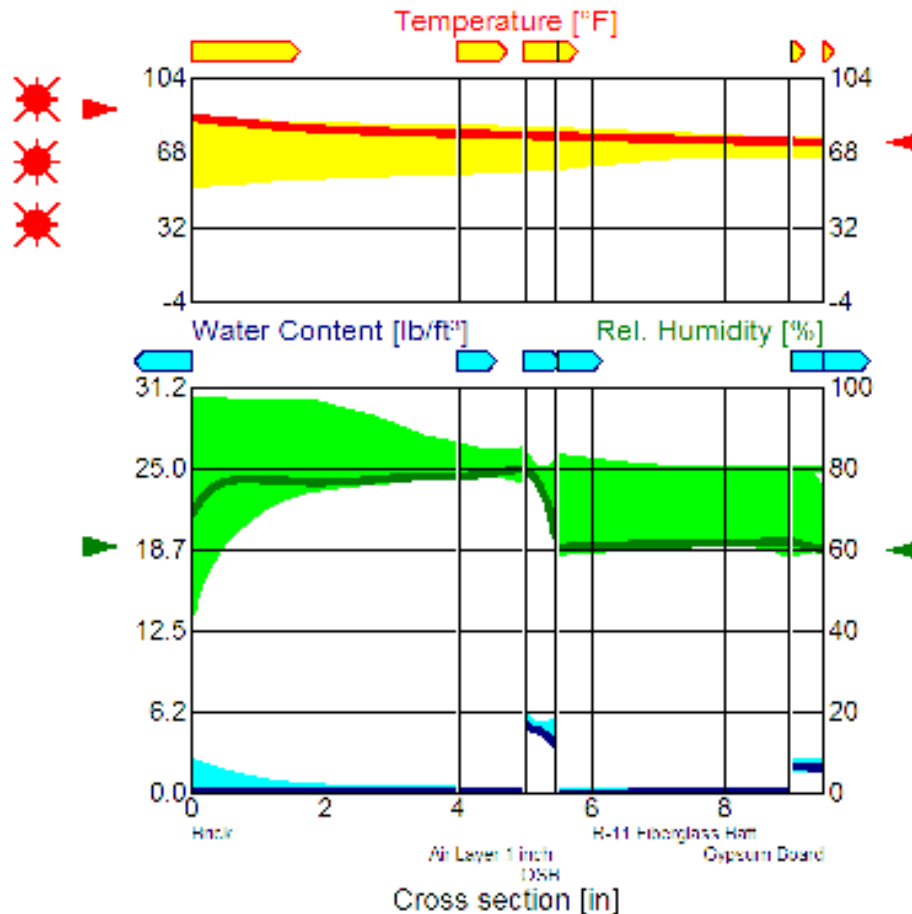
Wood Stud Wall and R5 Sheathing



Reduction



Reduction



WUFI3.3
Run

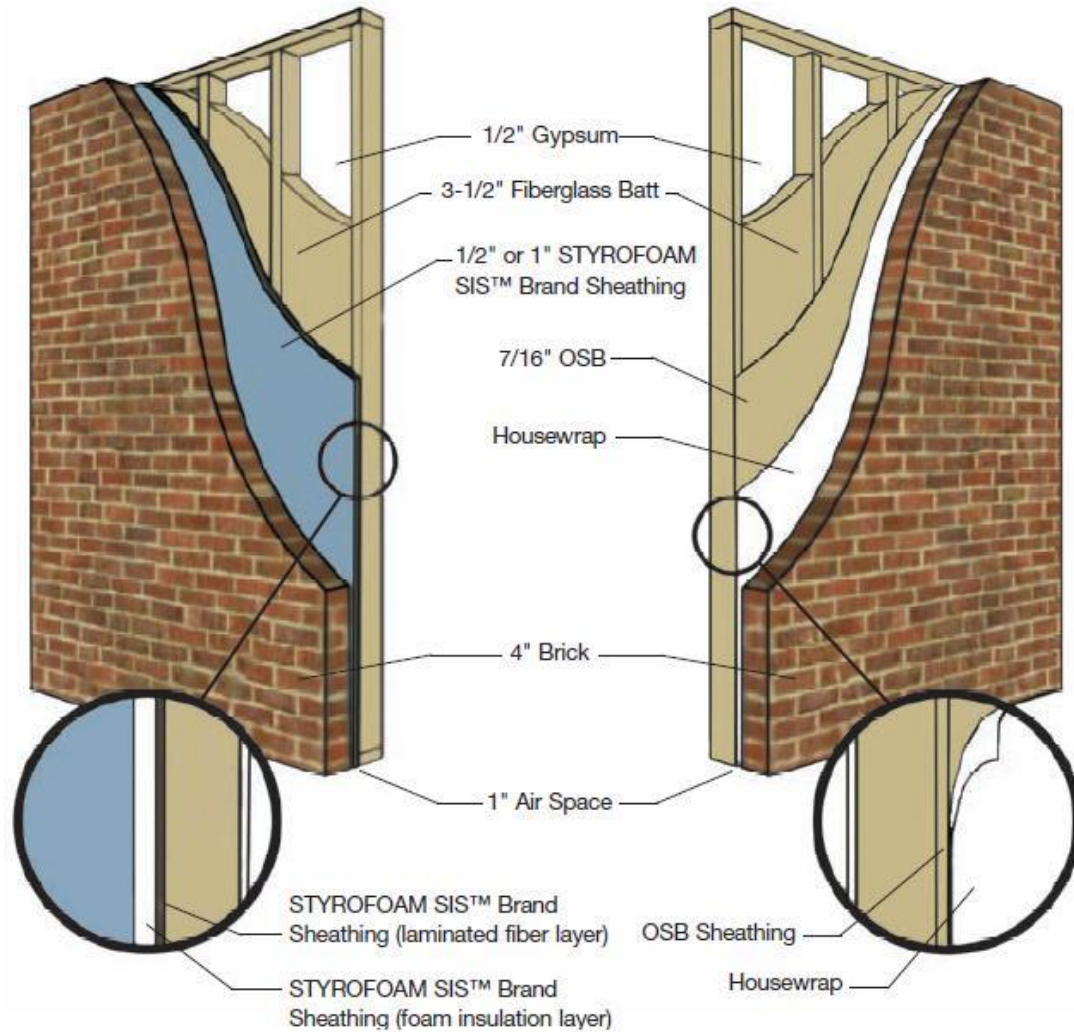
19 Aug
2008

Buttons: Run, Stop, Pause, Scale

Scale: 0 to 100

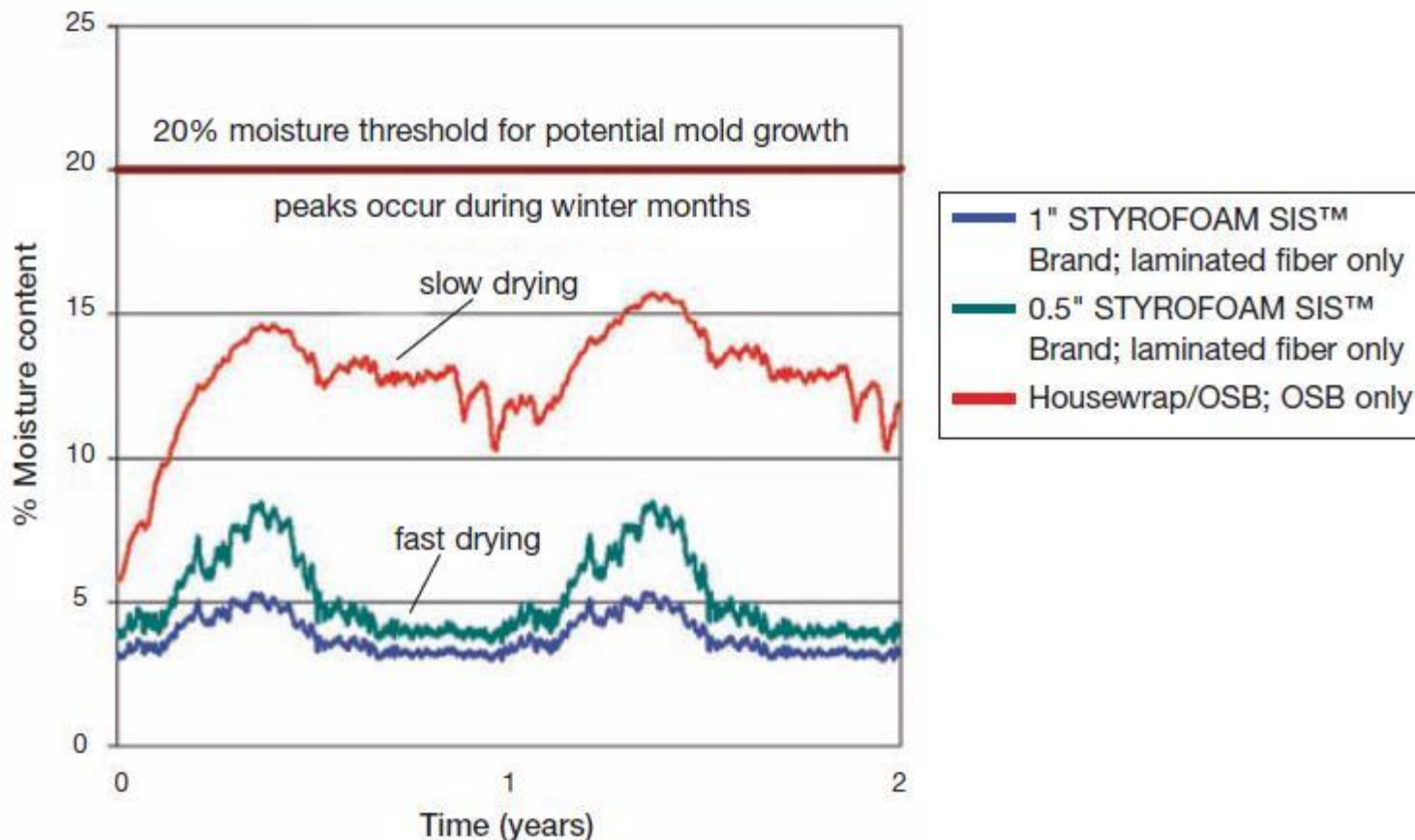
Buttons: ? Help, Print

Reduction



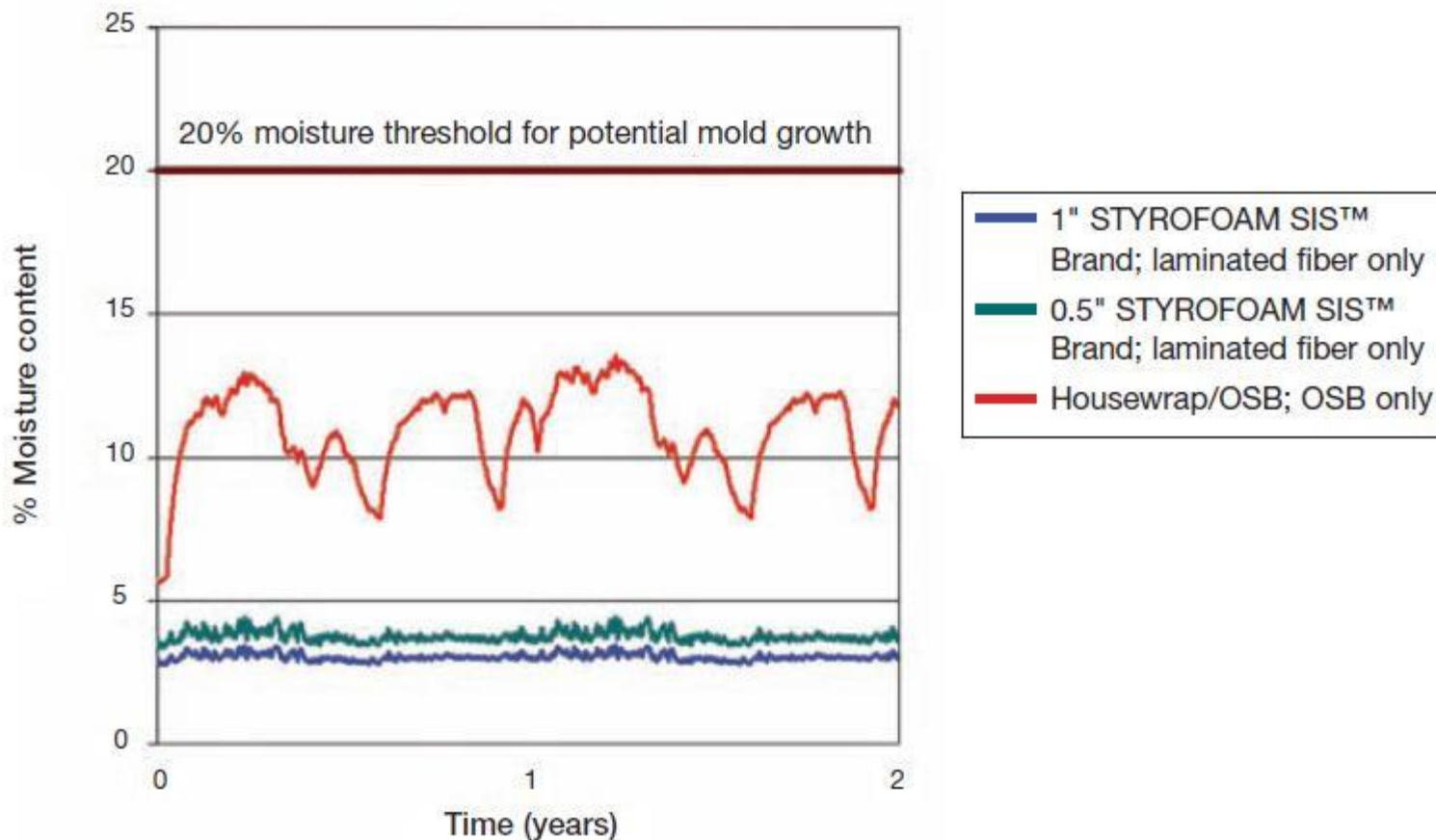
Reduction

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



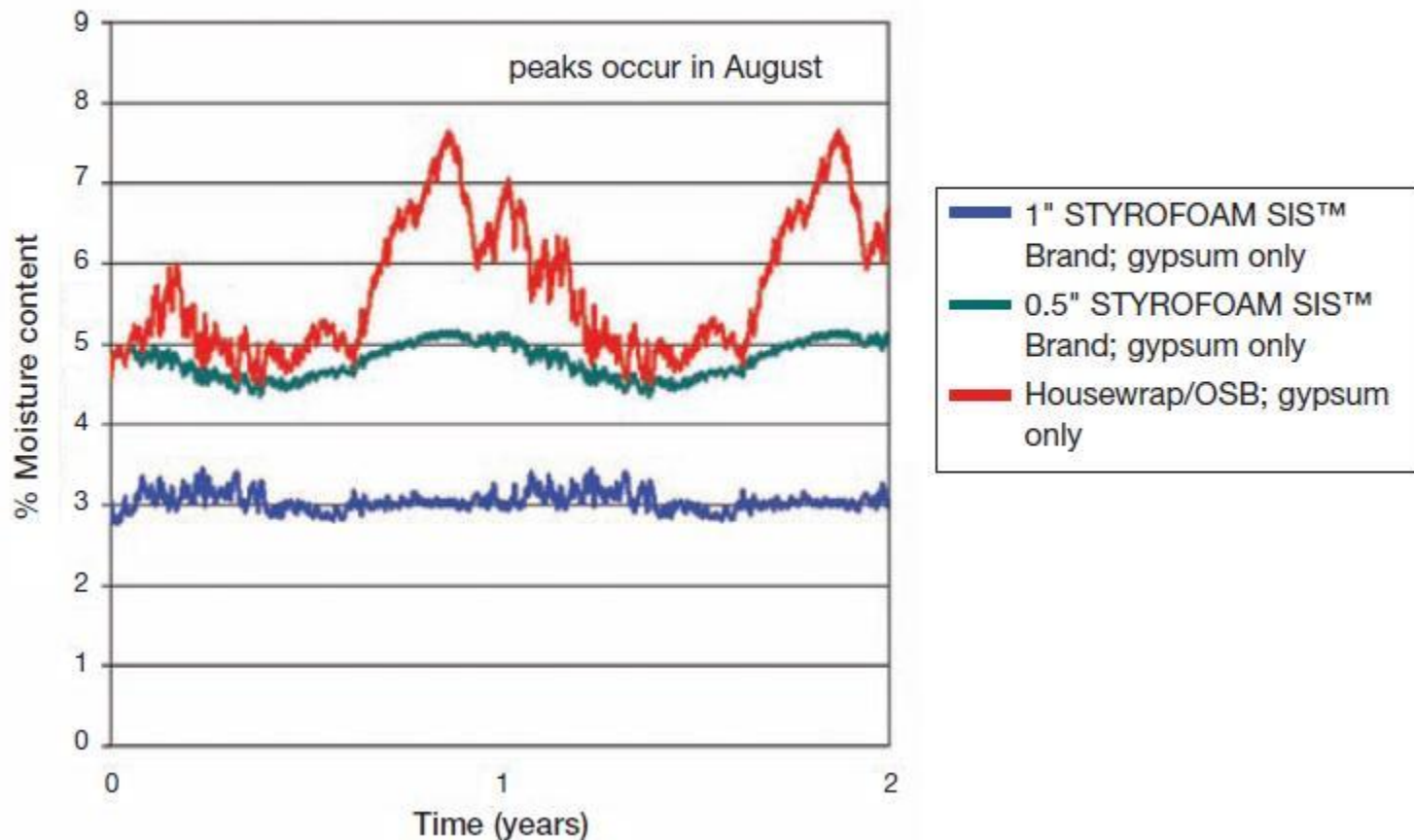
Reduction

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

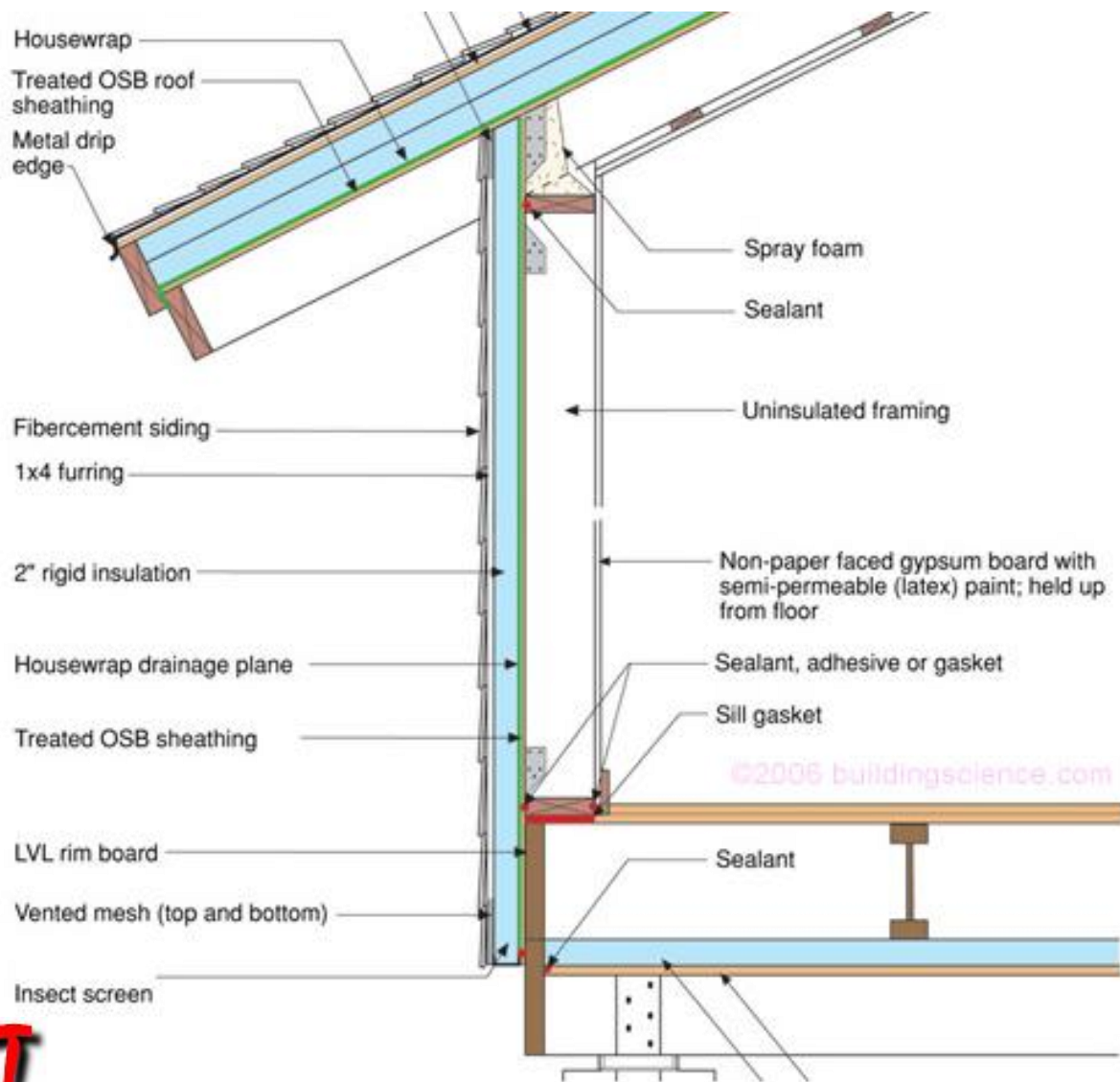


Reduction

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



Reduction



Execution

Options:

- Oversheathing



Execution

Options:

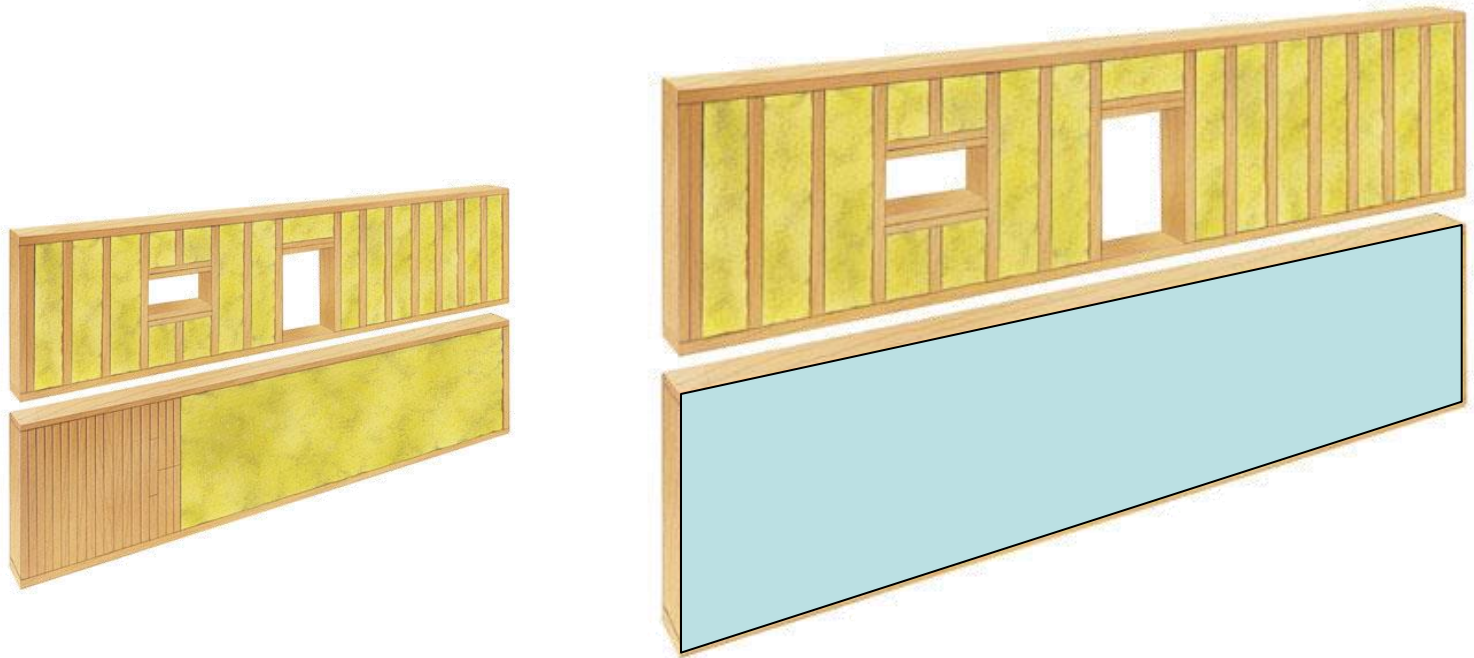
- Oversheathing
- Insulation Only



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 Sheathing



Insulated Sheathings

Energy Savings

- Why they work
- What difference Does it Make?

Moisture Performance

- Condensation



Warm Cold

Temperature!

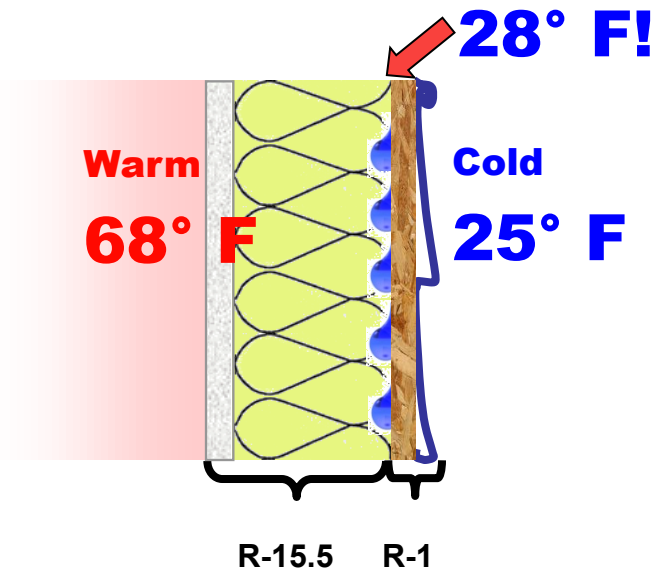
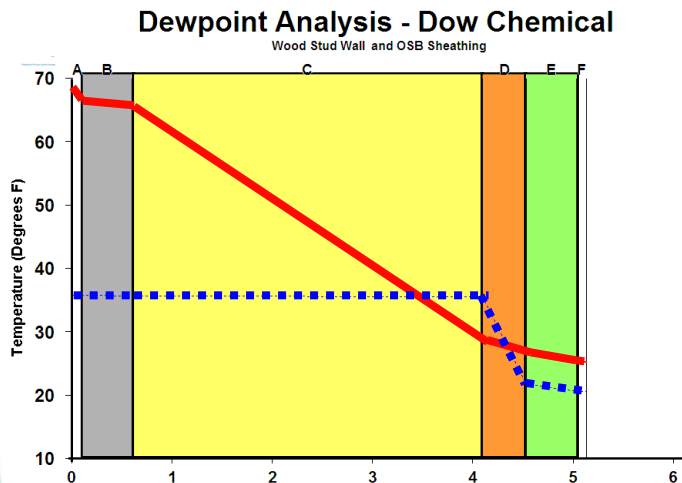
Insulated Sheathings

Energy Savings

- Why they work
- What difference Does it Make?

Moisture Performance

- Condensation
- Evaluation



Insulated Sheathings

Energy Savings

- Why they work
- What difference Does it Make?

Moisture Performance

- Condensation
- Evaluation
- Reduction

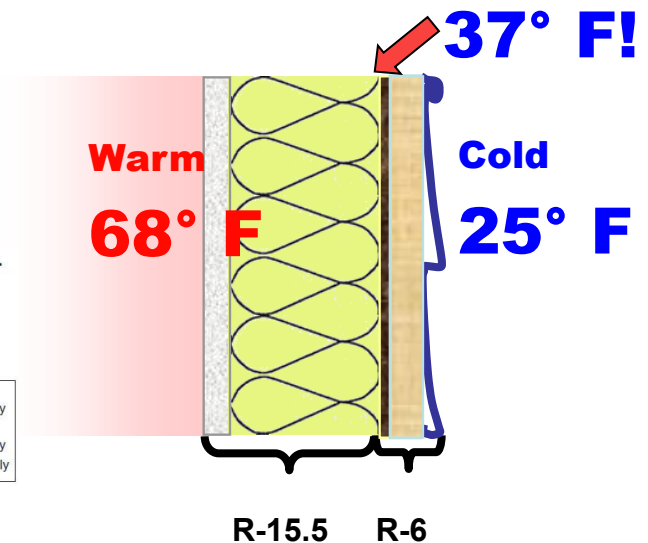
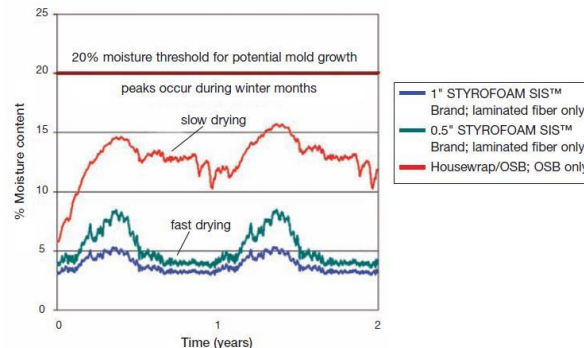


Figure 3: STYROFOAM SIS™ Brand Structural Insulated Sheathing vs. Housewrap/OSB; % Moisture Content of Sheathing; Chicago



Insulated Sheathings

Energy Savings

- Why they work
- What difference Does it Make?

Moisture Performance

- Condensation
- Evaluation
- Reduction
- Execution



Insulated Sheathings

Not just for Energy Savings

Dan Tempas
Sr. Scientist



Questions?