

## Building Solutions



### Hygrothermal Performance Comparison:

### 2x6 OSB/Housewrap and 2X4 OSB/Continuous Insulation

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# Agenda

Question:

*How do above grades wall in wood frame houses built with a layer of impermeable continuous insulation or a layer of breathable housewrap perform in a cold climate?*

- What the models tell us.
- Measured Wall Performance
  - What measured performance of occupied houses tell us.
  - What long term wall assembly research tells us.

# Occupied House Comparison Cases

*Experimental Background*

## 2X6 OSB/HW



49-Kendall



51-Kendall



53-Preston



48-Somerset



50-Preston



52-Somerset



54-Preston



56-Kendall

## 2x4 R5 CI



55-Somerset

# Modeling Predictions, Using WUFI

Relative Humidity,  
*Adjusted for occupants*

House number	Winter Average		Summer Average	
	Predicted % RH	Measured % RH	Predicted % RH	Measured % RH
1	42	29	60	39
3	43	29	60	59
5	22	17	60	51
9	25	23	60	49

Sheathing Moisture,  
*Using ASHRAE 160*

House Numbers	Measured Sheathing Moisture		WUFI Predicted Sheathing Moisture (using ASHRAE 160)	
	Maximum % Moisture	Number of days >20%	Maximum % Moisture	Number of days >20%
1-3	31%	71 +/- 35	50%	190
4-6	29%	42 +/- 35	19%	0
7-9	23%	5 +/- 5	12%	0

Sheathing Moisture,  
*Using Measured RH*

House Numbers	Measured Sheathing Moisture		WUFI Predicted Sheathing Moisture (measured RH)	
	Maximum % Moisture	Number of days >20%	Maximum % Moisture	Number of days >20%
1-3	31%	71 +/- 35	29%	46
4-6	29%	42 +/- 35	14%	0
7-9	23%	5 +/- 5	12%	0

# Wall Measured Moisture Comparison

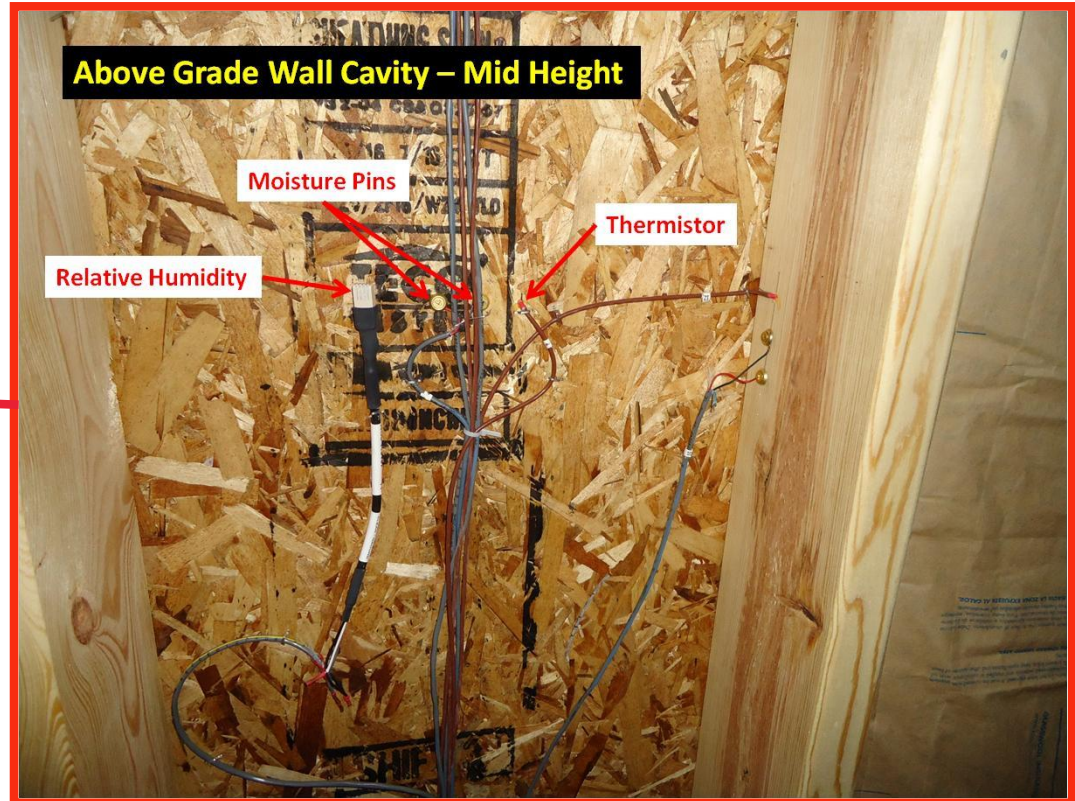








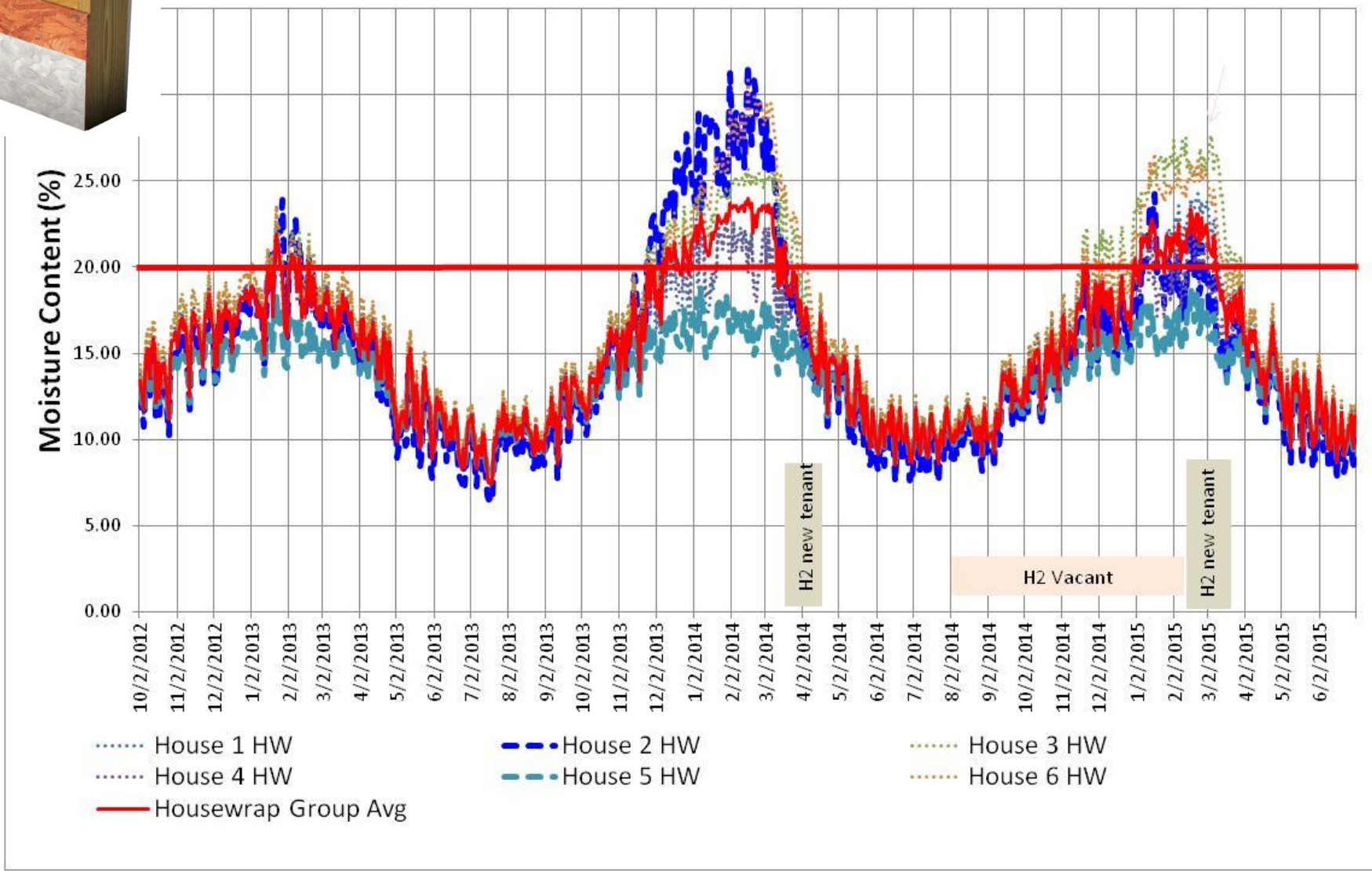
# Above Grade Wall Measurement Location

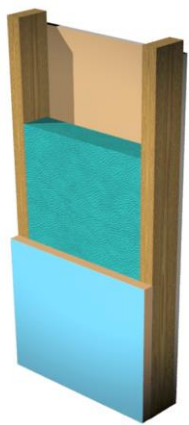




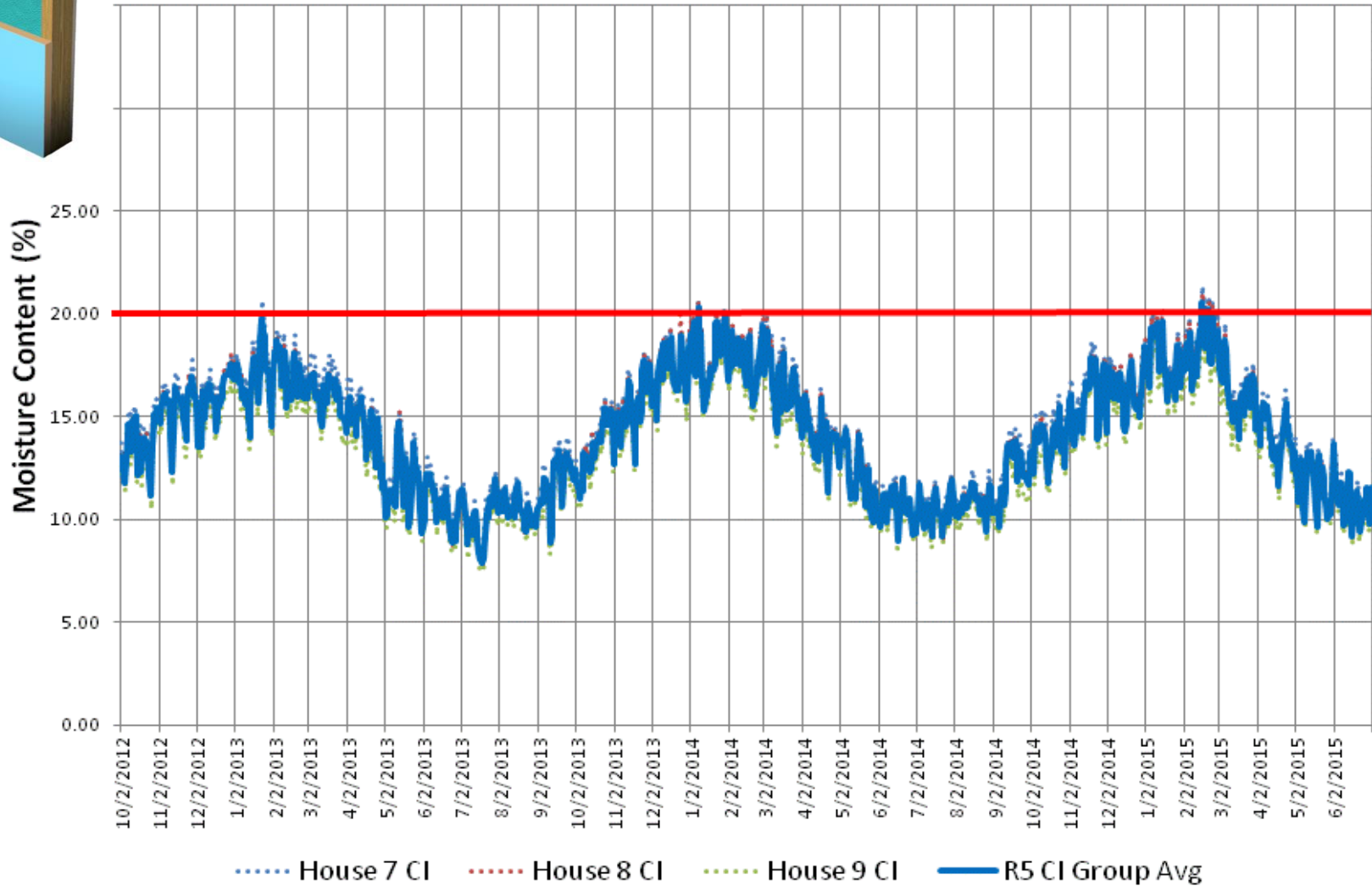


# Moisture Content - Housewrap Houses Interior Sheathing Surface - Above Grade Cavity

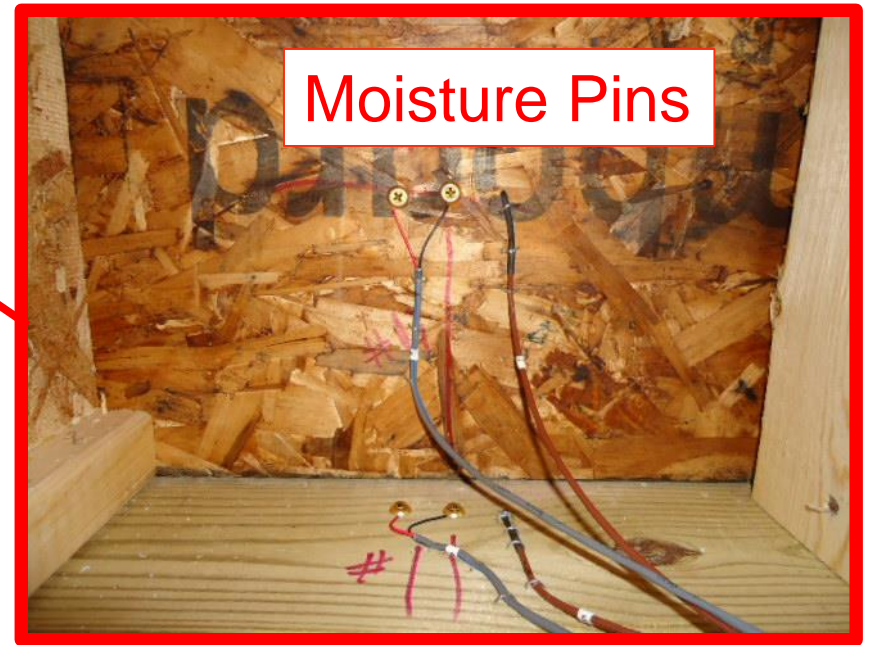




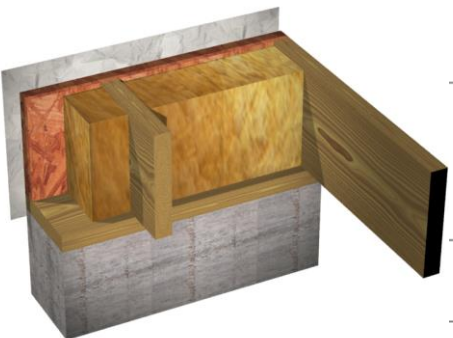
## Moisture Content- R5 CI Houses Interior Sheathing Surface - Above Grade Cavity



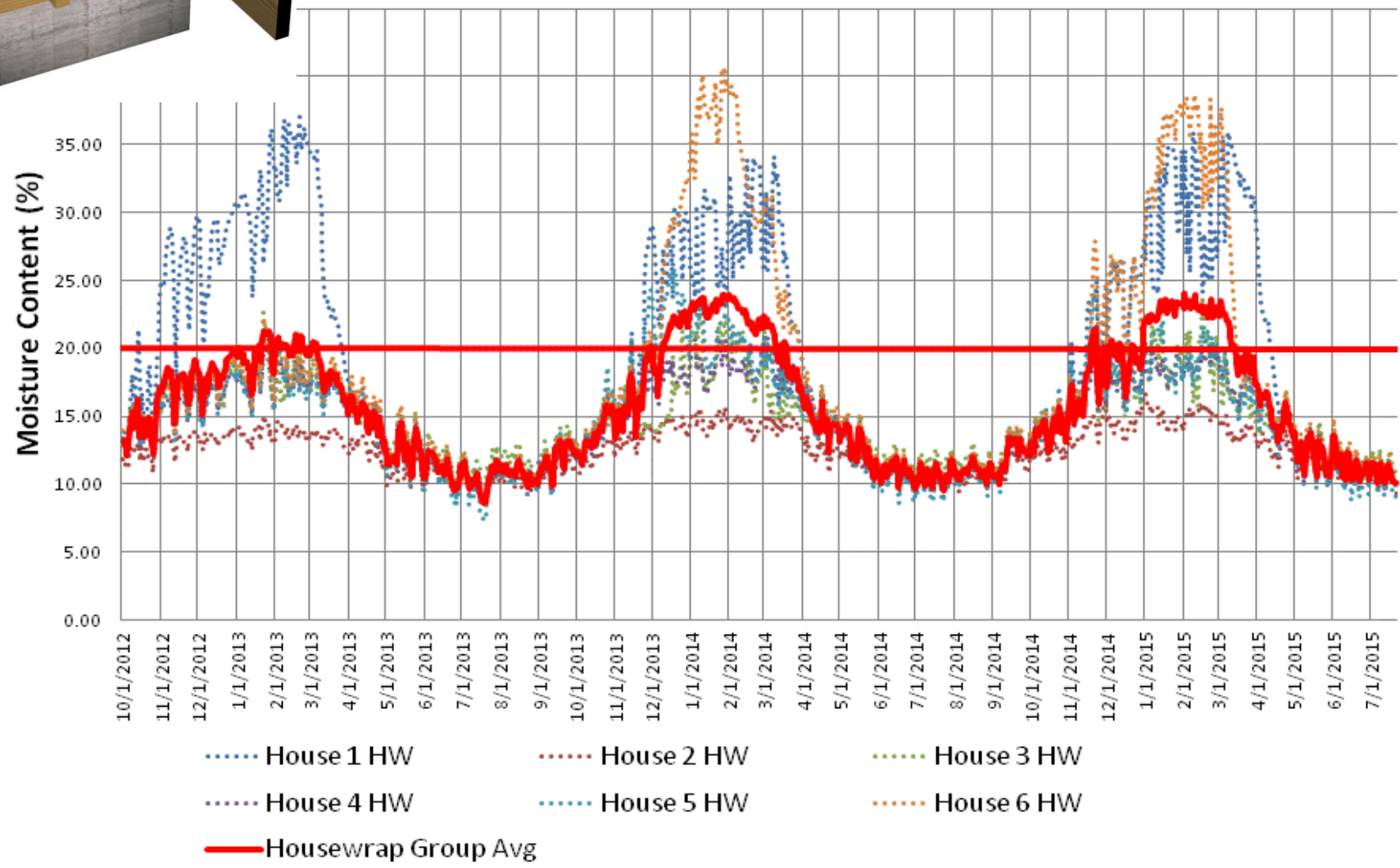
# Rim Joist Measurement Location



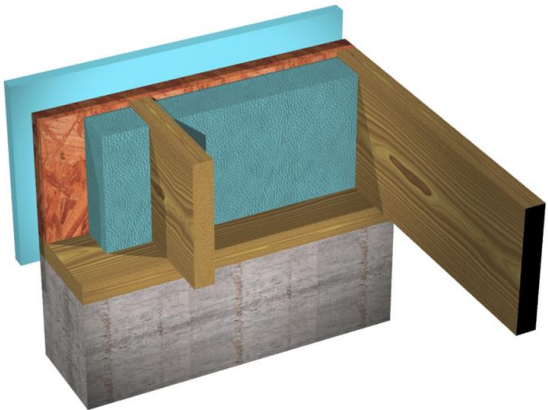
Moisture Pins



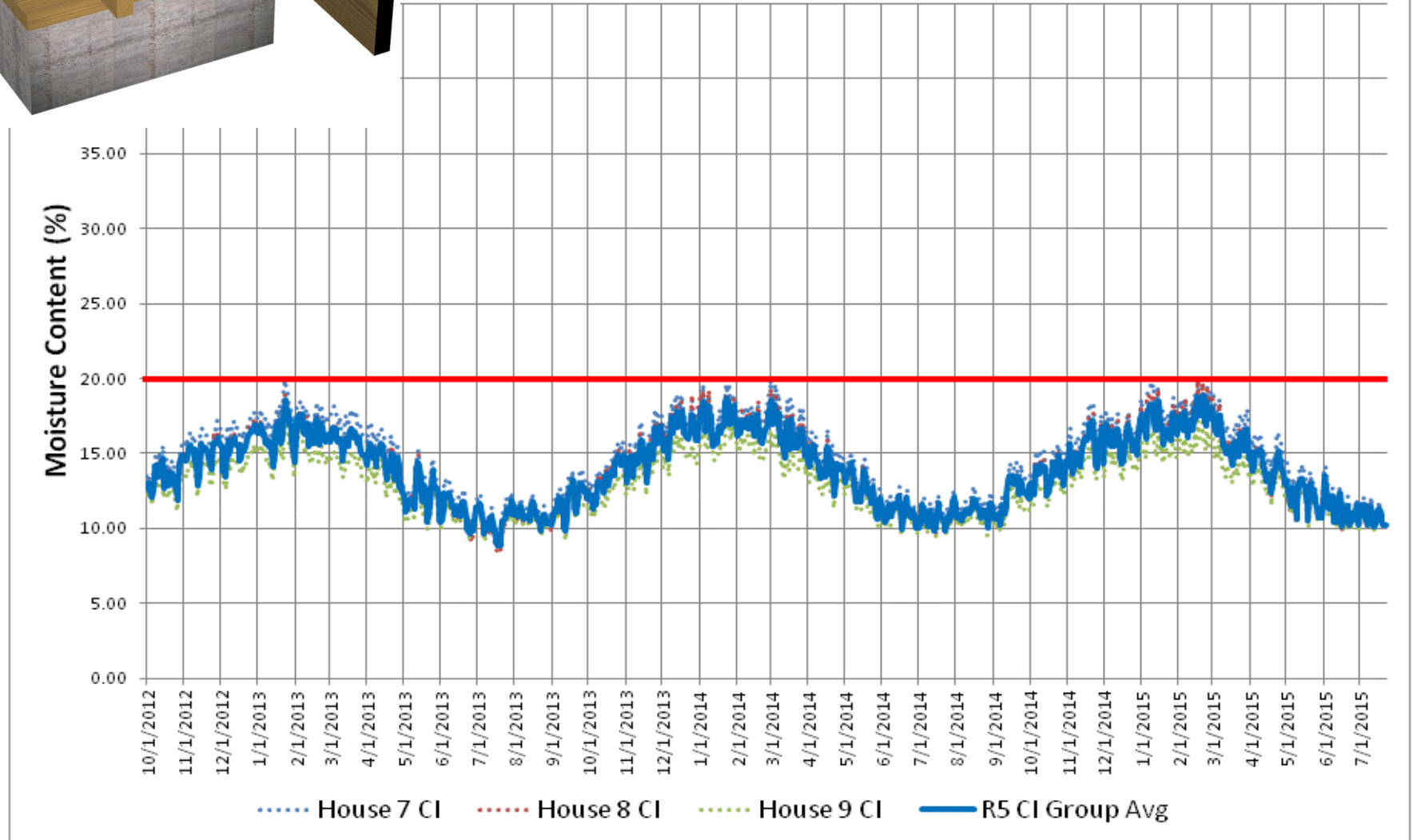
## Moisture Content - Housewrap Group Band Joist Interior Surface



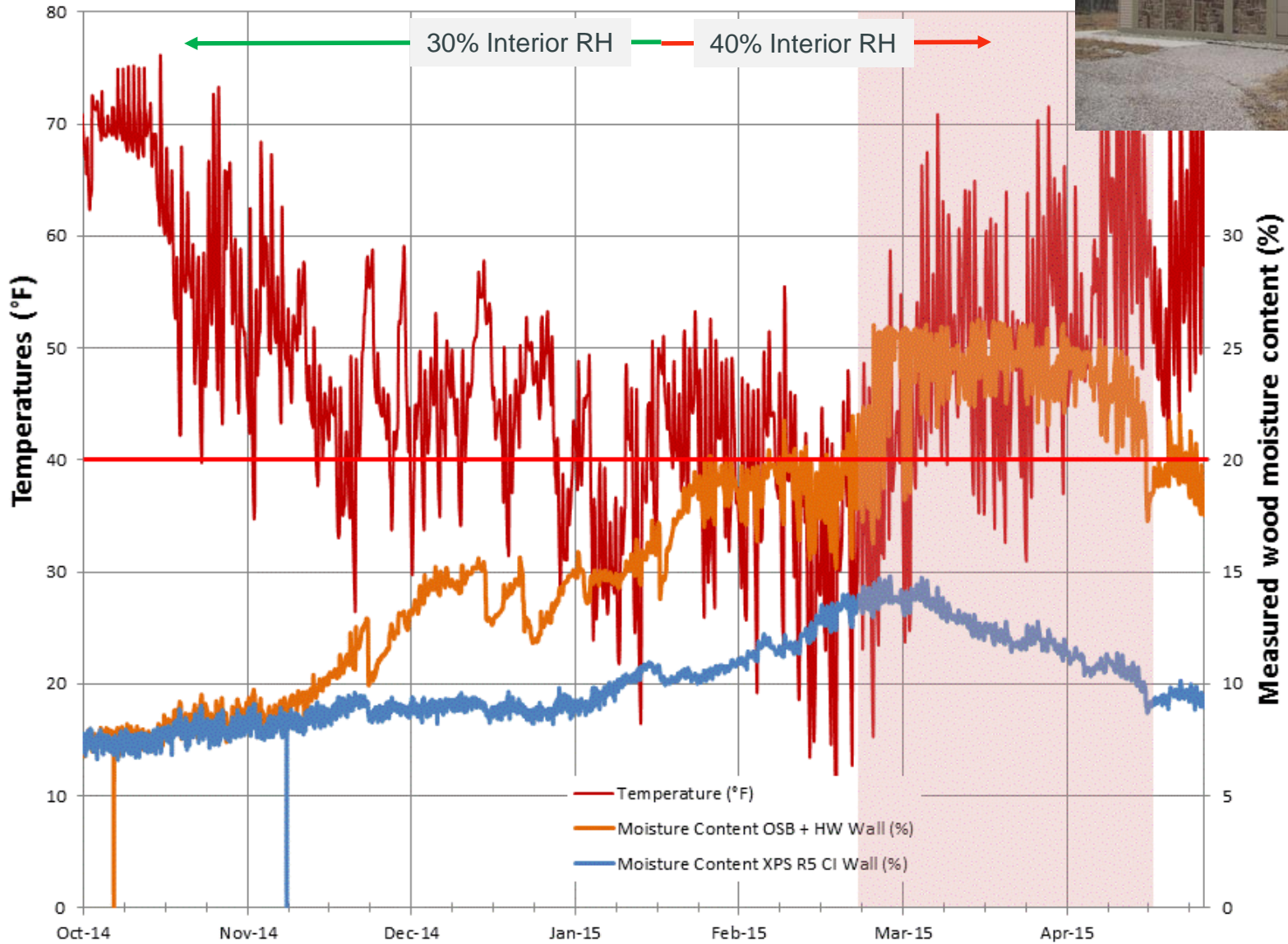




## Moisture Content - R5 CI Group Band Joist Interior Surface



# Long Term Wall Assembly Tests



# Forensic Inspection of Select Houses





# House 2

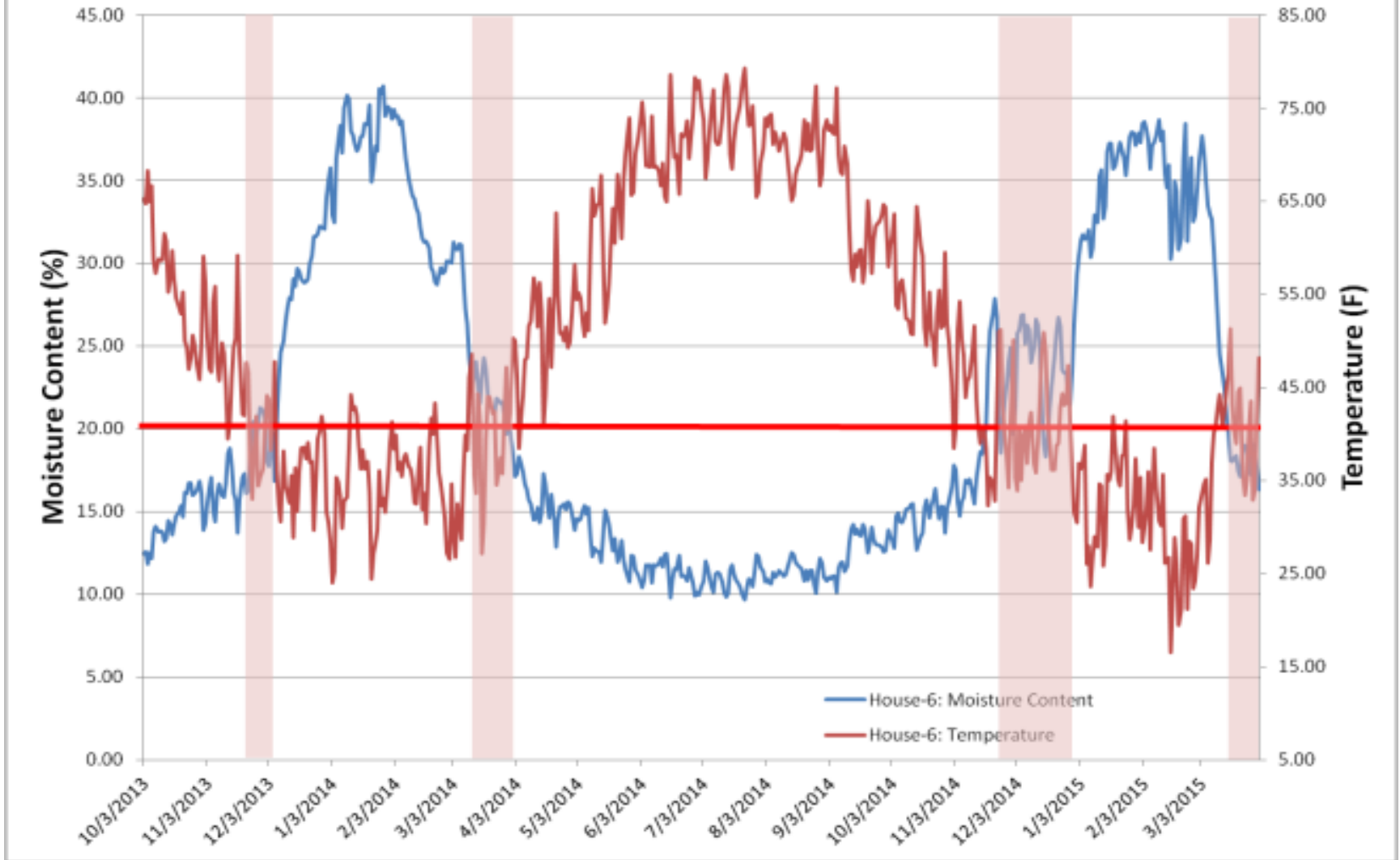


# Summary Forensic Findings

	Moisture Content	Above Grade Wall	Rim Joist	Microbial Sampling
House 2	Elevated	Water staining in cavity	No evidence of water	Moderate to heavy fungal growth – wall cavity
House 3	Elevated	Small area of dark staining	No evidence of water	Some fungal growth – rim joist
House 6	Elevated	No evidence of water	Some staining on joist bottom chord	Some fungal growth – rim joist
House 5	Low	Water staining in cavity	Rust on staples	No fungal growth

So, Why do we see this – high MC but no real deterioration?

### Temperature and Moisture Content - House 6 OSB/Wrap - Band Joist Surface





# Summary

- Calibration of interior RH in WUFI is necessary and impactful
- Above Grade Walls and Rim Joists with CI have lower measured moisture content
- Wall assembly testing, with CI and FG performed well at elevated RH
- Low perm on both sides of OSB stayed dryer, double vapor barrier wasn't a problem
- OSB & house wrap strategies more sensitive to occupant behavior
- Seasonal wetting events have not caused catastrophic degradation after 4 years



**Thank**  
**You**